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Review

Discover the Wonders of Natural Farming : Principles and Practices for a Sustainable Future

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Abstract

Natural farming is an agricultural philosophy that emphasizes minimal human intervention, fostering a harmonious relationship between nature and farming. Popularized by Masanobu Fukuoka, a Japanese farmer and philosopher, this method advocates for farming in a way that aligns with natural ecosystems, reducing the need for chemicals, heavy machinery, and excessive human labor. Natural Farming is a chemical-free farming system rooted in Indian tradition enriched with modern understanding of ecology, resource recycling and on-farm resource optimization. It is considered as agro ecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity. It is largely based on on-farm biomass recycling with major stress on bio mass mulching, use of on-farm cow dung-urine formulations; maintaining soil aeration and exclusion of all synthetic chemical inputs. Natural farming is expected to reduce dependency on purchased inputs. It is considered as a cost- effective farming practice with scope for increasing employment and rural development.

Keywords: Natural Farming, Sustainable Agriculture and Diversified farming.

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Introduction

In India, over 100 million farmers work on an average of 0.38 hectares (ha) of land, with over 85% of them being smallholders [1]. The majority of the world's impoverished and hungry people live on small farms and fight to make ends meet by employing low-input, low-yield farming practices on scarce land [2]. Utilizing state-of-the-art in Indian agriculture, creativity and technology are viewed as the only workable answers in this predicament. Because of several reasons, the increased production costs, lower factor productivity, and diminished environmental quality of modern chemical-based agriculture base of resources [3].

Rice, wheat, cotton, and sugarcane are examples of annual crops that degrade soil fertility, render topsoil infertile, weaken soil vitality, and mostly lower the amount of beneficial soil microorganisms [4]. Burning agricultural residue, using chemical fertilizers continuously, and other practices may all be contributing to environmental damage. Use of pesticides [5], their ongoing use reduces the micro- and macro fauna in the soil, which may directly impact soil enzymatic activity, the C-N ratio, and the availability of nutrients to plants [6].

Pesticides and chemical fertilizers used excessively, particularly those that include heavy metals like Cd, Cu, Mn, and Zn, can contaminate the soil profile and

seep down to the groundwater [7]. Numerous microbial communities exist in the soil root zone, which has positive implications on crop productivity. Herbicide use continued to lower soil microbial population [8]. When farmers spend more money on supplies but still do not achieve a good yield because of pests and illnesses, unfavorable weather, and/or poor soil qualities, which make their way of life difficult. It is no longer possible to produce food and agriculture in a sustainable manner using the high-input, resource-intensive conventional agricultural methods [9]. Therefore, there is an urgent demand in agriculture for affordable and environmentally suitable substitutes for guaranteed sustainability [10]. Rather than being production-centric, the Natural Farming method is farmer-centric. It supports efficient supply chains, wholesome and safe food, farmer income, sustainability, and efficient use of inputs. It is a farming method based on agro-ecology and depends on inputs and resources found on the farm [11]. Its main objectives are short value chain promotion, local value addition, farmer empowerment, and social change. When applied singly or in combination, techniques including mulching, seed priming, legume intercropping, crop diversity, and reduced tillage to retain more water are likely to improve yield of crops and their ability to adjust to shifting climate conditions [12]. In certain ecosystems, substituting natural inputs for chemical ones may encourage a more robust and evenly dispersed root system as well as the capacity to interact with advantageous soil microbes; these factors may support the health of the soil, crops, and seeds as well as improved yield levels and yield stability [13]. Therefore, natural farming in designated places can assist India in accomplishing a number of SDGs. through reducing hunger, protecting the environment, and providing food and nutrition security in a sustainable way [14]. On the other hand, there aren't many research papers and data on this crucial part of producing safe food.

Natural Farming Principles and Practices

Indian culture and customs are deeply ingrained in organic and natural farming techniques. Traditional farming methods that are less resource-intensive and beneficial to the environment have a rich history in India [15]. It is well known that ancient Indian farmers developed environmentally friendly farming techniques and methods, including mixed farming, crop rotation, raising cattle, and raising fish. Among many others, tree-based farming and farming based on crops. Natural farming is farming without the use of synthetic chemicals depending on cattle as well as local resources and expertise.

It is a cow-centric agriculture that emphasizes the use of symbiotic intercropping, mulching techniques, and inputs made from cow dung, urine, jiggery, and pulse flour. The government of India's Paramparagat plan, the Bhartiya Prakritik Krishi Paddhati Programme (BPKP), is now promoting natural farming in the country. The BPKP is a multifaceted farming method that combines cattle, trees, and crops, enabling optimal utilization of functional biodiversity, which holds the potential to increase farmer revenue while providing a number of advantages, such as improving environmental health and soil fertility [16]. Natural farming is one example of an agro-ecological strategy that offers less resource-intensive farming solutions and helps lessen reliance on chemical inputs.

An alternative to traditional high-input agriculture that produces higher yields without sacrificing the demands is agro-ecological methods of the coming generation and preventing disputes between generations. These have also received support from the Food & Agriculture Organization (FAO) of the United nation [17]. The potential for crop production via organic methods such as

Reusing crop wastes and weed biomass effectively in-situ, minimizing tillage, and choosing tolerant crops have all been as stated by Das and colleagues (2008; 2014). These methods have been shown to maintain soil health, lower production costs, and stabilize productivity in a marginal hill habitat with low input levels [18]. More than 2.5 million farmers are thought to still engage in natural farming in India; the majority of these farmers may be found in hilly, mountainous, and rain-fed environments.

Many farmers found themselves trapped in a debt trap as a result of the unrestrained extraction of natural resources and growing input costs. The IPCC states that low and stagnating yields, declining productivity, crop failure, declining groundwater levels, and related climate change issues have a detrimental impact on agricultural development and livelihood. The processes of climate change are made worse by Increased extreme rainfall events (strength and dispersion), flooding, heat stress, dry spells, and other phenomena are examples of land degradation. Problems like pesticide residue in cereals and commercial goods, groundwater depletion, greenhouse gas emissions, and pesticides genetic erosion, resistance, declining water quality, biodiversity loss, and rising production costs are a few of the difficulties posed by chemically intensive farming. The amount of organic carbon in Indian soils has decreased, especially in IGPs, from 2.5% in 1947 to 0.4% at now, which is significantly less than the recommended limit of 1.5% to 2.5%. One problem restricting the country's ability to increase food output is the deficiency of NPK, secondary nutrients (S, Ca, and Mg), and micronutrients (B, Zn, Cu, and Fe, etc.) in the majority of its soils [19].

Can be achieved through following specific principles:

1. No or minimum soil disturbances
2. Adoption of diversified cropping system-based agriculture
3. No chemical fertilizers/pesticides
4. Recycling of naturally available nutrients in fields
5. Managing weeds without chemicals
6. Recycling of on-farm generated biomass
7. Use of locally developed and refined practices based on plant, animal and microbial source as raw materials
8. Innovative practices continuously evolve on the field of farmers based on the cropping pattern, local climatic conditions, altitude, soil quality, severity and variability of insects and pests etc.

In intensive cereal-based cropping systems, the majority of farming activities, such as increasing the intensity of tillage, timing of tillage, residue removal/burning, low organic manure input, and others, physically degrade soil. Additionally, the application of agrochemicals for weed control and plant protection causes the buildup of hazardous substances in soil [20]. The depletion of SOC has resulted in the physical and chemical as the biological characteristics of the soil. Furthermore, soil biodiversity has been negatively impacted by the careless use of agrochemicals biochemical reactions and composition [21]. In India, the yearly average loss of soil is roughly 16 t ha-1, or roughly 5 billion tonnes a year [22].

The goal of natural farming is to grow plants by encouraging farmers to be self-sufficient while preserving the environment and promoting coexistence of people, animals, and plants for a sustainable future. Natural farming's guiding philosophy is to assist farmers in engaging in sustainable agricultural practices that preserve soil fertility, promote chemical-free agriculture, and guarantee low production costs [23].

Elements of Organic Farming

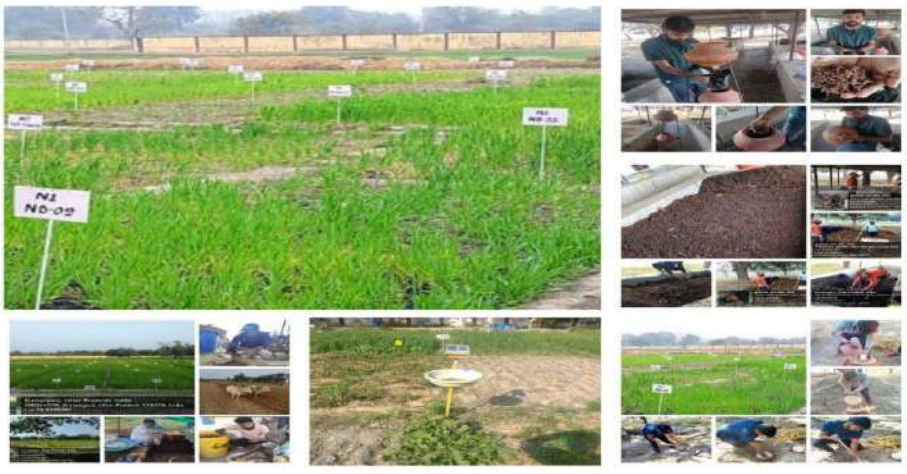
Beejamrit: seed treatment

Jeevamrit: the life's nectar (made mostly of microorganisms) that is made from the feces and urine of native cows

Waaphasa: soil aeration/moisture

Acchadana: mulching

* No external inputs
* Local seeds (use of local varieties)
* On-farm produced microbial formulation for seed treatment (such as bijamrita)
* On-farm made microbial inoculants (Jivamrita) for soil enrichment
* Cover crops and mulching with green and dry organic matter for nutrient recycling and for creating a suitable micro-climate for maximum beneficial microbial activity in soil.
* Mixed cropping
* Managing diversity on farm through integration of trees
* Management of pests through diversity and local on-farm made botanical concoctions (such as neemastra, agniastra, neem ark, dashparni ark etc).
* Integration of livestock, especially of native breed for cow dung and cow urine as essential inputs for several practices and
* Water and moisture conservation.



Importance of natural farming

Several studies have reported the effectiveness of natural farming in terms of increase in production, sustainability, saving of water use, improvement in soil health and farmland ecosystem. It is considered as a cost- effective farming practices with scope for raising employment and rural development. Natural Farming offers a solution to various problems, such as food insecurity, farmers' distress, and health problems arising due to pesticide and fertilizer residue in food and water, global warming, climate change and natural calamities. It also has the potential to generate employment, thereby stemming the migration of rural youth. Natural Farming, as the name suggests, is the art, practice and, increasingly, the science of working with nature to achieve much more with less.

Benefits of natural farming

- ***Improve Yield:*** Farmers practicing Natural Farming reported similar yields to those following conventional farming. In several cases, higher yields per harvest were also reported.
- ***Ensures Better Health:*** As Natural Farming does not use any synthetic chemicals, health risks and hazards are eliminated. The food has higher nutrition density and therefore offers better health benefits.
- ***Environment Conservation:*** Natural Farming ensures better soil biology, improved agro-biodiversity and a more judicious usage of water with much smaller carbon and nitrogen footprints.
- **Increased Farmers' Income**: Natural Farming aims to make farming viable and aspirational by increasing net incomes of farmers on account of cost reduction, reduced risks, similar yields, incomes from intercropping.
- Natural farming generates employment on account of natural farming input enterprises, value addition, marketing in local areas, etc. The surplus from natural farming is invested in the village itself.
- **Reduced Water Consumption:** By working with diverse crops that help each other and cover the soil to prevent unnecessary water loss through evaporation, Natural Farming optimizes the amount of ''crop per drop''.
- **Minimized Cost of Production:** Natural Farming aims to drastically cut down production costs by encouraging farmers to prepare essential biological inputs using on-farm, natural and homegrown resources.
- Eliminates Application of Synthetic Chemical Inputs.
- The overuse of synthetic fertilizers, especially urea, pesticides, herbicides, weedicides etc. alters soil biology and soil structure, with subsequent loss of soil organic carbon and fertility.
- Rejuvenates Soil Health.
- The most immediate impact of Natural Farming is on the biology of soil-on microbes and other living organisms such as earthworms. Soil health depends entirely on the living organisms in it.
- Livestock Sustainability.
- The integration of livestock in the farming system plays an important role in Natural farming and helps in restoring the ecosystem. Eco-friendly bio-inputs, such as Jeevamrit and Beejamrit, are prepared from cow dung and urine, and other natural products.

Conclusion

"Natural Farming is a chemical-free traditional farming method. It is considered as an agroecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity"-Niti Ayog Natural farming is a system where the laws of nature are applied to agricultural practices. This method works along with the natural biodiversity of each farmed area, encouraging the complexity of living organisms, both plants, and animals that shape each particular ecosystem to thrive along with food plants. Natural Farming builds on natural or ecological processes that exist in or around farms.

It represents a sustainable and environmentally friendly approach to agriculture. By prioritizing soil health, biodiversity, and ecological balance, natural farming reduces reliance on synthetic chemicals and promotes long-term sustainability. It supports the regeneration of natural resources, lowers input costs, and enhances the resilience of farming systems. While yields may be lower compared to conventional agriculture in the short term, natural farming fosters healthier ecosystems, better food quality, and a more sustainable future for both farmers and the environment.

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