Chapter

Role of Organic Farming in Agriculture

Muthuraman Yuvaraj, Peyandi Paraman Mahendran and Eman Tawfik Hussien

Abstract

Organic farming could be an all-encompassing generation administration framework that empowers and improves agroecosystem wellbeing, counting biodiversity, natural cycles, and soil biological activity. It stresses the role of management activities in preference to the use of off-farm data, considering that regional conditions require locally adapted systems. This can be achieved using agronomic, biological, and mechanical methods, in equal share to synthetic materials, to carry out any specific role inside the organization. Organic farming is still only a small industry, which represents only 2% of global food sales. However, it is growing in importance in the world. It is hard to get information due to lack of official statistics and the level of confidentiality of systems of organic produce. Soil practices such as crop rotations, organic fertilizers, symbiotic associations, cover crops, inter-cropping, and minimum tillage are central to organic practices. The static arrangements of soil are achieved by soil fauna and vegetation. Besides, cycling of nutrients and energy is enhanced by increasing the retentive abilities of the soil for nutrients and water.

Keywords: organic farming, vermicompost, soil health

1. Introduction

Organic farming is defined as a production system that avoids or largely eliminates the usage of synthetic compounded fertilizers, growth regulators, pesticides, and farm animal feed additives. To maximize feasible extent, the organic farming system depends on crop rotation, green manures, legumes, animal manures, crop residues, off-farming natural squanders, and aspect of biological pest control to preserve soil fertility and productivity to sustain plant and thereby curbing pests, diseases, and unwanted weeds. Organic farming methods are internationally regulated and legally executed by many countries, based in great part on the standards set by the International Federation of Organic Agriculture Movements (IFOAM), an international umbrella organization for organics established in 1972 [1].

After the launch of green revolution in India, substantial growth in the output of food grains was achieved. This was achieved through the utilization of improved crop varieties and higher levels of inputs of plant foods and plant protection chemicals. Merely there has been a rise in production, which was accomplished by the monetary value of soil health. The organic farming and ecological agriculture are one of the alternative agriculture systems to overcome the problems of soil degradation and declining soil fertility [2].

Soil organic matter is an essential soil component. These are residuals of dead plants, animals, and microbial tissues. Examples of organic manures are farmyard manure, compost, and green manure. They are added to the soil to the stock of organic matter. These added organics undergo a series of microbial decompositions, and finally, humus is formed. Humus is a light bulky amorphous material of dark brown to black color composed of organic compounds. Tropical soils characterized by low organic and loam less than of clay soils. The low organic matter is primarily due to climate, especially for high temperature and cultural practices, while organic matter contents increase with rainfall. In tropical and subtropical areas, there is much organic matter created, and it decays very quickly. Any organic matter added to the grounds will be decomposed (over 90% in a year), and thus, it is a Herculean job to produce the organic matter; content ranges from less than 1 to 15% [3].

2. Guidelines on production of organic produce

2.1 Duration of conversion period

Firstly, the formation of an organic controlling system and construction of soil fertility needs a temporal time known as change period. This change period may not continuously be the identical period to advance soil fertility and re-establish the equilibrium of the environment in all cases. It is defined as the time in which all the farm, including the livestock, is converted into organics. This was confirmed by the norms laid in the National Standards for organic products. The entire farm unit should be converted to organic in a phased manner, and the grower should present an alternative plan to the certification body when applying for accreditation.

Second step isolation belts are maintained all around the organic unit. This would drastically bring down the net area under organic cultivation. In view of this, a community approach is suggested to a group of continuous farms.

Thirdly, for existing conventional plantations, a changeover point for organic culture required a minimum of 3 years.

Finally, for a newly planted area, the first yield itself can be considered as organic, as the organic produce has a pre-bearing period of 1–2 years.

2.2 Farm designing

Firstly, an organic farm has to be a self-sustaining unit. Also, farm designing plays a very important role in optimizing the utilization of resources within the farm topography of the land and varieties of crops to be cultivated. Aside from these, border trees, compost yard, bounds, storage home, cattle shed, and farm-house can be suitably incorporated.

Secondly, the topography of the location of the cattle shed, compost yard, etc., should be decided. All the structures are better if at comparatively higher elevation than the cropped areas as it prevents water logging inside the cattle shed, store house, and office.

Finally, border trees: on the boundary of the farm, multipurpose border like Neem, Karanj or any other local trees of importance are planted 10 m apart. These border trees provide useful as wind break, abundant biomass for green manuring and composting, and preparation of pest management aids like Neem seed kernel extract to control insect pests.

2.3 Cattle shed

The cattle shed should be near the compost yard. The site for the cattle shed is better if it is at higher elevation. The shed should provide a comfortable and hygienic habitat to keep the cattle healthy and free of diseases. The floor may slope toward the dung channel to provide satisfactory drainage and facilitate collection of urine. Managers can be 0.75 m wide with all corners rounded off in cement. The cattle shed should be preferably oriented in east to west direction to have proper public discussion and with neem or peepal trees around it [4].

2.4 Store house

A storehouse should be maintained to stock the farm implements and the produce after harvest. The storehouse can be at least half a meter above the farm level and should throw a projection of 0.5 m at that height to protect the produce from rats and other rodents. The storehouse should be damp proof. The windows and doors could be lined with fine wire mesh [5].

2.5 Border plants

The planting of leguminous trees is suggested to be grown as border crops for biomass. The trees mentioned earlier would also enrich the soil fertility and help in the improvement of the soil structure [6, 7].

3. Components of organic farming system

The significant research in an organic farming system has been difficult to design due to the nature of organic philosophy. There is no shortage of essential component of research, which could be done to increase both nitrogen fixation (in legumes on component crops) and on weed and insect control measures. This research would touch only marginally on the basic questions inherent in organic philosophy [8, 9].

Principles of organic agriculture

- Use renewable resource in locally organized production system
- Increase balance between crop production and animal husbandry
- Give all livestock condition of life with due consideration for the basic aspects of their intake behavior
- Decrease all forms of pollution
- Processing organic products with renewable resources
- Production of fully biodegradable organic products
- Progress toward an entire production processing and distribution chain, which is both socially and ecologically responsible

Benefits of organic farming

- Organic agriculture helps to prevent environmental degradation and avoid a chain reaction in the environment from chemical sprays and dusts
- Organically grown crops are believed to be healthier and nutritional food for man and animals
- Organic fertilizer is considered as complete plant food. Organic matter restores the pH of the soil, which may become acidic due to the continuous application of chemical fertilizer.
- Organic manure is the principal component of organic farming to produce optimal conditions in the soil for high yields and good quality.
- Most of the organic manures are wastes or byproducts, which on accumulation may contribute to contamination. In this method of organic farming pollution is reduced.
- Organic farming is labor intensive in the nation which will also help in generating more employment in rural areas that will help in reducing economic inputs.
- As a whole, adoption of organic farming provides a better and balanced environment and better products and living conditions to the human beings.

4. Different available organic inputs

4.1 Organic droppings (manure)

The farm-yard manure (FYM) and vermicomposting, etc., are typically little in nutrient contented. So, great use rates are difficult to meet crop nutrient supplies. However, in numerous emerging nations (like India), the obtainability of organic manures is not sufficient for crop demands partly due to its wide use of cattle dung in energy production. Green manuring with Sesbania plant, cowpea, and green gram is effective to improve the soil content of organic matter. However, employment of inexperienced manuring has declined in the previous couple of decades because of intensive cropping and socioeconomic reasons. Taking these constraints, International Federation of Organic Agriculture Movement (IFOAM) and Codex Alimentarius have approved the use of some inorganic sources of plant nutrients like rock phosphate, basic slag, rock potash, etc., in organic farming systems [10].

4.2 Bacterial and fungal biofertilizers

Nitrogen fixation on the surface of the earth is mainly by microorganisms, representing 67.3% among all the bases of N fixation. Subsequent microorganism and plant life biofertilizers will be utilized as an ingredient of organic farming in numerous crops.

4.2.1 Rhizobium

The efficiency of nitrogen-fixing microorganisms viz. *Rhizobia* for legume crops e.g. *Rhizobium*, *Bradyrhizobium*, *Azorhizobium*, *Mesorhizobium,* and *Sinorhizobium*.

Legumes are infected by these bacteria all over the world. These rhizobia have a N_2-fixing capability up to 450 metric weight units N ha^{-1} counting on host-plant species and microorganism strains. Carrier based inoculants will primarily be coated with seeds for the introduction of microorganism strains into soil [11].

4.2.2 Azotobacter

Nitrogen will be fixed by independent microorganisms in cereal crops with no interdependency. Such free-living bacteria are: *Azotobacter sp*. for dissimilar cereal crops; *Herbaspirillum spp* and *Acetobacter diazotrophicus*.

4.2.3 Azospirillum

The gram-positive bacteria *Azospirillum* colonizes in a remarkably kind of yearly and perennial florae. Studies indicate that *Azospirillum* will proliferate the development of crops like flowers, cotton, oak, tomato, sugar beet, pepper, carrot, wheat, and rice. The crop yield can upsurge from 5 to 30%. Inoculum of *Azotobacter* and *Azospirillum* will be created and applied as in humate origination finished seed coating.

5. Plant growth-promoting rhizobacteria

Numerous microorganisms promote plant growth area. The unit is jointly known as plant growth-promoting rhizobacteria (PGPR). PGPR improves plant growth by colonizing the root system. Huge inhabitants of microorganisms recognized in implanting material and roots develop an incomplete sink for nutrients in the rhizosphere [12].

6. Phosphorus-solubilizing microorganism (PSB)

Phosphorus is also an important nutrient similar to nitrogen for plants. This part is important for the nodulation by bacteria genus and even to nitrogen fixers, *Azolla* and BGA. Phosphorus-solubilizing microorganism (PSB) fungi create on the market are insoluble phosphorus to the plants. It will increase crop weight up to 200–500 metric unit/ha and so 30–50 kg Super Phosphate will be preserved. Most predominant phosphorus-solubilizing microorganism (PSB) belongs to the genera *Bacilli* genus.

6.1 Mycorrhizal fungi

Mycorrhizal fungi which cause root-colonizing increase tolerance to many sever metal contamination and drought. Mycorrhizal fungi improve soil quality additionally by having an on-the-spot influence on soil aggregation and also aeration and water dynamics. An interesting potential of these fungi is their ability to permit plant access to nutrient sources [13–15].

6.2 Blue Chlorophyta (BGA)

The BGA represents the most important, most numerous and cosmopolitan cluster of microscopic organisms that perform an oxygenic chemical process. These are as well-known as Cyanophyceae and cyanobacteria [15–18].

6.3 Azolla

A floating fern '*Azolla*' hosts element fixing BGA *Anabaena azollae*. *Azolla* contains 3.4% nitrogen (on dry weight basis) and adds organic matter in soil. This biofertilizer is used for rice cultivation. There are six species of *Azolla* viz. *A. pinnata*, *A. microphylla*, *A. mexicana*, *A. filiculoides*, *A. nilotica,* and *A. caroliniana* [19–20].

7. Soil management in organic farming

It is essential to take care to build up comparison of average yields, standard deviations, and coefficients of variation over five successive years. This includes crops and soil fertility, based on three inextricably interrelated components of soil management. These components are physical (water-holding capacity, structure, etc.), chemical (nutrient dynamics, pH), and biological (soil biota). The soil fertility of organic farming, can be defined as: well-managed soil organic matter in the soil, good soil structure, diverse soil biota and a high nutrient and water-holding capacity by using compost and stable manure. The organic soil is one that can build up over time buffering capacity and resistance to an imbalance in growing conditions as part of the strategy to enhance the self-regulatory capacity of the farm ecosystem [21, 22].

8. Weed management in organic farming

Weeds are often cited as the most significant problem in organic farming systems, and they are certainly the problem that most concerns the farmers, who are looking at changing over their farm from a standard one into an associate-in-nursing organic one.

9. Botanical pesticide use in organic farming

9.1 Nicotine

Nicotine is obtained from tobacco or related Nicotiana species and is one of the oldest botanical insecticides in use today. It is also one of the most toxic to warm-blooded animals, and it is readily absorbed through the skin.

9.2 Sabadilla

Sabadilla is another botanical insecticide. It is extracted from the seeds of the sabadilla lilly. The veratrine alkaloid is the active ingredient. Sabadilla is a botanical insecticide with low toxicity. However, its dust can be extremely irritating to the eyes and can produce sneezing if inhaled.

9.3 Neem

Neem is a botanical pesticide that comes from the neem tree, which is native of India. This tree supplies at least two compounds, salannin and azadirachtin, that have insecticidal activity and other unknown compounds with fungicidal activity. Neem pesticide controls gypsy moths, western flower thrips, sweet potato white flies, leaf miners, loopers, caterpillars, and mealybugs.

10. Conclusions

The contemporary form of natural farming is being popular in the world in a timely fashion, in particular in developed countries. Organic farming device is a choice, and an appropriate management system would help to enhance the soil health environment and hence expand the productive ranges and the enhance quality of crops. The natural farming system utilizes extremely multifaceted and combined residing classifications to accomplish their cease of maintainable harvest and inventory output. Organic agriculture is a potential choice due to the fact that it enlivens the soil, strengthens the natural resource base, and sustains organic production at degrees to commensurate the carrying potential of the managed agro eco-system. In addition to this, export market can also be tapped by group initiatives in organic farming. In a country like India, food production has to grow steadily.

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