



Review on Organic and Chemical Farming in Agricultural Sector

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Present day healthy food is very important but farmers and market people are using more chemicals so that total resources are polluted. Mainly farmers using more chemical fertilizer so that it is affected to soil, resource, human health, animals and plants. These all are polluted due to inorganic farming. The main objective of the study is to reduce chemical fertilizers for growing yields and also not use chemicals in marketing. So, that reduces diseases like cancer, heart attack, stroke and many other type of diseases. Improvement of organic yields is very important in that way to involve government and take initiative towards motivate the farmer to use organic fertilizers and also provide separate marketing for organic products and also encourage for government site to give more subsidies to organic farmer and also provide free certification. The paper explained what is the differences between organic and chemical farming and the main advantage of using organic farming and how organic farming save the environment and climate.

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1. INTRODUCTION

Organic farming has ancient roots in India, where farmers are known to have developed nature-friendly practices such as mix farming, mix cropping, and crop rotation. Coined by Lord Northbound in 1940, the term "organic farming" has gained prominence in the last decade as a perceived solution to contemporary agricultural challenges [1]. It is not only a societal need from the consumer's perspective but also crucial for farmers [2]. India hosts 30 percent of the world's organic producers but utilizes only 2.59 percent of the total organic cultivation areas, as reported in the 2018 World of Organic Agriculture report [3]. Chemical farming, involving pesticides, herbicides, fungicides, insecticides, and fertilizers, poses environmental threats and contributes to water pollution. Even at low concentrations, these chemicals have serious implications for the environment. Pesticide exposure data over two decades reveal links to neural disorders, degenerative diseases, fetal growth issues, congenital anomalies, and carcinogenic effects on humans [4]. The indiscriminate use of pesticides over the past three decades has led to severe human health problems in developing countries [5]. Organic farming emerges as a unique practice that balances environmental sustainability and safeguards consumer safety by fostering a positive perception [6].

2. ORGANIC FARMING

Farm Yard Manure (FYM) and green manure exhibit lower nutrient levels compared to concentrated organic manure. FYM, a well-decomposed mixture of dung, urine, farm litter, and residual materials, is described by Das et al. [7]. Compost, formed through anaerobic decomposition of substantial waste materials like vegetable refuse, weeds, stubble, sugarcane trash, sewage sludge, animal waste, and industrial refuse, is highlighted by Singh et al. [8]. Green manuring involves ploughing and incorporating undecomposed green plant tissues into the soil to enhance its physical structure and fertility. Green manure crops, such as Sun hemp, Dhaincha, Cowpea, Cluster Bean, Senji, and Berseem, are commonly utilized for this purpose [9]. Numerous research studies indicate that organic soils surpass conventional soils in various soil health metrics. Organically managed soils exhibit greater biological activity, enhanced

soil stability, increased biomass, and higher diversity compared to conventionally managed soils [10-13]. Additionally, these soils tend to have higher water-holding capacity, porosity, and aggregate stability, providing yield advantages during extreme weather events such as droughts and flooding. This suggests that organic farming may be more resilient in the face of climate change [14].

3. METHODS OF ORGANIC FARMING

The principal methods of organic farming include crop rotation, green manures and compost, biological pest control, and mechanical.

3.1 Crop Rotation

Crop rotation is a farming technique where farmers do not cultivate the same crop on the same land every year; instead, they grow different crops in rotation to maintain the soil's health. Crop rotation is a very beneficial farming technique that replenishes the soil naturally as different plants contribute different nutrients to the soil. This technique helps control pests, weeds, insects, etc. by disrupting their habitat [15].

3.2 Green Manure

Green manure means the dying plants that are uprooted and turned into the soil. These plants act as nutrients to the soil that helps to improve its fertility [16]

3.3 Compost

Compost is one of the best natural fertilizers used in organic farming. It is a recycled organic matter highly enriched with nutrients that enhance the soil quality and improve crop production [17].

3.4 Crop Diversity

A new practice named 'Polyculture' is in trend these days. In polyculture, a variety of crops can be cultivated simultaneously to fulfill the increasing demand for food items across the world. On the other hand, traditional farmers were used to practicing 'monoculture' where only one kind of crop was used to cultivate in a particular location [18].

3.5 Soil Management

Soil is the primary requirement of cultivation. The soil depletes its quality as it loses its nutrients after the cultivation of crops. Hence, soil management is crucial to recharge the soil with the necessary nutrients. The main objective of organic farming is to increase soil quality by using natural ways. That is why organic farming focuses on using bacteria (present in animal waste) that help to increase the nutrients level in the soil, making it fertile for more production [19].

3.6 Controlling Pests Biologically

Agricultural lands host a diverse array of organisms, some of which play a beneficial role in supporting crop production, while others pose a threat by disrupting it. It is essential to manage and regulate the population of harmful organisms to safeguard both soil fertility and crop protection. Organic farmers employ mild or natural herbicides and pesticides, characterized by lower chemical content, to biologically control pests. Additionally, proper farm sanitation practices are implemented to effectively mitigate the presence of harmful organisms in the field [20].

3.7 Weed Management

Weeds or wild grass are unnecessary plants that grow along with the crops in agricultural fields. These weeds suck most of the nutrients available in the soil and thus affect crop production. Organic farming methods aim to reduce the growth of weeds instead of eradicating it [21].

4. CHEMICAL FARMING

Chemical contamination of the soil in chemical farming leads to health issues. In comparison to organic farming, the use of chemical products greatly overuses groundwater. The ability to raise multiple crops is less flexible. The boost in revenue through productivity is not long-term. Therefore, we might conclude that farmer's short-term profitability increases. If we continue to use chemical farming, there will be a long-term loss of biodiversity and soil fertility [22].

Advantages

- Chemical fertilizers provide consistency and dependability.
- Fertilizers can turn sterile soil into fertile ground very rapidly.

- They supply the right amount of nutrients to the plant.
- Included are the three NPKs that are crucial for plant development.
- They are easier to use and more economical than organic fertilizers.
- They do away with the necessity for crop rotation by allowing the growth of the same vegetable plants in the same location.
- It is possible to properly formulate fertilizers to meet the needs of crop soils, creating the ideal environment for farming.

Disadvantages

- Chemical fertilizers have an impact on the soil's microbial population.
- Chemical fertilizers' acidity also modifies the soil's pH and turns it acidic, which alters the kind of microorganisms that may survive there.
- Chemical fertilizers don't give the plant all the benefits it needs and leach into groundwater because they are very soluble in water. As a result, the plant can get fewer nutrients. Chemical fertilizer that has leached taints the water.
- These substances permeate the subsurface and combine with the clay to create layers of hardpan that are impermeable and solid. The soil is consequently compacted.
- Chemical fertilizers encourage plant diseases. In comparison to slow-release organic fertilizers, fast-release chemical fertilizers have higher nitrogen content. Plants are more productive when there is more nitrogen (N) than phosphate.

5. COMPARISON OF ORGANIC AND CHEMICAL FARMING

Organic farming represents a sustainable agricultural approach, employing diverse techniques such as intercropping, mulching, and the integration of crops and livestock. In strict adherence to its principles, organic farming prohibits the use of synthetic inputs, placing a central emphasis on preserving soil health [23]. It stands as a viable alternative to counteract the negative impacts of chemical farming. This agricultural method relies on biological fertilizers and pest control measures to cultivate various plant varieties across distinct fields. Originating with the aim of mitigating the adverse effects of chemical pesticides and fertilizers, organic farming is dedicated to restoring, maintaining,

and enhancing ecological balance. It upholds the well-being of soils, ecosystems, and individuals, harmonizing tradition, innovation, and science for the benefit of the environment and the overall quality of life. The organic farming system hinges on the natural decomposition of organic matter, replenishing nutrients through green manures and composting. Natural pesticides replace harmful chemicals, and weed management involves methods such as tillage, mowing, cutting, and the application of heat using organic materials to inhibit weed growth. Notably, organic farming has reduced irrigation requirements and leaves no detrimental impact on land, air, or water quality [24].

Chemical farming, also known as intensive farming, involves the extensive use of chemical pesticides and fertilizers, coupled with a low crop rotation ratio and high labor input. This approach utilizes genetically modified plants designed to yield large quantities, employing additional methods such as mechanical plowing, plant growth regulators, and chemical inputs [25]. Unlike organic farming, chemical farming is characterized by a chemical-centric rather than an ecological orientation. Despite its productivity, it brings about more drawbacks than advantages, leading to environmental destruction and harm to the natural ecosystem. The adverse effects extend to the land, air, and water, with an associated increase in irrigation demands. Initially implemented during the industrial revolution when human labor was replaced by machines, chemical farming served as a crucial method to address low productivity. However, it has lost popularity over time, as alternatives like sustainable farming, integrated multi-trophic aquaculture, zero waste agriculture, and organic farming have gained prominence [26,27].

6. CONCLUSION

In examining both organic and chemical farming, determining the superiority of one over the other proves challenging, as various factors come into play. The effectiveness and profitability of each system hinge on site-specific conditions, crop considerations, market opportunities, labor availability, agronomic factors, and the managerial expertise of farmers, collectively influencing overall farm performance. Profitability is intricately linked to crop selection, guided by environmental factors, product demand, and governmental support programs. Despite the acknowledged drawbacks of chemical farming, it remains the predominant method. Rather than

engaging in a binary argument between the two approaches, a more constructive approach involves encouraging farmers to cultivate safer and more cost-effective crops, minimizing potential drawbacks. It is crucial to recognize that both methods have their merits and demerits. Addressing the choice between chemical and organic farming requires a consideration of our preferences: whether we prioritize safe, chemical-free food or opt for more readily available, cheaper alternatives, even if they may carry potential health risks. Striking a balance and working towards a farming method that offers both safe and affordable food is an essential goal. By promoting the cultivation of crops with fewer drawbacks, we can contribute to a healthier and more sustainable agricultural landscape.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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