

17. Organic and Natural Farming; Concept and Principles

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Abstract:

Organic and natural farming practices have gained significant attention in recent years due to their sustainable and environmentally friendly approaches. This abstract explores the concept and principles underlying organic and natural farming methods. Organic farming emphasizes the use of natural inputs and techniques to cultivate crops and raise livestock, while minimizing the use of synthetic chemicals and fertilizers. Key principles include soil health improvement through composting and crop rotation, biodiversity conservation, and the avoidance of genetically modified organisms (GMOs). Natural farming, on the other hand, focuses on harnessing natural processes and fostering ecological balance within agricultural systems. Its principles encompass the use of indigenous microorganisms, minimal tillage, and the integration of diverse plant species to enhance resilience and productivity. By adhering to these principles, organic and natural farming methods promote sustainable agricultural practices that prioritize environmental stewardship, biodiversity preservation, and the production of healthy, nutritious food.

Keywords:

organic farming, natural farming, sustainable agriculture, soil health, biodiversity conservation.

17.1 Introduction:

The agriculture sector plays a key role in the Indian economy. In conventional farming system, farmer faces the problem of higher cost of cultivation and various health issues. "Natural Farming was generated in Japan by Masanobu Fukuoka and Mokichi Okada.

Natural farming does not allow buying inputs from the market. In natural farming, farmers prepare the inputs in the farm naturally and this helps in saving the money of farmers. So, Natural Farming (NF) is considered as a convenient method to overcome these problems. “Organic farming is a holistic system of production which aims in sustaining the health of soil, humans & ecosystems by preventing or limiting the usage of synthetic fertilizers and pesticides in crop production and emphasizes on improving animal breeding and human well-beings. Organic agriculture reduces the risk of human diseases caused by pesticides and prevents the development of pesticides resistance in plants. The objective of organic farming is to maintain the sustainable environment. (Ashwini. et al.,2021) Organic farming is a system of raising crops without using chemicals. Organic agriculture rejuvenates the health of soil and sustain the soil fertility and makes soil alive and sustains the health of soil, people and ecosystem. This system totally depends on the ecological processes and cycles which are adapted to the natural environmental condition. Organic products are free from chemical-based fertilizers and pesticides residues and are rich in nutrients. (Hammed et al.2019). Organic farming combines traditional, science and innovation to promote fair relationships among all the peoples of society and benefit the shared environment. (Alsanius et al. 2019). Both organic and natural farming don’t require chemicals for growth and cultivation of crops and these farming methods proves less toxic. In both farming systems, the growers discourage use of any chemicals in farm. Both the farming systems encourages the natural and homemade products to eliminate the attack of insect-pests and to foster the growth of plant. (Ashwini. et al.,2021)

17.2 Organic Farming:

According to IFOAM, ‘it is a production system which totally depends on ecological cycles and processes that are adapted to particular conditions and avoids the use of inputs which has adverse effects on environment. It combines conventional, science and innovation to promote the fair relationships between the shared environments.

17.2.1 Concept of Organic Farming:

There are four basic principles of organic farming:

- Principles of health
- Principles of ecology
- Principles of fairness
- Principles of care (Alsanius et al. 2019).



- a. **Principles of Health:** According to the World Health Organization (WHO), health is described as not only the absence of diseases but also the complete state of social, mental and physical well-being of humans. According to IFOAM, organic farming is meant to generate superior and healthy food which contributes to the healthy lifestyle of the peoples. Principles of Health states that the ecosystem health, humans and community health are linked to one another, and it can't be separated from each other. If the soil is healthy, it will generate healthy crops which promotes the health of humans and animals. (Wijesinghe et al. 2023)
- b. **Principle of Ecology** This principle ties the organic farming with living ecological systems. It specifies that recycling and ecological activities should be the foundation of production. Good health and nourishment are derived from the ecology of the particular environment. Based on living ecological processes and cycles, the organic production system ought to cooperate with, mimic, and support them. (Anonymous,2016). Reducing the use of inputs through recycling, reuse, effective energy and material management is aided to preserve and enhance the ecological quality and to save resources. It results in reducing inputs by recycling, reuse and systemic management of energy & material to nurture the ecological quality and to save resources. (Wijesinghe et al. 2023)
- c. **Principles of Fairness:** Organic Agriculture should construct a relationship that ensures fair relationship with the environment. This principle states that organic production system should treat all the parties fairly including farmers, employees, processors, distributors, merchants, and customers. In addition, organic agriculture promotes food sovereignty and helps in lowering poverty and to improve quality of human lives. Its goal is to generate enough high-quality food. (Anonymous,2016)
- d. **Principles of Care:** Organic farming is a living farming system which promotes safe and healthy environment. This principle states that it is the responsibility of all the individuals to take care of the environment.

17.3 Effects of Organic Farming on Soil Health: Biological, Physical and Chemical Properties of Soil:

Organic farming help to reduce the negative impacts of modern agriculture by using the good soil management practices, proper land use planning, cropping systems, organic residues, conservation tillage and the use of organic fertilizers. In organic farming, different management practices affect the health of the soil, physical, chemical, and biological properties of soil. (Jernigan et al. 2020). In organic farming different practices like using cover crops, organic amendments and crop rotation reduce soil disturbances (Tully and McAskill,2020). Growing cover crops in organic farming is known to be the best practice to improve the health of soil. Soil amendments involved in organic farming are made up of the naturally occurring materials i.e., plants and animal materials. Sometimes, tillage is used to remove or control the weeds in the farms, but it results in loss of soil organic carbon and degradation of the soil structure. So, to conserve the soil carbon, conservation tillage practices are used such as no-till method and reduced tillage.

17.3.1 Effect of Organic Farming on Physical Properties of Soil:

In organic farming, compost, vermicompost, green manure, animal manure and mulches are applied to the soil for improving the abiotic and biotic properties of the soil. These fertilizers

are organic, non-toxic rich in organic matter, humus, and comprises various beneficial microorganisms (De Corato 2020). Organic matter is very important for maintaining the health and fertility of soil. Addition of organic matter in soil helps in the better accumulation of soil organic matter, helps to improve soil structure, fertility and allows better infiltration and moisture retention, which in turn helps in increasing the yield of crop. Hence, it is said that organic amendments help to alter the physiochemical properties of the soil and thereby reduces the risk of long-term negative effects caused by excessive inorganic fertilizers (Qaswar et al. 2020). Application of organic fertilizers to the soil can improve the physical properties of the soil by increasing porosity & aggregates of soil and reducing its bulk density. (Sheoran et al.2019)

17.3.2 Effect of Organic Farming on Chemical Properties of Soil:

Conservation techniques, increases the crop residue retention by accumulation of SOC (Soil Organic Carbon). In no- tillage systems, there is an increase in SOC due to the residue retention which is greater than the conventional tillage system. (Hati et al.2020) and (Jha et al.2020). Residue retention is known to be the most critical factor which affects the rate accumulation of SOC in organic agriculture. Hence, conservation tillage increases the concentrations of SOC and had positive effects on soil health in organic agriculture. Decomposition of soil organic matter commences the carbon mineralization, which affects the supply of nutrient in soil. (Govindasamy et al.2021) In non- tillage systems, the stable carbon mineralizes very slowly which helps in enhancement of soil health. Organic amendments and fertilizer alter the chemical properties of soil. When organic amendments are applied to the soil, the microorganisms present in soil starts to decompose the available materials and quickly releases nutrients to meet the nutrient requirements of succeeding crops in organic farms. (Kranz et al.2020) With addition of compost nutrient levels are maintained in soil for long term. The soil organic matter serves as a source of slow releasing nutrients specially for N, P, S, B and buffer for micronutrient levels. This also helps to reduce the deficiency and toxicity of soil and resulted in improving the soil health. Devarajan et al. (2021) With incorporation of compost and cover crops, the initial soil moisture content, organic matter content and micronutrients levels are increased, while the pH of soil is decreased. The application of organic fertilizers helps in reducing nutrient and leaching losses and therefore it improves soil fertilizer retention. All these improvements give higher crop yields. So, it is proved that there is a positive correlation between crop yield, SOC concentration and soil nutrient status. (Xu et al. 2019). Addition of organic fertilizers in field helps to improve the quality of crop with increased availability of the soil N, P, K (Gondwe et al. 2020).

17.3.3 Effect of Organic Farming on Biological Properties of Soil:

The microorganisms present in soil are uncountable and are not seen by naked eye. They balance the amount of organic matter and carbon sequestration in soil, therefore improves the plant health and structure of soil. (FAO 2020). Compost is mostly used as a source of nutrition for soil organisms to improve the soil health. Humus increases the count of microorganisms in the soil and the microorganisms converts the unavailable form of nutrients to available forms. (Sanathara and Vibhute 2020). Addition of organic fertilizer has a direct correlation with activities of various enzymes such as soil urease, catalase,

invertase, phosphatase etc. which helps in improving the living environment for soil microorganisms. According to Devarajan et al. (2021), the addition of soil amendments like growing cover crops and application of compost increases the soil macronutrients, and causes bacterial shift. For enhancing the beneficial soil microbes and by reducing the population of harmful pathogen in soil helps in improving soil health (Anyango et al. 2020).

A. The Effect of Organic Agriculture on Environment are:

- Soil quality
- Organic matter decomposition
- Crop pollination
- Ground and surface water
- Climate and air
- Pest and disease control,
- Food production and quality. (Birkhofer et al.2016)

B. Challenges, Trends, and Prospects:

The yield obtained from organic farming is less than the conventional farming therefore the key challenge in organic farming is to expand the production of farm. By improving the practices used in organic agriculture, the production of crops can be increased.

C. Different between Organic and Natural Farming:

Both are chemical free farming system, based on diversity and nutrient recycling. Nowadays, organic farming is a popular concept of farming. In organic farming off-farm biological and organic inputs are allowed. Genetically modified products are not allowed in organic farming whereas in natural farming external inputs are not allowed and only on-farm inputs obtained from Desi Cow are used i.e. Jeevamrit, Ghanajeevamrit, Beejamrit.

17.4 Natural Farming:

As per NITI Ayog, Natural Farming is a chemical-free and traditional farming practice. It is a diversified farming system that is based on agro-ecological system which combines trees, crops and animals with the particular biodiversity.

It is a farming practices which avoids or minimize the use of external inputs and the native resources are used along with the agro-ecological principles, common resource management and people participation to largely benefit the farmers and community. (Sharma et al.2023) Natural farming is the “natural way of farming” without the use of chemical-based fertilizers and pesticides and adopting agro-ecological farming practice, which was established by a Japanese farmer Masanobu Fukuoka, in his book named “One-straw Revolution” in 1935. And in 1936, “Nature Farming” was introduced by Mokichi Okada. In today’s world, Organic and natural farming are the best and popular alternatives for agriculture practices. (FAO, 2017 and HLPE, 2017). Natural farming is referred as “The Fukuoka Method,” the “Natural way of Farming” or “Do –Nothing farming.”

A. Principles of Natural Farming:

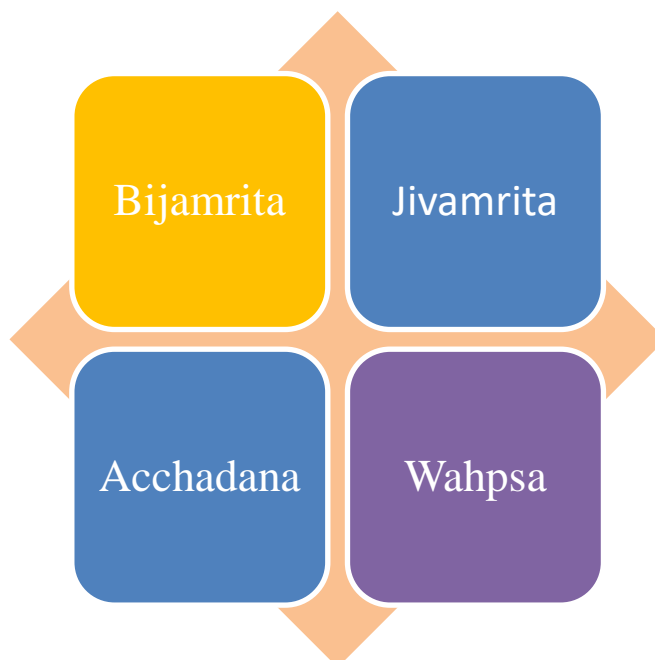
- Minimum soil disturbance
- Organic inputs
- Biodiversity
- Integration of traditional knowledge

17.5 Zero Budget Natural Farming (ZBNF):

ZBNF is a technique of growing crops without the use of any external inputs like fertilizers and pesticides. It means zero cost of cultivation for raising the crops. ZBNF increases the farmer's income and helps to maintain the sustainability of the environment by maintaining soil fertility, ecological health.

In mid-1990s an agriculturalist named Subhash Palekar promotes the ideas of ZBNF. In 2016, the Govt. of India awarded him with Padamashri for his work. According to research conducted by WHO, about 50% of food material contains natural carcinogenic substances (Prasad, 2016)

17.5.1 There are Four Pillars of Natural Farming:



- Bijamrita
- Jivamrita
- Acchadana: Use of botanicals for plant protection
- Wahpsa: Excludes all purchased inputs (organic or chemicals)

A. Bijamrita:

Ingredients used in preparation of Bijamrita:

- Water - 20 litres
- Lime - 250 g
- Cow dung - 5.0 kg
- Soil - 50 g
- Cow urine - 5.0 liters

This mixture is made with locally available natural ingredients available in the area. This mixture is used for treating seeds or planting material.

The cow dung and urine serve a source of fungicides and antibacterial agents to the plants. This mixture is helpful in protecting the plants from seed and soil borne diseases and fungus.

Application: - The seeds are coated with the Beejamrita followed by mixing and shade drying, then the seeds are ready for sowing.

B. Jeevamrutham/ Jivamrita:

Jivamrita acts as a bio-fertilizer which enhances the microbial activity in the soil.

Ingredients used in preparation of Bijamrita:

- Cow dung - 5 kg
- Water - 20 litres
- Urine - 5 litres
- Lime - 50 g & a trace of soil

This fermented microbial culture was prepared by using locally available natural materials. Jeevamrita is applied to plants and soils during different growth stages of the crop. Different types of aerobic and anaerobic bacteria are present in cow dung and urine.

They continue to multiply when they feed on organic components present in fermentation process. Jeevamrita can be used as a foliar spray on plants. (Saharan et al.)

C. Acchadana/ Mulching:

A suitable favorable microclimate is required by microorganisms for proper growth, and functioning that are provided through Jivamrita.

For obtaining this favorable microclimate the temperature of the soil should ranges in between 25 - 32°C and there should be 65 to 72% moisture, darkness and warmth. This microclimate is created when mulching of the soil is done.

Mulching has three distinct types:

- Straw mulching:
- Soil mulching:
- Live mulching:

D. Waaphasa/Moisture:

It ensures the suitable moisture level in the soil. It is a condition in which both the water and air molecules remains present in the soil. This reduces the need for irrigation and irrigation is done only during afternoon and nighttime.

➤ **Insect-Pest Management in Natural farming:**

Neemastra: - Used to prevent sucking pests & mealy bugs.

Bramhastra: - Sprayed for controlling sucking pests and borers etc.

Agniastra: - Used to control stem borers, fruit borers, pod borer and leaf miners. (Saharan et al)

A. Other Principles of ZBNF:

- Intercropping
- Contour bunds
- Local species of earthworms
- Cow dung

17.5.2 Benefits of ZBNF:

- Zero Budget Natural Farming improves the soil fertility, crop production, and quality of the produce. The species of earthworms break down the larger molecules of plants into the smaller ones and add humus to the soil. The pores present in soil improves the infiltration and water-holding capacity of the soil.
- Pest control used in ZBNF doesn't harm the environment and are free from chemical treatments. It does not contaminate soil and water like chemical.
- Intercropping and crop rotation prevent the loss of nutrient and improves the fertility of the soil.
- Mulching maintains the moisture in soil for longer time and prevents water evaporation and keeps soil moist. (Saharan et al.)
- It improves yield.
- It increases income of farmers.
- ZBNF Minimizes the cost of production.
- It generates Employment.
- It reduces the use of chemical inputs.

- Helps in environment resources conservation.
- It restores soil health.

A. The initiatives taken by Government to promote the natural farming are:

- Paramparagat Krishi Vikas Yojana
- Prakriti Kheti Khushaal Kisan Yojana
- Zero Budget Natural Farming
- Bharatiya Prakritik Krishi Paddhati
- National Mission on Natural Farming
- National Committee on Natural Farming

17.6 Conclusion:

In conclusion, both natural and organic farming is an effective approach to maintain sustainability. Modern farming systems harms our ecosystem, pollutes soil and water resources, uses harmful chemicals which deteriorates the health of soil. It also requires high cost of cultivation which keeps the farmers in debt. Hence, the farming systems i.e., organic and natural farming system helps to resolve all these problems. Natural farming has linked to health benefits and technological innovation. It plays an important role in framing the future of agriculture. Natural Farming works with principles and practices that uniformly works with nature. Adoption of natural farming helps in resources conservation, economically profits the growers by using cost-effective strategies and preserves traditional knowledge. (Singh). Organic agriculture improves agricultural productivity and enhances the lifestyle of farmers. Organic farming is an effective method for maintaining the health of soils by increasing the organic matter content which ultimately leads to improve the soil structure, soil fertility, WHC (Water-Holding Capacity) and nutrient availability of the soil. Organic farming is a comprehensive approach that help in the restoring the agricultural soils.

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