

## Natural Farming for Soil Health

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The Green Revolution marked a turning point in Indian agriculture, transforming it from a subsistence-based system into a surplus-generating enterprise and establishing the country as a global leader in the production of several agricultural commodities (Ravisankar et al., 2025). In India, the Green Revolution paved the way for modern farming through the adoption of intensive cropping systems, high-yielding seed varieties, mechanized irrigation methods, and the use of ready-made chemical fertilizers as well as pesticides, weedicides, fungicides, antibiotics, etc. (Suja et al., 2017). While this transformation significantly improved food security and rural livelihoods, it also ushered in an era of intensive farming practices heavily reliant on external market inputs such as hybrid seeds, chemical fertilizers, and synthetic pesticides. Over time, the imbalanced and excessive use of these inputs, coupled with the declining application of organic manures, has resulted in the degradation of soil health, reduced efficiency of agricultural inputs, accumulation of chemical residues in food, contamination of water resources, and growing environmental concerns. Continuous use of these agrochemicals adversely affects soil health by suppressing beneficial soil microflora essential for nutrient cycling (Surpura et al., 2025).

In response to these challenges, agricultural priorities worldwide are gradually shifting from maximizing production to conserving natural resources, restoring soil fertility, and minimizing adverse environmental impacts. Natural and agro ecological farming systems, grounded in traditional knowledge and ecological principles, are increasingly recognized as viable alternatives to conventional high-input agriculture. These systems emphasize biomass recycling, biological nutrient cycling, on-farm plant- and livestock-based inputs, and biodiversity-enhancing practices. Beyond being resource-conserving and environmentally safe, natural and agro ecological approaches offer economic advantages by reducing input costs, improving farm resilience, and ensuring sustainable productivity, thereby aligning agricultural development with the needs of both present and future generations.

Natural Farming (NF) is an ecological, chemical-free, and diversified farming approach that integrates crops, trees, and livestock, thereby promoting functional biodiversity and enhancing ecosystem resilience. This approach is rooted in agro ecological principles and is strongly supported by rural social movements that emphasize farmer autonomy, local knowledge systems, and sustainable food production

(Rosset&Martinez-Torres, 2012). The philosophy of Natural Farming (NF) is founded on the principle of working in harmony with nature and natural ecological cycles to produce safe and healthy food while sustaining the health of soil, humans, and livestock. This approach was introduced by the Japanese farmer and philosopher Masanobu Fukuoka (1913–2008) and was comprehensively described in his seminal work *The One-Straw Revolution* and later in *The Natural Way of Farming* (Fukuoka, 1985). Natural Farming, also referred to as the “Fukuoka method,” “the natural way of farming,” or “do-nothing farming,” emphasizes minimal external intervention and the exclusion of manufactured chemical inputs and heavy agricultural machinery. The concept of “do-nothing” does not imply the absence of farmer involvement but rather denotes a deep understanding of natural processes and the deliberate avoidance of practices that disrupt soil biological balance and ecosystem functions (Fukuoka, 1985).

Natural Farming relies on several indigenous inputs prepared from farm by-products to enhance soil fertility and crop protection. Five important concoctions, namely Beejamrit, Ghanajeevamrit, Jeevamrit, Neemastra, and Brahmastra, serve distinct agronomic purposes. Soil microorganisms play a crucial role in maintaining soil fertility by actively participating in essential nutrient cycling processes, particularly the carbon and nitrogen cycles, which are fundamental for plant growth (Lazarovits&Nowak, 1997).

### JEEVAMRIT

Jeevamrit (Jivamrit) is a key input in Natural Farming, often described as a “living microbial culture” that improves soil health and fertility. It is prepared by fermenting fresh cow dung and cow urine, preferably from indigenous cows, with jaggery or molasses, pulse flour (besan), water, and sometimes a small quantity of local soil for 2–4 days. Jeevamrit is available in two forms: Drava Jeevamrit, the liquid form used immediately as a soil drench or foliar spray, and Ghana Jeevamrit, the solid form prepared for easier storage and later application. Microorganisms play a vital role in soil fertility by converting unavailable forms of nutrients into plant-available forms within the rhizosphere. When Jeevamrit is applied to the soil, the diverse microbial population present in it facilitates the solubilization and mineralization of nutrients, thereby enhancing nutrient availability to plants. In addition, these microorganisms exhibit antagonistic activity against soil-borne pathogens and contribute to biological control (Glick & Bashan, 1997).

Jeevamrit contains several beneficial microbial groups, including plant growth-promoting rhizobacteria (PGPR), cyanobacteria, phosphorus-solubilizing bacteria (PSB), mycorrhizal fungi, and nitrogen-fixing bacteria, all of which play a significant role in improving soil health and crop productivity (Chen et al., 2006).

The protocol for preparation of Jeevamrit (Ravisankar et al., 2025, p.18) is as given below

- 10 kg of fresh dung from desi cows, 10 liters of aged desi cow urine, 1.5 kg of cane jaggery or sweet fruit pulp, and 1.5 kg of pulse flour mixed in a barrel with 180 liters of water.
- A handful (50–100 g) of virgin soil from banyan tree areas, forests, or termite mounds is added as a local micro flora inoculant.
- Jeevamrit is ready after 3–4 days in summer and 6–7 days in winter and is applied to soil twice a month at a rate of 200–600 liters per acre, depending upon crops and soil conditions, either through irrigation water or as a foliar spray.

During fermentation, aerobic and anaerobic bacteria in cow dung and urine multiply as they decompose the organic ingredients. Cane jaggery and pulse flour act as carbohydrate and protein sources, respectively, during fermentation. Mukherjee et al. (2025) reported that several rod-shaped bacterial isolates belonging to the genera *Bacillus* and *Pseudomonas* exhibit considerable potential for the development and customization of plant-beneficial microbial consortia in improved Jeevamrit formulations. **GHANAJEEVAMRIT**

Ghanajeevamrit (also spelled Ghana Jeevamrit) is the dry, solid form of Jeevamrit, prepared using ingredients such as desi cow dung (150 kg), jaggery (1 kg), pulse flour (2 kg), virgin fertile soil (50–100 g), and native cow urine as required. The preparation involves partial drying of cow dung, repeated inoculation with Jeevamrit, periodic turning of the heap, and curing for 30–35 days. The final product is powdered and applied uniformly to fields or stored under shade (Ravisankar et al., 2025).

### **BEEJAMRIT**

Beejamrit is a liquid microbial inoculant prepared from fresh cow dung, cow urine, lime, and sometimes a small quantity of soil, and is primarily used as a seed treatment to enhance germination and protect young seedlings from pests and diseases. Through fermentation, Beejamrit develops a rich population of beneficial microorganisms while providing a modest supply of nutrients that support early plant growth. According to Mukherjee et al. (2025), it is also

a potent source of indole-3-acetic acid (IAA), a key plant growth regulator that promotes plant development.

Naik et al. (2009) evaluated beneficial microorganisms isolated from Beejamrit at the University of Agricultural Sciences, Dharwad, and reported their ability to fix atmospheric nitrogen and solubilize phosphorus. Preparation involves fermenting fresh cow dung, cow urine, virgin soil, calcium chloride, and water for 24 hours (Ravisankar et al., 2025.). Beejamrit-associated microorganisms also produce plant growth-promoting substances such as IAA and gibberellic acid, enhancing seedling vigor (Sreenivasa et al., 2010).

### **ACCHADANA (Mulching)**

Mulching (acchadana) is an important soil management practice that improves soil moisture conservation, nutrient cycling, and overall soil health. Straw, biomass, and live mulching systems reduce evaporation, regulate soil temperature, suppress weeds, and improve soil organic matter through microbial activity (Kader et al., 2019). Live mulching through legumes enhances nitrogen fixation and soil carbon (FAO, 2011). Mulch retention plays a vital role in conserving soil moisture and sustaining soil fertility (Hatfield et al., 2001).

### **WHAPASA**

Whapasa refers to the soil condition where air and water vapor coexist in nearly equal proportions, creating an ideal environment for root growth and microbial activity (FAO, 2011). Maintaining Whapasa through reduced irrigation, alternate furrow irrigation, and mulching improves water-use efficiency, crop resilience, and sustainable soil fertility (Hatfield et al., 2001; Palekar, 2006).

In conclusion, natural farming presents a viable solution for sustainable agriculture in India by addressing environmental, economic, and social challenges. Adoption of natural farming practices improves soil health, conserves water, enhances biodiversity, and supports climate resilience, while reducing input costs and improving farm sustainability.

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