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NATURAL FARMING: A SUSTAINABLE AND REGENERATIVE AGRICULTURE PRACTICE

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Wider ranges of climate and natural resources make India a country that relies heavily on agriculture to address the current demographic problem. Natural resources must be conserved without depleting them, particularly in agriculture. The use of chemical fertilizers and pesticides in India has increased since the green revolution. Farmers' income is being reduced and their debt is being increased as a result of the excessive and expensive use of chemicals. Human health, the environment and the purity of ground water can all be negatively impacted by the excessive use of chemicals. Farmers are increasingly turning to natural farming after learning about the numerous negative consequences of pesticide use in agriculture. Natural farming is a holistic ecological farming approach that is closely observing the natural conditions in order to build a mutually beneficial relationship between farmers and nature (Altieri, 2002). This method has gained widespread popularity in southern India, especially in Karnataka, where it originated. Due to its fast adoption rate, it is now expanding rapidly across India. Developed by Padma Shri awardee Mr. Subhash Palekar in the 1990s, this zero-budget natural farming approach relies on minimal or no external inputs, promoting a self-sustaining farming system (Khan *et.al*., 2020). Natural Farming, commonly known as low-cost farming, is increasingly valued for its role in restoring soil quality to support sustainable crop production. This is achieved through practices like crop diversification, enhancing microbial activity, recycling nutrients, and fostering beneficial biological interactions. Bio-fertilizers are integral to this process, significantly promoting plant growth and making them vital for organic and sustainable farming approaches (Chaudhary et. al., 2020). Low input agricultural practices have proliferated around the globe, providing producers with potentially lower costs and improved yields as well as food that is free of chemicals for consumers and improved fertility for the soil. For farmers who want to avoid the use of synthetic fertilizers and pesticides in their

agroecosystems for the long term by using local, low-cost inputs, Natural Farming is the answer.

Natural Farming for Sustainable Development Goals

Natural farming, as a socio-economic and environmentally friendly approach, holds promise for advancing the United Nations Sustainable Development Goals (SDGs) by 2030. Agroecological practices like natural farming, being both cost-effective and ecologically aligned, support these goals by reducing input costs, thus enhancing farmers' income and financial stability. This contributes to poverty reduction, promotes gender equality, and fosters sustainable production and consumption. By improving crop yields, diversifying crops, and providing year-round access to nutritious and income-generating plants, this approach also strengthens food security and helps achieve zero hunger (Attapatu, 2024). Natural farming's water-conserving and eco-preserving practices enhance water availability and sustainable management, while significantly lowering CO2 emissions across the agricultural value chain. Limiting chemical inputs in agriculture helps to curb land degradation, minimize ocean acidification, and reduce marine pollution from land-based sources. This approach promotes the well-being of both farmers and consumers and can play a role in lowering disease incidence within communities.

Origin of Natural Farming

Conventional or chemical farming often leads to an unstable ecosystem where the aim for maximum yield is inherently linked with ecological risks (Vogtmann, 1984). These issues have led scientists to reconsider our reliance on modern chemical farming methods and explore sustainable alternatives. Organic farming, a crop production approach rooted in early agricultural history, is one such alternative. The concept of Nature farming, while potentially new terminology for modern agriculturists, shares foundational principles with organic farming. Originally proposed over 60 years ago by Japanese philosopher Mokichi Okada, who pioneered fertilizer and pesticide-free farming, this approach was later popularized by Masanobu Fukuoka as shizen noho. Although natural farming originated in Japan, similar methods are practiced globally, such as fertility farming in the United States, and Rishi Kheti and Zero Budget Natural Farming (ZBNF) in India. Rishi Kheti gained prominence through the Friends' Rural Centre NGO, while Subhash Palekar developed ZBNF (Gupta, 2021).

Objective of Natural Farming

1. To encourage alternative farming systems that eliminate reliance on externally purchased inputs, reduce costs, and thus enhance farmers' income.

2. To popularize integrated agriculture-animal husbandry models based on livestock and local resources.

3. To collect, validate and document Natural Farming being practiced across country and encourage participatory research with farmers on up-scaling of the mission.

4. To undertake activities for awareness creation, capacity building, promotion and demonstration of Natural Farming.

Principals of Natural Farming

1) A healthy soil microbiome is critical for optimal soil health and plant health, and thereby animal health and human health.

2) Soil may be covered with crops for maximum period of the year.

3) The soil across a farm or larger field/collection of fields should have diverse crops, a minimum of 8 crops over the year. The greater the diversity, the better.

4) Minimal disturbance of soils is critical, hence no till farming or shallow tillage is recommended.

5) Animals should be incorporated into farming. Integrated farming systems are critical for promoting Natural farming.

6) Healthy soil microbiome is the key to retaining and enhancing soil organic matter. Bio stimulants are necessary to catalyze this process. There are different ways of making bio stimulants. In India, the most popular bio-stimulants are based on fermentation of animal dung and urine, and uncontaminated soil.

7) Increasing the amount and diversity of organic residues returned to the soil is very important. These include crop residues, cow-dung, compost, etc.

8) Pest management should be done through better agronomic practices (as enshrined in Integrated Pest management) and through botanical pesticides (only when necessary).

9) Use of synthetic fertilizers and other biocides is harmful to this process of regeneration and is not allowed.

Components of Natural Farming

(1) Beejamrit: Beejamrit is a traditional, sustainable agricultural practice used for seeds, seedlings, and other planting materials. It effectively safeguards young roots against fungal infections. As a fermented microbial solution rich in beneficial plant microbes, Beejamrit is applied as a seed treatment. These beneficial microbes are anticipated to colonize the roots and leaves of germinating seeds, promoting healthy plant growth.

Inputs needed: 5 kg cow dung, 5 litre cow urine, 50gram lime, 1kg bund soil, 20 litre water (for100 kg seed).

Preparation of Beejamrit: To prepare the mixture, begin by taking 5 kg of cow dung, wrapping it in cloth, and securing it with tape. Suspend this bundle in 20 liters of water, allowing it to steep for up to 12 hours. In parallel, dissolve 50 grams of lime in one liter of water and let it sit undisturbed overnight. The next morning, thoroughly squeeze the cow dung bundle into the water three times to ensure that its nutrients fully dissolve into the water. Add approximately 1 kg of soil to the solution, stirring it well to blend all the components. Finally, pour in 5 liters of desi cow urine along with the prepared limewater, and mix the solution thoroughly.

Application as a seed treatment: Add Beejamrit to the seeds of any crop; coat them, mixing by hand; dry them well and use them for sowing. For leguminous seeds, which may have thin seed coats, just dip them quickly and let them dry.

(2)Jivamrit: Jeevamrutha is a fermented microbial culture that supplies nutrients and, more critically, serves as a catalyst to boost microbial activity in the soil. It also helps increase the population of native earthworms. To prepare Jeevamritha, start by filling a large barrel with 200 liters of water. Add 10 kg of fresh, locally sourced cow dung and 5 to 10 liters of aged cow urine to the water. Next, mix in 2 kg of jaggery, which is a traditional unrefined brown sugar, along with 2 kg of pulses flour to enrich the solution. Finally, add a handful of soil collected from the bund of the farm to introduce beneficial microbes. Stir the mixture thoroughly, allowing all ingredients to combine and activate before application. Stir the solution well and let it ferment for 48 hours in the shade. Jeevamritha is ready for application. The 200 litres of Jeevamritha are sufficient for one acre of land. During the 48-hour fermentation process, the aerobic and anaerobic bacteria present in the cow dung and urine multiply as they eat up organic ingredients (like pulse flour and jaggery). A handful of

undisturbed soil acts as inoculate of native species of microbes and organisms. Jeevamritha also helps to prevent fungal and bacterial plant diseases. Application of Jeevamritha: It should be applied to the crops twice a month in the irrigation water or as a 10% foliar spray. The preparation is stored up to a maximum of 15 days and used in the field either through spray or mixing with irrigation water (Bhardwaj, 2023).

(3) Mulching: Mulching is defined as covering of soil surface using both live crops and straw (dead plant biomass) to conserve moisture, lower soil temperature around plant roots, prevent soil erosion, reduce runoff and reduce weed growth. There are two types of mulches (a) Crop Residue Mulch: This comprises any dried vegetation, farm stubble, such as dried biomass waste etc. It is used to cover the soil against severe sunlight, cold, rain etc. Residue mulching also saves seeds from birds, insects, and animals. (b) Live Mulch: Live mulching is practised by developing multi-cropping/inter cropping patterns of short durational crops in the rows of a main crop. It is suggested that the pattern should be of monocotyledons and dicotyledons in the same field, in order to provide all the essential nutrients. Monocots, like wheat and rice, supply nutrients such as potash, phosphate and sulphur, while dicots such as pulses are nitrogen-fixing plants. Such practices reduce the demand of a particular type of plant nutrient.

(4)Whapasa: Whapasa means the mixture of 50% air and 50% water vapour in the cavity between two soil particles. It is the soil's microclimate on which soil organisms and roots depend for most of their moisture and some of their nutrients. It increases water availability, enhances water-use efficiency and builds resilience against drought.

Insect Pest Management in Natural Farming

According to ZBNF-adopter farmers, when chemical fertilizers are applied to the crops, the vegetative growth of the crop is very good and lush green. This attracts the insects/ pests to the crops. While in case of Jeevamritha, the leaves colour is not that much green, and therefore, menace of pests is limited. However, when infestation occurs, the farmers prepare different types of formulations (Kashayam) made up of locally available plant materials to control the pests. Some of these are:

1. Neemastra: is the most commonly used pest controlling solution which is prepared by the farmers. Cow dung, cow urine, neem leaves, and water are used for preparing the neemastra. The neem leaves are grinded into paste and added with water. The solution is directly applied

to plants without any further dilution. For this, 5 kg of neem paste is added with around 2-3kg of dung, 10-20 litres of cow urine, handful of soil. The solution is fermented for about 48 hours. It was found that the farmers are making the solution ranging from 100-200 litres depending upon their usage and crops grown.

2. Brahmastra: is prepared from five types of bitter leaves. Neem leaves are used along with the other bitter-tasting leaves, like custard apple, chillies, etc. Around 20-30 litres of cow urine is used and is boiled for about 2-3 hours. The solution is cooled for about 12 hours and is filtered using fine cloths. The solution is further diluted with about 15 litres of water for every 1 litre of Brahamastra. The farmers are using 10-20 litres of cow urine and 5kg of neem leaves in preparing Brahmastra.

3. Agniastra: is prepared by adding 5 kg of neem paste with around 1 kg of tobacco leaves, 0.5 kg of chillies and 0.5 kilo of garlic paste. These are added in about 25-30 litres of cow urine and is cooled down for about 24 hours. The solution is then filtered and used. The solution is diluted before applying in the field for every half litre of Agniastra about 15 litres of water is added. Agniastra is considered to be effective against insects like Leaf Roller, Stem Borer, Fruit borer, Pod borer.

4. Tutikada rasam is prepared from datura leaves and cow urine. The leaves are boiled in cow urine for 2-3 hours and is cooled then it is filtered using a cloth.

5. Dashparini Kashyam It is prepared from ten types of plant leaves. The leaves of Neem, Agele marmelos, Calotropis, Senna auriculata, Papaya, Custard apple, Gauva, Vitex negundo, castor, Pomegranate, Nerium, Ocimum, Aloe vera, Tobacco, Datura, Lantana camara and Pongamia pinnata are used in preparing the solution. Green chilli and garlic are also crushed and added and mixed with 20 litres of cow urine. It is kept up to 45 days for fermentation. The solution is filtered and sprayed after dilution. In about 8-10 litres of solution 100 litres of water is added for dilution.

Scheme for promotion of Natural Farming

Union Government is promoting and supporting organic farming and Natural Farming under various schemes:

1. DARE/ICAR through its Plan Scheme ‘Network Project on Organic Farming (NPOF)’ is undertaking research in 20 centers covering 16 states to develop location specific organic

farming package of practices for crops and cropping systems. Organic farming package of practices for 51 crops/cropping systems have been developed to provide technical backstopping to the line departments' schemes implemented in the country.

2. PKVY, a sub-component of Soil Health Management (SHM) scheme under National Mission for Sustainable Agriculture (NMSA), promotes cluster-based organic farming with Participatory. Cluster formation, training, certification and marketing are supported under the scheme. Assistance of Rs. 50,000 per ha for three years is provided, out of which 62 per cent i.e., Rs. 31,000 is given as incentive to a farmer towards use of organic inputs.

3.The Development for North Eastern Region (MOVCD-NER), promotes 3rd party certified organic farming of niche crops of north east region through Farmer Producer Organizations (FPOs) with focus on exports. Farmers are given assistance of Rs. 25000/ha for three years for organic inputs including organic manure and bio-fertilizers etc. Support for formation of FPOs, capacity building, post-harvest infrastructure up to Rs. 2 Crores is also provided under the scheme.

4. Under the Agriculture Infrastructure Fund (AIF) of Aatmanirbhar Bharat, financing facility is provided to State agencies, Primary Agricultural Credit Societies, Farmer Producer Organisations, entrepreneurs etc. for setting up of organic input production units, community farming assets and post-harvest infrastructure for value addition to organic produce.

5. The Bharatiya Prakritik Krishi Paddhati (BPKP) operates as a sub-mission of the Paramparagat Krishi Vikas Yojana (PKVY), itself part of the broader National Mission on Sustainable Agriculture (NMSA). BPKP's goal is to encourage indigenous, traditional agricultural practices, enabling farmers to become independent of externally purchased inputs. The focus is on on-farm recycling of biomass, especially through biomass mulching, the use of cow dung and urine-based formulations, and the avoidance of synthetic chemicals. The scheme, with a budget of Rs. 4645.69 crore over six years (2019-20 to 2024-25), is demand-driven and follows the Centrally Sponsored Scheme (CSS) guidelines. Through BPKP, financial support of Rs. 12,200 per hectare is available for three years, covering activities like cluster formation, capacity building, ongoing support by trained personnel, certification, and residue analysis, with a target of reaching 12 lakh hectares across 600 major blocks of 2,000 hectares each in various states. The program aligns with PGS-India certification under the PGS India initiative, with eight states-Andhra Pradesh, Chhattisgarh,

Kerala, Himachal Pradesh, Madhya Pradesh, Odisha, Tamil Nadu, and Jharkhand-participating.

6. To motivate farmers to adopt chemical free farming and enhance the reach of natural farming, the Government has formulated National Mission on Natural Farming (NMNF) as a separate and independent scheme from 2023-24 by up scaling the Bhartiya Prakritik Krishi Paddati (BPKP) which is a subscheme of PKVY (Paramparagat Krishi Vikas Yojana).

Challenges in Natural Farming Adoption

In a such diverse country like India, one farming practice cannot suit to all kinds of soil types, agro-climatic conditions, and all crops. The country has 146 million farmers, out of which 100 million farmers have hardly 0.4 ha of operational holding. Their socioeconomic backgrounds are different. Therefore, it would be utopian idea to assume that ZBNF/NF practice would be adopted by all the farmers in India, no matter how best this practice proved to be. Following may be the major challenges in spread of this practice at large scale:

1. Convincing the scientific community: Unless the scientific data and evidences are created by the research institutes, it would be difficult to convince different stakeholders to develop broad consensus for its adoption. In such situation, there will always be suspicion among the stakeholders and farmers about its efficacy.

2. Adoption by large-size farm holding: It has been observed that ZBNF practice requires regular monitoring of the field for monitoring of nutrient deficiency as well as pests & weed infestation. Further, preparation of huge quantity of Jeevamritha and its application at regular interval may require increase in labour demand, which may increase the cost of crop cultivation. Thus, the practice may be more applicable for smallholder farmers with 1-2 family labour available at home. Therefore, adoption by large farm-size holding would be a herculean task.

3. Doubtful in case of high-input monocropping region: The ZBNF practice is contemplated to be agroecological approach, in which crop/farm diversity is must. In case of monocropping, wherein huge quantity of similar types of nutrients are applied, this practice may not give better/same crop yield as compared to existing practices of application of HYV, chemical fertilizers & pesticides. Therefore, in the region like Indo Gangetic Plains, where farmers cultivate single crop in whole field in a season may not be interested to adopt this. It

may have repercussion on total foodgrain production for the country if adopted at large scale by most of the farmers.

4. Reduced scope of mechanization: The benefits of ZBNF can only be realized when farmers cultivate several crops together as inter-crop or mixed crops so that demand for specific nutrients don't lead to nutrient exhaustion in the soil. Inter-/mixed crops can also be harvested at different points of time. This creates big hindrance in large scale adoption of farm machinery for sowing, harvesting, even other management practices. Achieving economy of scale and farm efficiency may always be the challenge in such case.

5. Continuous improvement in crop. yield: Crop harvest is the first stage of output realization by the farmers. Since the ZBNF practice forbids application of improved cultivars/ hybrid seeds, it would be difficult to keep the farmers motivated to grow the crops with this practice, as possibility of reaching yield plateau is quite imminent. Therefore, it requires experimenting with ZBNF/NF practices with different genotypes/ cultivars to get continuous improvement in yield.

6. Setting up institutions for recognizing ZBNF produce: It is obvious that ZBNF products are different than conventionally produced commodities. Unless some mechanism is developed to place this product as niche product in the market, it would be difficult to attract premium price for ZBNF products. Therefore, different institutional mechanism and policy change would be required for producing, aggregating, certifying and bringing near to the final consumers. It may be appropriate to encourage the farmers to go far this practice in collective way, so as to economize the whole process at scale.

Conclusion

Natural farming offers a sustainable alternative to conventional agriculture by minimizing external inputs, restoring soil health, and fostering ecological balance. It not only reduces production costs but also enhances farmers' income and contributes to food security. By promoting chemical-free farming and local resource utilization, this approach mitigates environmental degradation while improving water-use efficiency and lowering carbon emissions. Government initiatives, including the NMNF and PKVY, play a crucial role in scaling these practices. Natural farming aligns with global sustainability goals by empowering rural communities, reducing poverty, and ensuring nutritious food production.

Its holistic model positions it as a key strategy for addressing the socio-economic and environmental challenges posed by modern agriculture.

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