

SUSTAINABLE AGRICULTURAL PRODUCTION TECHNOLOGIES – NEED FOR ORGANIC FARMING: AN ANALYSIS

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Abstract

The agriculture sector plays an important role in the development of the Indian Economy. Agriculture provides more employment opportunities for rural people. It is evident that the majority of the Indian farmers are marginal and small farmers, they are unable to earn more income and find it difficult to maintain their livelihood. It is also evident that the contribution of the agriculture sector to the national GDP has been showing declining trends in these days. Hence, Sustainable Development of Agriculture is needed by innovative techniques, where organic farming is one of the techniques that help sustainable agriculture. Therefore, the present study attempted at an analysis of Sustainable Agricultural Production Technologies focusing on Organic Farming Techniques. The objectives of the paper are to study techniques of organic farming for sustainable agriculture and to examine the problems faced by farmers in raising production following Organic farming in India. The study is based on secondary sources of data gathered from titles, journal articles, reports and e-sources. The study found that organic farming improves agriculture productivity and production in India and contributes more to sustainable development. Also, it is found that production of agricultural output under organic farmers has been confronting the problem of higher cost of production. Hence, government should provide incentives for the faster and more sustainable development of agriculture in India.

Key Words: Sustainable agriculture, Innovative Technology, Organic Farming

1. Introduction

Agriculture is the prime sector of the overall development of rural areas. It plays a predominant role in ensuring food security, raw materials, and livelihood and provides a spur to the growth of the industrial and service sectors. Hence, a huge proportion of labour force still depends on agriculture (Deshmukh and Ghagare, 2019). The statistical data proved that more than 80 per cent of the poor depend on farming for their livelihood and more than 85 per cent of the farmers in India are marginal and Small farmers groups. These farmers face the problems of inadequate access to credit, shortage of capital, unskilled human capital, incompetent access to extension services, and lack of technological acquaintance which are the main obstacles to continuing with farming activities. Further, poor financial accessibility, high cost of quality inputs and production, and fluctuation in climatic conditions are the main problems confronting small farmers (Sinha and Sinha, 2022). The concept of sustainable agriculture gained more importance with the publication of the Brundtland Report (1987). According to this report, “sustainable development refers to fulfill the needs of present generation without compromising the ability of future generation” (Soni et al., 2022). Organic farming is the production of crops, animals, and other products without the use of synthetic chemical fertilizers and pesticides, transgenic species, antibiotics growth-enhancing steroids, or other chemicals. Organic farming emerged as a solution for adverse effects faced by the agriculture in the recent years. The adverse effects caused by the use of agrochemicals, are contamination of individual components of the environment, reduced soil fertility, declined plant vitality and immunity, diminished biodiversity, and lowered quality of food with negative effects on human health (Annual Report 2020-21).

Organic farming is emerging as an alternative production system because of enhancing demand for organic products in the market, for improving in soil fertility, environment conservation, and improving the well-being of society. Organic farming is an method of agriculture used fertilizers of organic base, like green manure, compost manure and other techniques involved namely rotation of crop and other companion planting techniques. These methods of organic farming contribute more to sustainable agriculture.

According to the Food and Agriculture Organization ‘organic agriculture is a holistic production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity (Bankar and Lihitkar, 2023). In the above context the intended study aimed at an analysis of Sustainable Agricultural Farming Technologies, focusing on Organic Farming Techniques.

2. Review of Literature

Amritpal and Singh (2019) in their study on “Problems Faced By Organic Farmers in Punjab: A Business Approach” described that the implementation of organic farming takes a very prolonged period, and the farmers in organic farming practices face the problem of scarcity of labour and huge competition, so small farmers are unable to compete with many large companies and hence, lose profit; it is very risky, lack of input availability and lack of open local markets also cause worry.

The study carried out by Soni et al. (2022) examined “Organic Farming: A Sustainable Agricultural Practice” and found that organic farming improved soil fertility by using soil management, the technique of Crop rotation and inter-cropping, mixed cropping helps enhance soil life by increasing soil properties and its biological activities. Hence, the techniques of organic farming contribute to sustainable agriculture by way of increasing agricultural productivity and production avoiding weeds, and also managing the chemical and physical properties of soil.

Another study was carried out by Narmadha. (2022) on “Problems and Prospects of Organic Farming in India”, discussed that organic farming improves soil quality and fertility by practicing multi-cropping, crop rotations, organic manures and pesticides, and low tillage. Further, the study also found that it enhances natural plant nutrients from green manures farmyard manures, composts, and residues builds organic content in the soil enhances employment opportunities, and higher amounts of nutrient food.

Gamage et al. (2023) in a study on “Role of Organic Farming for Achieving Sustainability in Agriculture” examined that, organic farming plays a predominant role in reducing the environmental and ecological impact of sustainable development. The methods followed in organic farming in agricultural practices improve natural cycles in the recovery process enhance production and productivity and also enhance the quality of food.

Tiwari et al. (2023) in their article on “A Review of Organic Farming for Sustainable Agriculture in India” described that organic farming plays a significant role in sustainable agriculture development by way of high-yielding cultivation, improves the irrigation water, and fertilizers, and it environmentally, socially and economically sound in the economy and ensures the sustainable agriculture development in the form of crop rotation, soil conservation, and agrochemical method to conserve the crops from weeds, conservation of agricultural and biological diversity.

3. Statement of the Problem

Agriculture is the major occupation in India. A huge proportion of the population depends on agriculture for their livelihood. It is evident that majority of the farmers in India are marginal and small farmers registered about 45 per cent of land holdings; it generates a meager per cent of income. These marginal and small farmers find it difficult to continue with agriculture and are unable to compete with the large farmers. Further it is also found that the growing population demands more and more quality food grains. Hence, organic farming fulfills the demand for food of the growing population by the way of quality and nutrient food. Hence, considering the above pertinent issue, a study on Sustainable Agricultural Production Technologies focusing on Organic farming techniques is felt relevant and attempted at.

4. Objectives

Present study has been undertaken with the following objectives :

1. To understand the importance of organic farming for sustainable development of agriculture in India.
2. To examine the problems confronting the farmers in practising organic farming in India.

5. Methodology

The intended study is descriptive and analytical based on secondary sources of data gathered from books, journal articles, reports and e-sources. The study used percentages and averages for the analysis

• **Meaning of Organic Farming**

According to the United States Department of Agriculture (USDA), the word organic farming is "a system without using fertilizers, pesticides, hormones, feed additives, etc in agriculture production. It is mainly associated with the practices of various techniques like crop rotations, crop residues, animal manures, off-farm organic waste, mineral-grade and biological systems of nutrient enlistment, and ensuring plant conservation efficiently. "Organic agriculture is a production method that improves the health, soil fertility and environmentally friendly and people. It relies on ecological processes, biodiversity, and cycles adapted to local conditions, rather than the use of inputs with adverse effects (Ashoka Gamage et al., 2023).

6. Results and Discussion

6.1. Organic Food Production in India

Out of the total 178 countries, India is placed in 9th position in practicing organic agriculture. India produced a higher variety of organic products with the prevailing agro-climatic zones. The total area under organic certification is registered at 3.566 million ha in 2018-19, together with cultivated area and wild harvest area. States like, Madhya Pradesh occupied first place under organic certification it was about 9.18 lakh ha followed by Rajasthan placed second registered with (6.32 lakh ha), Maharashtra reported at (2.61 lakh ha), Odisha it was (1.28 lakh ha), Karnataka at (1.05 lakh ha), Gujarat (0.94 lakh ha), the Telangana state at (.88 lakh ha) and Sikkim (0.76 lakh ha). The entire share of these was about 90 per cent of the total area covered under organic certification in 2018-19. The total production of both cultivated and wild harvest was registered at 2645315.67 lakh ha in 2018-19.

The entire export quantity stood at about 614089.61 Tons of total value INR 5150.99 crore in 2018-19. Currently, India is the home country for individual farm producers, it was about 2371 and, the Internal Control System(ICS) about 3488 groups (11.47 lakh farms), further 1452 total processors, about 777 total traders, 90 water harvesting operators (total collectors 29384), total operators were 8301 and 11,49,371 total farmers organic production by crop in the cultivated area during 2018-19 such are Sugar crop 991640.09 tons, Oil Seeds 727156.19 tons, Fibre Crops 313833.43 tons, Cereals & Millets 269734.14 tons, Pulses 71875.27 tons, Plantation Crops (tea/coffee/coconut) 61544.01 tons, Spices and Condiments 56253.05 tons, Medicinal/Herbal/Aromatic Plants was about 48424.78 tons, concerning Fruits it was about 35814.95 tons, Dry fruits 8864.228 tons, Flowers it was 11015.82, and Vegetables it was about 7135.395 tons, Miscellaneous it was 1964.47 tons, Fodder seeds/Crops registered at 1851.19 tons and Tuber crop it was 289.07 tons in the country. This is made certified production of 2607396.089 tons during 2018-19 (Kumari and Raj, 2020).

6.2. Techniques of Organic Farming

Several components of organic farming techniques used in agricultural practices improve the production and productivity of agricultural output in the form of better soil structure and its management for a high-quality yield, farm squanders can be reused by composting to manufacture organic dung, and wild plant organization method by the without chemical and non-hazardous means accumulation of bio-fertilizers despite whichever additional chemical fertilizers.

6.3. Crop and Soil Management

The management of soil in organic matter is an important factor in improving soil fertility; it can be increased by good farming methods. Fertile soil enhances the good water-holding capacity, and cation exchange and is less prone to soil erosion. The use of green manures is one of the main aspects of organic farming which carefully manages soil by enhancing its biological activity. The methods of organic farming like crop rotation and inter-cropping practices are involved in organic farming which helps in controlling weeds and also managing chemical and physical properties of soil, livestock, farm residues or leftover straw, etc.

6.4. Crop rotation and Inter-cropping

It is a technique to grow various kinds of crops in the same area, season-wise, in a sequential way (Behera et al., 2011).

6.5. Crop Residues

In India every year tones of crop residues are left which are the most important source of nutrient recycling in soil. Usually, the crop residues are inoculated with fungal hyphae and spores which improve the soil health and support in organic farming. The crop residues mainly involved stalks, straws, bristles, halms of beans, and cobs of maize, and, peas, potatoes, etc. (Soni et al., 2022).

6.6. Green Manure

Green Manure means the converted soil by using dying plants that are uprooted and then act as a nutrient for the soil to enhance its quality.

6.7. Biological Pest Control

With this method, one can use living organisms to control pests with or without the use of chemicals.

6.8. Compost

Compost is highly rich in nutrients, it is a recycled organic matter used as a fertilizer in agricultural farms.

6.9. Benefits of Organic Farming

• Better Taste and More Nutritious

Organic Fruits and vegetables are augmented and have a much better taste than other form of mechanically produced ones. It is because they are provided a much longer period to develop and are not pumped with synthetic things. The structure of sugar structures in these crops has given them more time to grow up and expand into a flavorsome and nourishing product.

• Minimizes the use of Chemical Residue in Soil and Pesticide

Organic farming minimizes the use of pesticides and chemicals thereby reducing the major environmental issues. It guarantees the fertility of the soil, air, water, flora, and fauna. Further, it also reduces main environmental problems such as air pollution, soil erosion, and water pollution, etc.

• Improves the Biodiversity

The method of organic farming like Crop rotation to improve soil fertility and augment animals Upgrade helps support biodiversity, which improves greater health in all living genera. As organic farms provide safe havens for wildlife, local ecosystems also improve.

• Consumes Less Energy

•Organic farming does permit on the employ of synthetic fertilizers as different to conventional methods that are species with these outside chemicals. Energy conservation is possible when avoiding the use of fertilizers. Organic farming systems protect energy by lowering usage on average by at least 30 to 50 percent which leads to conserving energy and improving the energy system.

• Long-term Sustainability

Organic farming is a long-term, sustainable approach to food production. Organic farming is considered a realistic, anticipatory move rather than dealing with problems after they appear which can be very late.

• Reduced Erosion and Better Water Management

Both soil improvement and the concept of keeping the ground “covered” as much as possible, either by mulches or cover crops, reduce soil erosion. Soils with improved structure higher content of organic matter and the more compact growth of an organic crop also reduce water consumption in agriculture (Kumar et al., 2022).

6.10. Sustainable Agriculture and Organic Farming

Sustainable agriculture integrates the main goal to maintain biodiversity and augment the quality of natural resources, economic productivity, and social justice. Organic farming provides various profits for people and the earth. A lot of changes experiential in the atmosphere are enduring, happening gradually greater than occasion. Organic agriculture associated with the medium and long-term effects of agricultural interventions on agro- ecosystems.

- **Improving Soil Fertility**

Soil-building practices such as crop rotation, cover crops, and organic fertilizers are central to organic practices. These practices replenish soil organic matter, feed soil life, reduce erosion, improve soil structure, and enhance nutrient and water retention. The extent of time that the soil is showing to erosive forces is declined, soil biodiversity is augmented and nutrient fatalities are abridged, serving to continue and improve soil output.

- **Improving Water Quality**

Organic farming practices, such as the application of compost manures and the use of fodder legumes and green manures within extended grain cropping rotations, can optimize soil nutrient release and plant nutrient uptake and subsequently improve water quality. Improved soil structure, water infiltration, and nutrient retention also reduce the risk of groundwater pollution.

- **Energy and Climate Change**

Through the use of leguminous cover crops, compost, and other organic-approved materials for fertility management, organic farms often decrease the greenhouse gas emissions concerned with together infield and embedded emission components. By prohibiting the use of synthetic fertilizers and pesticides, organic production avoids the CO₂ emissions associated with the production of these inputs. Additionally, many of the practices associated with certified organic production, such as diverse crop rotations, use of cover crops, and application of compost manures improve the accumulation of carbon in the soil.

- **Protection of Biodiversity**

Organic systems enhance biodiversity at various levels. A variety of seeds and breeds are chosen for greater resistance to diseases, climate, and pests. Producers employ diverse combinations and rotations of plants and animals to increase yields and income. The sustainable development of natural places contained by the organic fields and without the use of chemical inputs creates proper habitats for flora and fauna and vital pollinators and advantage to insects. Organic Farmers are together conservers and users of biodiversity at the whole levels (Deshmukh and Ghagare, 2019).

7. Problems Confronting Farmers Practising Organic Farming

7.1. Lack of Awareness

The main problems of organic farming inability policy of the government towards the firm decision making about the proper progress of organic Agriculture. Most of the farmers in the country are not aware about the benefits and use of techniques in the farming.

7.2. Output Marketing Problems

Before the beginning of organic farming, their marketability and that too at a premium over conventional produce has to be assured. The inability to obtain a premium price, at least during the period required to achieve the productivity levels of the conventional crop will be a setback.

7.3. Shortage of Biomass

Most of the experts opined and also well trained farmers are not confident whether the availability of whole essential quality, nutrients by organic materials. Even if this problem can be summoned, they are of the view that the available organic matter is not simply to meet the requirements. The crop residues useful to prepare vermin compost are removed after harvest from the farms and they are used as fodder and fuel. Small and marginal cultivators differ in getting organic manures compared to chemical fertilizers which can be easy if they have the financial ability.

7.4. Inadequate Infrastructure

The infrastructure farmers are faced the poor infrastructure facilities the state governments are still now framing, formulating machinery required policies towards proper implementation. The presence of very few organic certification agencies in each state is a problem confronting.

7.5. High Cost and Non-availability of Inputs

The cost of organic inputs is more than that of industrially produced agrochemicals used in the conventional farming system. Even though the various made at domestic by farmers extremely faced the problem of higher cost bared by the farmers while using organic fertilizers in the process of science making organic fertilizers pesticides through natural processes.

7.6. Socio-Cultural Problems

High cost of cultivation, low yield, small size of land holdings, Attack of insect pests and diseases, and lack of open local markets are the problems faced by the farmers in organic farming practices.

7.7. Other Problems

The other problems faced by the farmers such are Non-remunerative prices, delays in payment by firms, and unfavourable weather conditions are the problems faced by the farmers in organic farming practices (Kaur and Kalra, 2015).

8. Findings

Based on the above analysis some useful findings are listed below:

- Organic farming techniques help sustainable agricultural development, generate employment opportunities, improve soil quality, and reduce soil erosion by practicing soil management, the production techniques of organic farming like crop rotation, compost, green manure, and bio pest control help to enhance agricultural productivity.
- Organic farming improves water quality and irrigation, improves infrastructural development, and environmental conservation conserves biodiversity, and supplies quality and nutritious healthy food for the growing demand for food from the population. Hence, organic farming contributes more to sustainable development by enhancing agricultural production and mitigating poverty and hunger to achieve sustainable goals.

9. Suggestions

Some useful suggestions made for improved sustainable development of agriculture in India are :

- The government should create more awareness among people about organic farming for the development of agriculture.
- Government should guide the concerned authority to avoid delays in payment to the labour.
- Government should provide agricultural land to improve the productivity of the small farmers.
- The government should provide incentives to the farmers while the cost of production increases and also provide remunerative prices for agricultural outputs for the betterment of the organic farming system.
- There is a need for the establishment of an open market system at local levels for improving agricultural produce and selling them in the local markets.

10. Conclusion

Agriculture is the backbone of the Indian Economy. It provides employment opportunities for the growing demand for food of the population. Reduction in poverty and hunger by 2030 is the agenda of the United Nations Sustainable Goals. These sustainable goals can be achieved by increased agricultural production and productivity. The adoption of organic farming techniques in agriculture development is noteworthy. Organic farming techniques enhance agricultural productivity and production, farmers receive more benefits after practicing organic farming system in India. However, the farmers need more awareness, adequate infrastructure, and a high cost of production. Hence, to improve agricultural productivity, the government should enhance the incentive and arrange for awareness programmes towards organic farming, and improve infrastructure facilities to achieve sustainable agriculture development goals by improving organic farming techniques by 2030 in the future of India.

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