



ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS INSTITUTION

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AI3019

SUSTAINABLE AGRICULTURE AND FOOD SECURITY

UNIT 3

ORGANIC FARMING

Natural farming principles

Natural farming is a sustainable agricultural approach that minimizes human intervention, relying on natural processes to cultivate crops and maintain soil fertility. It was popularized by **Masanobu Fukuoka**, a Japanese farmer and philosopher, through his book *The One-Straw Revolution*. The method emphasizes working in harmony with nature rather than controlling it.

Core Principles of Natural Farming

1. No Tillage (No Plowing or Turning of Soil)

- Avoids disturbing the soil structure, allowing natural organisms (worms, bacteria, fungi) to thrive.
- Prevents soil erosion and maintains moisture retention.

2. No Chemical Fertilizers or Pesticides

- Instead of synthetic inputs, natural farming depends on compost, green manure, and microbial life to enhance soil fertility.
- Beneficial insects and companion planting help manage pests naturally.

3. No Weeding by Tillage or Herbicides

- Weeds are not considered enemies but rather part of the ecosystem.
- Mulching and cover crops are used to suppress unwanted weeds and maintain soil health.

4. No Dependency on Prepared Fertilizers or Compost

- Instead of adding external fertilizers, soil fertility is improved by growing nitrogen-fixing plants, using crop residues, and maintaining biodiversity.

5. Seed Balls (Direct Seeding Instead of Transplanting)

- Seeds are often mixed with clay and organic matter to form small balls before sowing, which protects them from birds and harsh weather.
- This method reduces labor and promotes natural germination.

Additional Principles in Modern Natural Farming Approaches

- **Use of Indigenous Microorganisms (IMOs):** Enhancing soil health by encouraging native beneficial microbes.

- **Livestock Integration:** Using animals for natural manure, pest control, and soil aeration.
- **Agroforestry & Polyculture:** Growing multiple species together to improve resilience and biodiversity.

Benefits of Natural Farming

- ✓ Restores soil fertility and microbial life
- ✓ Reduces farming costs by eliminating external inputs
- ✓ Conserves water through improved soil structure
- ✓ Encourages biodiversity and ecological balance
- ✓ Improves food quality and nutrition

Natural farming aligns with permaculture, organic farming, and other regenerative agriculture techniques, making it a promising approach for sustainable food production.

Advantages & Disadvantages of Natural Farming

Advantages of Natural Farming

1. **Eco-Friendly & Sustainable**
 - Reduces soil degradation, water pollution, and loss of biodiversity.
 - Promotes ecological balance by working with nature instead of against it.
2. **Improves Soil Health**
 - Enhances soil fertility by maintaining natural microbial activity.
 - Prevents soil erosion and improves moisture retention.
3. **Cost-Effective for Farmers**
 - Eliminates the need for expensive fertilizers, pesticides, and machinery.
 - Low input costs increase profitability, especially for small-scale farmers.
4. **Healthier Food Production**
 - Produces chemical-free, nutrient-rich food that is safe for human consumption.
 - Reduces the risk of pesticide-related health issues.
5. **Water Conservation**
 - Increases the soil's ability to retain water, reducing irrigation needs.
 - Protects groundwater from contamination by synthetic chemicals.

6. Biodiversity Promotion

- Encourages the growth of diverse plant and animal species.
- Natural predators control pests, reducing dependency on insecticides.

7. Climate Change Mitigation

- Reduces carbon footprint by avoiding synthetic fertilizers and heavy machinery.
- Increases carbon sequestration in the soil, helping combat global warming.

Disadvantages of Natural Farming

1. Lower Initial Yields

- In the short term, natural farming may produce lower yields compared to chemical-intensive farming.
- It takes time for soil fertility to build naturally.

2. Labor-Intensive

- Requires more manual work, such as mulching, composting, and weed management.
- Farmers need to invest time in learning and adapting to the system.

3. Pest & Weed Control Challenges

- Without chemical pesticides and herbicides, managing pests and weeds naturally can be difficult.
- Requires careful planning, companion planting, and natural predator management.

4. Limited Awareness & Training

- Many farmers are unaware of natural farming techniques and their long-term benefits.
- Training and support systems are still lacking in many regions.

5. Unsuitable for Large-Scale Commercial Farming

- Large-scale farms may struggle to adopt natural farming due to high labor needs and slower adaptation time.
- Industrial food production relies on uniformity and quick turnover, which natural farming does not always support.

6. Risk of Yield Instability

- Natural farming depends on environmental factors like climate, rainfall, and local biodiversity.
- Extreme weather conditions (droughts, floods) can have a greater impact compared to conventional farming.

7. Long Transition Period

- Shifting from chemical-based to natural farming takes time for soil and ecosystem recovery.
- Farmers may face financial difficulties during this transition phase.

Sustainable Rain fed Farming

1. Soil & Water Conservation Techniques

- **Mulching:** Applying crop residues or organic materials to retain moisture and reduce soil erosion.
- **Contour Farming:** Plowing along the natural contours of the land to reduce runoff and increase water infiltration.
- **Terracing:** Constructing step-like structures on slopes to slow down water flow and prevent soil erosion.
- **Rainwater Harvesting:** Collecting and storing rainwater in farm ponds or check dams for supplemental irrigation.

2. Drought-Resistant & Climate-Adapted Crops

- Growing crops that require less water, such as millets, sorghum, and pulses.
- Using **indigenous and stress-tolerant** seed varieties that can withstand dry conditions.
- Practicing **crop rotation and intercropping** to maintain soil fertility and resilience.

3. Soil Fertility Management

- **Green Manuring:** Growing nitrogen-fixing plants like legumes to enrich the soil.
- **Composting:** Recycling farm waste into organic compost to improve soil structure.
- **Agroforestry:** Integrating trees with crops to enhance biodiversity and improve moisture retention.

4. Water-Efficient Farming Methods

- **Zero-Tillage Farming:** Avoiding plowing to retain soil moisture and improve carbon sequestration.
- **Micro-Irrigation (Where Possible):** Drip or sprinkler irrigation can be used efficiently in regions with occasional access to groundwater.
- **Cover Cropping:** Growing cover crops between main crops to reduce evaporation and improve soil moisture.

5. Biodiversity & Integrated Pest Management (IPM)

- Encouraging **natural pollinators and predators** (e.g., bees, ladybugs) to reduce pest attacks.
- Using **botanical pesticides** (neem, garlic extracts) instead of chemical pesticides.
- Maintaining **diverse cropping systems** to prevent pest and disease outbreaks.

6. Farmer Training & Climate Resilience

- Educating farmers on **weather forecasting**, sustainable practices, and water conservation.
- Promoting **community seed banks** to preserve traditional and drought-tolerant seeds.
- Encouraging **farmer cooperatives** to share knowledge, resources, and risk management strategies.

Benefits of Sustainable Rainfed Farming

- ✓ Reduces dependence on external irrigation and energy-intensive inputs.
- ✓ Enhances soil fertility and water retention over time.
- ✓ Increases biodiversity and resilience against climate change.
- ✓ Improves food security and income for smallholder farmers.
- ✓ Lowers greenhouse gas emissions compared to conventional agriculture.

Challenges & Solutions

Challenges	Sustainable Solutions
Unpredictable rainfall	Rainwater harvesting, soil moisture conservation
Soil degradation	Organic matter addition, cover cropping, agroforestry
Low productivity	Drought-resistant crops, crop diversification
Pest & disease outbreaks	Integrated Pest Management (IPM), biodiversity conservation
Limited farmer knowledge	Training programs, farmer cooperatives

Organic farming:

Organic farming refers to organically grown crops which are not exposed to any chemicals right from the stage of seed treatments to the final post harvest handling and processing.

Importance of Organic Farming

The agriculture today in the country is hampered by erosion of natural resources viz., land, water, biodiversity, fast declining soil fertility and use efficiency of inputs, such as water, fertilizer and energy. Demographic pressure accelerates the former and the faulty agronomic practices account for the latter problems. The modern agriculture with its potential takes the country out of the food trap and to reach an era of self sufficiency in food grain production.

The present day for self sufficiency in food grain production may not last longer unless we develop a sustainable agricultural system which maintains and /or improves soil fertility and productivity with greater acceptance of biological principles so as to assure adequate/more food production in future. Besides plants are more prone to pest and diseases in intensive agriculture, use of chemicals can have residues on the produce, in the soil and in ground water. With more of purchased inputs cost of production is also mounting up. Pesticides use in paddy, cotton and vegetables which occupy less than 30 per cent of total area account for more than 80 per cent of the chemicals used. Organic farming practices that reduces the pressure on land, water and bio-diversity without adverse effects on agricultural production and nutritive value of food comprise, judicious use of organic manure, viz. farm yard manure, compost, crop residues, Vermicompost etc. integrated is an efficient nutrient management practices, cropping systems, conjunctive use of rain, tank and underground water, integrated pest management and