

## About the Department of Zoology

The Department of Zoology, established in 1960, is one of the college's oldest departments, celebrating its Golden Jubilee in 2010 and Diamond Jubilee in 2020. It began with an undergraduate programme and attained Research Department status in 2013. The department is committed to excellence in teaching, research, innovation, and community engagement. Facilities include a Zoological Museum, sericulture units, mulberry garden, and an integrated solid waste management unit, providing hands-on training and experiential learning.

Supported by grants from the University Grants Commission, Department of Biotechnology under the DBT-Star College Scheme, and Department of Science and Technology, the department strengthens research and laboratory infrastructure. It regularly organizes seminars, conferences, workshops, and skill-based training programmes. The UGC-supported Community College Scheme in Sericulture promotes rural women entrepreneurship. Collaborations with OISCA International, Dolphin Special School, and Nature Conservation Foundation foster outreach initiatives. Signature programmes such as "Weekend Deliberation Series" and "Tiny Changes: Tall Impacts" promote knowledge exchange, sustainability, and holistic student development.



CONFERENCE PROCEEDINGS ON SUSTAIN LIFE 2026 : EXPLORING BIOLOGICAL FRONTIERS FOR A GREENER PLANET



SEETHALAKSHMI RAMASWAMI COLLEGE  
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### CONFERENCE PROCEEDINGS ON **SUSTAIN LIFE 2026 :** EXPLORING BIOLOGICAL FRONTIERS FOR A GREENER PLANET VOLUME - I

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**RESEARCH DEPARTMENT OF ZOOLOGY**  
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**VOLUME I**

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**CONFERENCE PROCEEDINGS ON SUSTAIN LIFE 2026: EXPLORING  
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© Dr. A. S. Maheswari, Dr. J. Viji, Dr. M. Isai

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## NATURAL AGRICULTURE: CONCEPTS AND PRACTICES

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### Abstract

Natural agriculture is an ecological farming approach that promotes sustainable production by working in harmony with natural processes. It emphasizes soil health, biodiversity conservation, and reduced dependence on synthetic fertilizers and pesticides. The system is rooted in the principles introduced by Masanobu Fukuoka, which include no tillage, no chemical inputs, minimal intervention, and reliance on biological interactions within the ecosystem. Practices such as jivamrit, bijamrit, mulching, and moisture management enhance microbial activity, nutrient cycling, and soil fertility. The use of local resources, crop rotation, intercropping, and organic amendments supports environmental balance while improving farm resilience to climate variability. Natural agriculture contributes to long-term food security by maintaining ecological stability and reducing environmental degradation. This approach integrates scientific understanding with traditional knowledge to create a sustainable farming system that is economically viable, environmentally safe, and socially responsible for present and future generations.

### Keywords

Natural Agriculture, Sustainable Farming, Soil Health, Biodiversity and Ecological Balance.

### Introduction

Sustainable agriculture in a natural way, refers to farming practices that maintain environmental balance, conserve natural resources and ensure long-term productivity without harming ecosystems. It focuses on working with nature rather than against it, promoting soil health, biodiversity and ecological stability. This approach avoids excessive use of synthetic fertilizers and pesticides and instead relies on natural inputs such as compost, green manure, crop

rotation and biological pest control (Tilman *et al.*, 2002). Natural sustainable farming systems are closely associated with concepts like organic farming, which emphasizes chemical-free cultivation and agroecology, which integrates ecological principles into agricultural production (Altieri, 1995). These methods aim to protect soil fertility, reduce pollution, conserve water and enhance resilience to climate change (Lal, 2004). In recent years, sustainable agriculture has gained global importance due to environmental degradation, declining soil quality and climate variability. International initiatives such as the Food and Agriculture Organization promote sustainable farming to ensure food security for present and future generations. By adopting natural and eco-friendly practices, farmers can achieve higher productivity while maintaining ecological harmony and supporting rural livelihoods. Overall, sustainable agriculture in a natural way represents a holistic system that balances economic viability, environmental protection, and social responsibility. Adopting natural agriculture today is a vital step toward sustainable food systems and a healthier future for coming generations.

### **Natural Farming**

Natural farming, also known as the Fukuoka Method, the natural way of farming, or do-nothing farming, is an ecological approach developed by Masanobu Fukuoka (1913-2008). He introduced the term in his 1975 book, 'The One-Straw Revolution.'

### **Fukuoka's Principles**

Fukuoka outlined natural farming through five principles (Norberg-Hodge *et al.*, 2001).

- No tillage
- No fertilizer
- No pesticides or herbicides
- No weeding
- No pruning

### **What is essential for practicing natural farming?**

- ✓ Knowledge of practices that empower farmers to make their own decisions based on their context.
- ✓ Technology that benefits now and for the next 50 years.
- ✓ Scientific understanding of biological systems and natural processes in nature.
- ✓ Creating values beyond yield, inputs and products; embracing diversity and supporting systemic transitions.

The four pillars of natural farming, such as jivamrit, bijamrit, acchadan and wapsa, aim to enhance nature's processes while eliminating external resources, debt and dependency. Jivamrit, meaning 'life tonic', consists of cow dung, urine, water, jaggery, legume flour and soil. It is a fermented microbial culture, with soil acting as an inoculum for local microorganisms. Jivamrit promotes microbial activity and organic matter in the soil. It also inhibits harmful fungal and bacterial growth and significantly increases earthworm activity. The dung and urine from indigenous cows (*Bos indicus*) are found to be superior to that from European breeds (Palekar, 2005). Natural farming practices include adding microbial cultures to enhance decomposition and nutrient recycling, using local seeds instead of hybrids, implementing multiple cropping and effective crop spacing while conserving water through mulching, intercropping, and crop rotations. Mulching positively impacts soil organic carbon levels due to improved soil and water conservation, lower soil temperatures compared to unmulched areas, returning biomass to the soil, increasing biodiversity, and strengthening nutrient cycling (Lal and Kimble, 2000).

#### **Preparation of Jivamrit:**

- Put 200 litres of water in a barrel
- Add 10 kg of fresh local cow dung
- Add 5 to 10 litres of aged cow urine
- Add 2 kg of jaggery (a local type of brown sugar)
- Add 2 kg of pulse flour

Add a handful of soil from the farm bund Stir the solution well and let it ferment for 48 hours in the shade. Jivamrit is ready for application, sufficient for one acre of land. During fermentation, bacteria in cow dung and urine multiply, consuming organic materials like pulse flour and jaggery. Jivamrit can be applied during sowing, with each irrigation, or as a 10% foliar spray. The preparation lasts up to 15 days and can be used through spraying or mixing with irrigation water. It consists of cow dung (20 kg), urine (5-10 L), jaggery (20 kg) and flour (2 kg) and is applied to crops during each irrigation cycle. It provides nutrients, promotes microbial activity in the soil, and helps prevent fungal and bacterial diseases.

#### **Bijamrit**

This is made up of water (20 L), cow dung (5 kg), urine (5 L), lime (50 g), and a handful of soil. It serves as a seed treatment, protecting young roots from fungi and soil-borne and seed-borne diseases.

### **Acchadan (Mulching)**

This can involve using soil or straw mulch. It conserves soil moisture by reducing evaporation.

### **Wapsa (Moisture)**

Irrigation should be reduced, and watering should occur at noon in alternate furrows. This creates a condition where air and water molecules exist in the soil. Proponents of natural farming argue that dung from indigenous cows and small amounts of undisturbed soil contain diverse microorganisms that improve nutrient bioavailability to plants. Soil is a complex ecosystem with bacteria, fungi, plants, and animals (Bonkowski *et al.*, 2009; Muller *et al.*, 2016). Soil microbes convert hard-to-process nutrients into forms that plants can use. In natural ecosystems, most nutrients like nitrogen, phosphorus and sulphur are bound in soil particles and are less available to plants. The microorganisms help these elements become accessible. Thus, jivamrit aims to boost microbial activities so that nutrients can reach plants (Jacoby *et al.*, 2017). Various bacterial genera, such as *Citrobacter koseri*, *Enterobacter aerogenes*, *Escherichia coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Kluyvera spp.*, *Morgarella morganii*, *Pasteurella spp.*, *Providencia alcaligenes*, *Providencia stuartii*, and *Pseudomonas spp.*, from cow dung were identified by Sawant *et al.* (2007). Gupta *et al.* (2016) found that microorganisms in cow dung enhance soil fertility through phosphate solubilization. In total, 219 bacterial strains were isolated (Lu *et al.*, 2014).

### **Fish Fertilizers**

Similar to seaweed extracts, liquid fish extracts contain many minerals and trace elements. While fish extracts lack some components of seaweed, like growth hormones, they contain fish oil and generally inhibit fungal and bacterial growth more effectively. Research in the USA shows that fish emulsion can:

- ✓ Promote plant growth in strawberries, soybeans and various vegetables
- ✓ Delay aging in lettuce and peas
- ✓ Postpone flowering and fruiting
- ✓ Reduce stress during transplanting when used as a foliar spray
- ✓ Cut some fungal diseases by 50%

## **Cocopeat**

Peat has been commercially used in horticulture for years. Unfortunately, it is sourced from non-renewable peat bogs. Cocopeat, derived from coconut fiber, is an eco-friendly alternative to mined peat moss. It is a by-product of coconut husks processed to extract long fibers. The binding material, known as coir fiber pith or coir dust, holds water well and can replace traditional peat in soil mixes. Cocopeat has a pH ranging from 5.7 to 6.5 and offers a high cation exchange capacity, meaning it retains nutrients effectively.

## **Vermicomposting**

Earthworms create high-quality compost by digesting agricultural waste, known as vermicompost. This mixture includes earthworm residue, their cocoons, useful microorganisms, macro and micro nutrients, and decomposed organic material. Earthworms can excrete waste exceeding their own weight, producing top-quality vermicompost. In it, nitrogen is present at 1.2-2.5 percent, phosphorus at 1.6-1.8 percent, and potash at 1.0-1.5 percent. The number of actinomycetes is eight times higher than in farmyard manure. Moreover, vermicompost provides a balanced array of micronutrients, enzymes, and vitamins.

## **Follow Good Agricultural Practices**

To start and expand areas under natural farming, include the following best practices:

- Crop rotation
- Cover crops
- Multiple cropping
- Natural methods for disease and pest management
- Agroforestry practices

Soil preparation, sowing, manuring, irrigation, weeding, harvesting and storage are additional steps for good agricultural practices.

## **Conclusion**

Sustainable agriculture in a natural way is essential for ensuring long-term food security while protecting the environment. By adopting eco-friendly practices such as crop rotation, composting, biological pest control, and the use of organic inputs, farmers can maintain soil fertility, conserve water resources, and promote biodiversity. These methods reduce dependence on harmful chemicals and minimize environmental pollution. Approaches like Organic Farming and Agroecology demonstrate that agricultural productivity and environmental conservation can

go hand in hand. Supported by global efforts from organizations such as the Food and Agriculture Organization, sustainable natural farming is increasingly recognized as a practical solution to challenges like climate change, soil degradation, and resource depletion. In conclusion, sustainable agriculture in a natural way promotes a balanced relationship between humans and nature. It ensures that farming remains productive, environmentally safe, and socially responsible, benefiting present communities while safeguarding resources for future generations.

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