



Natural Farming: A Path Towards Sustainable Agriculture

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Agriculture is the backbone of the Indian economy. It faces multiple challenges, including declining soil health, rising production costs, water shortages, biodiversity loss, changing climate, and concerns about excessive agrochemical use. Agricultural intensification increased yields and supported food security, but concerns about long-term soil fertility, greenhouse gas emissions, ecosystem health, and groundwater quality have emerged. Consequently, there is growing interest in farming systems that maintain productivity while reducing environmental pressure. Natural farming is an agroecological approach that works with ecological processes and reduces dependence on external chemical inputs. The concept is associated with Japanese farmer Masanobu Fukuoka, whose method avoids synthetic fertilisers and pesticides, manages weeds ecologically, and uses natural processes to maintain soil fertility. In India, natural farming was pioneered by Padma Shri Subhash Palekar and includes locally adapted practices such as intercropping, crop diversification, livestock integration, on-farm biological inputs like *beejamrita*, *jeevamrita*, *ghanjivamrita*, botanicals, *whapasa*, and *acchadana* (mulching). Natural farming received considerable policy attention in India through Bhartiya Prakritik Krishi Paddhati (BPKP), which has been scaled up to the National Mission on Natural Farming. Natural farming remains the subject of scientific and policy debate. It emphasises its potential to reduce cultivation costs, improve soil health, and strengthen ecological resilience, but questions remain about whether nutrient supply, pest management, and crop productivity can be maintained consistently without external inputs. The issue is not simply whether natural farming is a “boon” or a “bane”, but under what agroecological, economic, and institutional conditions it can contribute effectively to sustainable agricultural development.

Principles of natural farming

Natural farming is a broad agroecological concept. Fukuoka's philosophy was based on four major principles, i.e., no tillage, no chemical fertilisers or prepared compost, no weed eradication, and no chemical pesticides. In India, natural farming has incorporated practices such as mulching, crop diversification, livestock integration, biological inputs, crop-residue recycling, and botanical formulations. Subhash Palekar has defined four aspects of natural farming that are critical viz. *beejamrutha*, or by using cow dung and urine-based formulations, microbial coating of seeds is possible. *Beejamrutha* contains beneficial microorganisms that protect the crop from harmful soil-borne and seed-borne pathogens. The second part is a fermented microbial culture called *jivamrita/jeevamrutha*. It supplies nutrients, but it also acts as a catalytic agent, encouraging soil microbial activity and enhancing earthworm activity. The addition of *jeevamrutha* to the soil activates microorganisms effectively. Higher microbial load and growth hormones were attributed to the favourable benefits of *jeevamrut*, which may have boosted soil biomass, thereby sustaining the availability and uptake of applied and native soil nutrients, resulting in higher crop growth and production; the third aspect, *acchadana* - mulching, is the process of adding a layer of organic material to the soil surface to avoid water

evaporation and aid in the formation of soil humus. The fourth aspect, *whapasa* - moisture, is the state in which both water and air molecules are present in the soil.

Advantages of Natural Farming

1. Environmental sustainability

Crop residues, mulches, livestock-derived materials and biological inputs support nutrient recycling and reduce the need for external inputs. Crop diversification supports biodiversity and ecological functioning. These practices are environment-friendly and support sustainability.

2. Soil health

Natural farming emphasises maintaining soil as a living system. Practices like mulching, crop-residue recycling, crop diversification, and natural inputs can increase soil organic matter and support microbial activity.

3. Water conservation

Mulching, maintaining soil cover, and improving soil structure reduce evaporation and improve infiltration. Better soil-water relations can enhance water availability to crops, especially under rainfed conditions.

4. Reduction in production costs

On-farm preparation of formulations can reduce cash expenditure, especially for small and marginal farmers with access to livestock and biomass resources.

5. Livestock integration

Natural farming integrates crops and livestock. Cow dung and urine, crop residues and other farm resources may be recycled within the production system. Such integration can improve nutrient cycling and reduce waste.

6. Climate resilience

Healthy soils with adequate organic matter, biological activity, and effective ground cover can improve agricultural resilience to drought and climate variability. Crop diversification and mixed cropping further reduce dependence on a single crop.

7. Employment generation

Preparation of farm-based inputs, crop monitoring, livestock management, mulching, and diversified crop production create additional employment opportunities.

8. Sustainable development goals

Natural farming can contribute to several Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) through sustainable food production and resilient agricultural systems; SDG 6 (Clean Water and Sanitation) by reducing agricultural pollution and improving water management; SDG 12 (Responsible Consumption and Production) through recycling and reduced dependence on external inputs; SDG 13 (Climate Action) via climate-resilient and potentially lower-emission practices; and SDG 15 (Life on Land) through biodiversity conservation and improved soil management.

Challenges

1. Yield variability

Yield is a major concern in natural farming. Crop response varies with soil type, climate, crop species, previous management, nutrient availability, and farmer experience. Several studies report considerable yield variability among farms and stress the need to identify conditions where natural farming performs well.

2. Labour requirement

Preparation of farm-based inputs, mulching, manual weed management, crop observation, and diversified farming require considerable labour.

3. Nutrient management

The major scientific challenge is ensuring adequate and timely nutrient availability. Crop demand for nitrogen, phosphorus, potassium and micronutrients can be high, particularly in intensive production systems. Natural farming should therefore not be interpreted as no nutrient management. Instead, nutrient cycling, soil testing, crop rotation, legumes, biomass recycling,

green manuring and other scientifically validated approaches need to be integrated to maintain nutrient balance.

4. Pest and disease management

Severe pest and disease outbreaks can cause substantial crop losses. Natural farming uses botanical extracts, biological control, crop diversification, and ecological management. Their effectiveness varies with pest species, disease pressure, weather, and timing. Complete dependence on a single pest-control method may increase production risk.

5. Limited location-specific research

India's agricultural diversity makes it difficult to prescribe a single natural farming package for the entire country. A practice suitable for rainfed millet may not suit irrigated rice, vegetable production, or high-altitude horticulture. The NMNF recognises this by emphasising agroecological research and developing location-specific natural farming packages through ICAR institutions, Krishi Vigyan Kendras, and agricultural universities.

6. Certification and market access

Farmers may face difficulty obtaining higher prices for naturally produced commodities if consumers cannot distinguish certified produce from conventional ones. Certification, traceability, branding, aggregation, and reliable market channels are essential.

Government Initiatives

1. Bharatiya Prakritik Krishi Paddhati

The Government of India began promoting natural farming through Bharatiya Prakritik Krishi Paddhati (BPKP) as part of the Paramparagat Krishi Vikas Yojana (PKVY) during 2019-20. The programme aimed to promote chemical-free farming and encourage use of locally available resources.

2. National Mission on Natural Farming

A major policy development occurred in November 2024 with approval of the National Mission on Natural Farming (NMNF) as a standalone Centrally Sponsored Scheme under the Ministry of Agriculture and Farmers Welfare. Its target is to encourage about one crore farmers to adopt natural farming and promote it across approximately 7.5 lakh hectares.

3. Training and capacity building

Training is an important component of the NMNF. The programme provides Centres of Natural Farming (CoNF), farmer training, demonstrations, and extension activities. As reported by the Ministry in March 2025, training through CoNF had started, and 70,021 Krishi Sakhis had been trained in soil health and natural farming.

Strategies for Strengthening Natural Farming

The following measures can improve the scientific and economic viability of natural farming in India.

1. Location-specific packages of practices

Natural farming technologies should be developed separately for major crops, cropping systems, soil types, and agroclimatic regions. Agricultural universities, ICAR institutes, and KVKs should conduct multi-location and multi-year experiments.

2. Long-term field experimentation

Research should compare natural farming with conventional, organic, and integrated systems using common indicators such as crop yield, production cost, returns, soil organic carbon, resource use efficiency, biodiversity, labour requirement, and pest and disease management. can allow farmers to observe performance under local conditions. Farmer experience should be combined with scientific measurements rather than treated as a substitute for experimental evidence.

3. Training and extension services

Farmers need practical training in preparing and applying biological inputs, crop diversification, mulching, pest monitoring, biological control, soil management, and record-keeping.

4. Certification and value chain

Certification alone will not guarantee premium prices. Farmer Producer Organisations (FPOs), aggregation, storage, processing, branding, traceability, and direct marketing should be strengthened so farmers can capture a greater share of consumer value.

Conclusion

In conclusion, natural farming has the potential to be a significant pathway to sustainable agriculture, but its success depends on scientific validation, ecological suitability, economic viability, and effective institutional support. A balanced approach combining farmers' traditional knowledge with modern scientific research can help determine where, when, and how natural farming can best contribute to India's future food and environmental security.