



An Overview of Zero Budget Natural Farming: Problems and Prospects in Implementation

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This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In the current agricultural landscape, increase in production cost, decrease in soil productivity, food with pesticide residues, driven by escalating input expenses, are placing a significant financial stress on farmers. In response to this challenge, Zero Budget Natural Farming (ZBNF) or Subhash Palekar Natural Farming (SPNF), a farming method promoted by Shri Subhash Palekar, offers a potential solution by emphasizing cost reduction while producing high-quality, safe food. ZBNF gives priority to indigenous cows, utilizing their dung and urine in various preparations. The system is based on four core principles: Beejamrutha (seed treatment), Jeevamrutha (liquid bio-fertilizer),

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mulching, and Vapsa (moisture conservation), which collectively enhance nutrient availability, create a favorable micro-climate, and protect crops using locally sourced tree leaves. While ZBNF has shown benefits for farmers, particularly in producing safe food for personal consumption, critical questions remain about its broader adoption. Key concerns include the scalability of natural farming among farmers and its implementation in the absence of intensive scientific validation. Addressing these challenges requires further research into both the obstacles and potential pathways for integrating natural farming into mainstream agricultural practices.

Keywords: ZBNF; natural farming; beejamrutha; jeevamrutha; mulching.

1. INTRODUCTION

Agriculture has long been the cornerstone of India's economy, with nearly half of the population still relying directly on farming and related activities for their livelihood. Contributing around 15% to the gross value added (GVA) of the national economy (Anon., 2023), Indian agriculture has transitioned from subsistence-based to commercialized farming systems, evolving to address the nutritional needs of a rapidly expanding population. However, the current agricultural scenario faces significant challenges. Overreliance on chemical fertilizers and harmful pesticides has disrupted the sustainability of farming systems, leading to stagnant productivity, limited income growth for farmers, and pressing concerns about food security and safety. Modern farming practices often depend heavily on a mix of agrochemicals, including both organic and inorganic fertilizers (Tapke et al., 2017). For small-scale and marginal farmers, privatized seeds, costly inputs, and distant markets exacerbate these challenges. High production costs, excessive interest rates on loans, fluctuating crop prices, increased inputs costs, and reliance on private seeds have trapped Indian farmers in a vicious cycle of debt. Tragically, more than 2,50,000 farmer suicides have been reported in India over the past two decades, with studies linking many of these to financial burdens. Debt remains a pervasive issue for farmers of all scales across the country.

Monoculture farming, such as repeated cultivation of rice, wheat, sugarcane and cotton on the same land, leads to the depletion of topsoil, loss of soil fertility, contamination of groundwater, and reduction of beneficial microbes. This practice ultimately weakens crops, making them more susceptible to parasites and pathogens. Moreover, the excessive use of chemical fertilizers and pesticides has become a global environmental

concern. Their prolonged application not only threatens soil health by destroying beneficial micro and macro organisms (Shaikh et al., 2015) but also contaminates soil, surface water, and groundwater with harmful chemicals and heavy metals (Lena & Rao, 1997).

Natural farming offers a sustainable alternative to mitigate these challenges. Defined as "the use of holistic production management systems that promote and enhance agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity," natural farming reduces environmental hazards. This approach, also known as "do-nothing farming" or "no-tillage farming," was first introduced by Masanobu Fukuoka in the 1940s in Japan and has since gained recognition as a solution for restoring ecological balance.

A revolutionary agricultural technique known as Zero Budget Natural Farming (ZBNF) or Subhash Palekar Natural Farming (SPNF) emerged, initially gaining traction in southern India, particularly achieving remarkable success in Karnataka (Kumar, 2012). This approach has since rapidly expanded across India and other parts of the world. As its name suggests, ZBNF involves farming practices where the cost of cultivation and harvesting is effectively zero or minimum. Farmers do not need to rely on external fertilizers or pesticides to ensure healthy crop growth. Instead, the method emphasizes using locally available, natural, biodegradable materials, integrating scientific ecological knowledge with modern technology, and blending these with traditional farming practices rooted in natural biological processes. The concept was introduced and popularized by Shri Subhash Palekar, who was honored with the Padma Shri in 2016 for his contributions (Anon., 2016).

Over six years of dedicated research, *Palekar* revealed that:

1. Only, the dung from local, Indian cows (desi cow) is effective in the enrichment of the barren soil. Dung from Jersey and Holstein cows is not as effective. If one is falling short of dung from local cows, one may even use the dung from bullocks or buffaloes.
2. Dung and urine of the black coloured Kapila cow is believed to be extraordinary.
3. To get the most out of the cow dung and urine, ensure that the dung is as fresh as possible and that the urine is as stale as possible.
4. An acre of land requires 10 kilograms of local cow dung per month. Since the average cow gives 11 kilograms of dung a day, dung from one cow can help fertilize 30 acres of land per month.
5. Urine, jaggery and pulse flour can be used as additives.
6. The lesser milk the cow gives, the more beneficial its dung is towards reviving the soil (Babu, 2008).

“ZBNF is self-nourishing and symbiotic in nature.”-Subash Palekar (Palekar, 2014).

Natural farming is an eco-friendly farm management practice that conserves soil micro and macro flora, enhances soil health, and produce quality by pesticide residues free food. This method also offers a cost saving practice for farmers, reducing the need for expensive chemical inputs and development sustainable crop cultivation (Nagarjun et al., 2024).

2. FOUR PILLARS OF ZBNF

2.1 Beejamritha

Palekar (2006) opined that beejamrit or beejamritha is not a source of nutrients, but it is a product which contains ingredients viz., cow dung (5 kg), cow urine (5 L), lime (50 g) and 20 L water. It is being used by the natural farming farmers for seed or seedling treatment which was found to increase seed germination and seedling growth as it contains growth hormones and beneficial microflora. Sreenivasa et al. (2009) in an experiment conducted for quantification of beneficial bacteria, nutrient status and microbial population present in beejamritha, noticed pH of 8.2, EC (Soluble salt) 5.5 dSm^{-1} , total nitrogen 40 ppm, total phosphorus 155.3 ppm, total potassium 252.0 ppm, total zinc 2.96 ppm, total copper 0.52 ppm, total Fe 15.35 ppm, total manganese 3.32 ppm and bacteria (15.4×10^5), fungi (10.5×10^3), actinomycetes (6.8×10^3), phosphate solubilizing organisms (2.7×10^2) and

nitrogen fixers (3.1×10^2) cfu/g of beejamritha. They also opined that the bacterial isolates from beejamritha were capable of producing the growth promoters like IAA and GA. Devakumar et al. (2014) reported that beejamritha formulation having a pH of 8.02, contained nutrients like nitrogen, phosphorus and potassium (2.38%, 0.127% and 0.485%, respectively) and also Mg (16 ppm) and Cu (36 ppm). They also found that there was maximum microbial load viz., bacteria, fungi, actinomycetes, N-fixers and P-solubilizers in beejamritha on the day of preparation, a population of 623×10^5 , 22×10^4 , 2×10^3 , 71×10^4 and 52×10^4 cfu/ml respectively, were recorded and later on, there was sharp decline in their number as the days elapsed and it was minimum on 7th day after preparation. Hence, they opined that beejamritha should be used on the day of preparation.

Priyanka (2020) studied on the response of field bean to farm yard manure and fermented liquid manures under organic production system. Among the various liquid organic manures, application of beejamrutha + jeevamrutha (1500 liters per ha) + foliar spray of 5 per cent panchagavya recorded higher protein content of seeds (24.76 %) over all other treatments except beejamrutha + jeevamrutha (1000 liters per ha) + foliar spray of 5 per cent panchagavya (23.78 %) and beejamrutha + jeevamrutha (500 liters per ha) + foliar spray of 5 per cent panchagavya (23.23 %). The protein content recorded with control treatment (without fermented liquid manures) was observed significantly lower (22.10 %) and was equivalent to rest of the treatments. Kiran (2014) noticed that application of beejamrutha along with the jeevamrutha, vermi-compost and panchagavya recorded higher protein content (21.23 %) in chickpea followed by beejamrutha along with jeevamrutha, FYM, vermicompost and panchagavya (21.06 %). The treatment received with beejamrutha + jeevamrutha alone registered lower protein content in chickpea seeds (20.15 %).

Performance of beejamritha also depends on the quality of the ingredients used for the preparation as well as the time of seed treatment and planting material used. But this method is not having any kind of adverse effect on the soil microflora helps to improve the soil health without any detrimental effect on environment. Farmers need to take care while treating seeds like groundnut since the outer layer is very and there will be the chances of damage while treating with beejamritha.

2.2 Jeevamrutha

Palekar (2006) defined jeevamrit or jeevamrutha as a fermented liquid product which is prepared by mixing desi cow dung (10 kg), desi cow urine (10 liters), chemical free jaggery (2 kg), pulse flour (2 kg) and a handful of soil brought from the bunds of the cultivated lands or forest soil. Jeevamrutha also contains enormous amount of beneficial microbial load which on application enhances microbial activity in soil and ultimately ensuring the availability and uptake of nutrients by the crops. Vasanth kumar (2006) reported that jeevamrutha is not a source of nutrients, but it is a fermented liquid product which contains huge quantity of microbial load which will enhance soil bio-mass upon its application to the soil even at very lesser rate as it acts as a tonic to the soil and helps in improving soil health. Pathak and Ram (2007) reported that the jeevamrutha contained *Azospirillum* (2×10^6 cfu), Phosphorus solubilizing bacteria (2×10^6 cfu), *Pseudomonas* (2×10^2 cfu), *Trichoderma* (2×10^6 cfu), yeast and moulds (2×10^7 cfu) per milli liter of sample, when the samples were analyzed after 5 days of incubation. Devakumar et al. (2008) reported that maximum microbial population in jeevamrutha was observed between 9th and 12th day of the preparation of jeevamrutha, which might have enhanced the decomposition process in the soil and resulted in relatively quick release of nutrients from compost than without application of jeevamrutha.

Sweta et al. (2017) revealed that the application of 100 per cent nitrogen through farm yard manure + seedling treatment with beejamrutha + soil application of jeevamrutha at 500 liters per ha just after transplanting and at every 10 days interval up to 15 days before harvest recorded higher growth and yield parameters (93 cm, 6384 kg ha⁻¹, 61 m⁻², 1648 kg ha⁻¹ and 4148 kg ha⁻¹ of plant height, dry matter production, number of productive tillers, grain yield and straw yield, respectively). Devakumar et al. (2018) observed that higher yield of field bean (1472.4 kg ha⁻¹) and maximum population of general bacteria, fungi and actinomycetes (50.33×10^5 , 32.33×10^4 and 20.33×10^3 CFU g⁻¹, respectively) with the application of jeevamrutha at 1000 l ha⁻¹ and panchagavya spray at 7.5 per cent over control. Reshma et al. (2019) recorded higher plant height (65.60 cm), number of branches (8.89), number of leaves (26.50), leaf area (1039.56 cm²) and leaf area index (1.54) in cow pea with application of jeevamrutha at 1000 liters per ha over no jeevamrutha application (55.82 cm, 5.5,

16.65, 88.62 cm² and 0.87, respectively). Mallikarjun (2020) conducted a comparative study on natural and organic farming systems in green gram-rabi sorghum, sequence cropping. Natural farming treatments include application of solid ghanajeevamrutha and liquid jeevamrutha revealed that organic farming system resulted in significantly higher growth, yield and yield attributes over remaining farming systems in both the crops. Grain yield (2584 kg ha⁻¹), straw yield (5285 kg ha⁻¹) and biological yield (7869 kg ha⁻¹) in rabi sorghum compared to the natural farming. Saraswati, 2020, observed the influence of ghanajeevamrutha and liquid organic manures on soil fertility and productivity of chickpea in vertisol and noticed that application of ghanajeevamrutha at 100 per cent of nutrient requirement + foliar spray of jeevamrutha at 10 per cent recorded, significantly higher NPK uptake, where uptake of N (61.66 kg ha⁻¹), P (33.30 kg ha⁻¹) and K (67.75 kg ha⁻¹) at harvest compared to other treatments.

Jeevamrutha is applied in both solid (ganajeevamrutha) and liquid form, and both have a significant impact on improving soil health. Jeevamrutha is the microbial consortia that provide nutrients, as revealed by various literature. Application of jeevamrutha along with the other organic inputs helps to improve the nutrient mineralization and improve the nutrient availability along with enhancing the soil fertility. For better results application of jeevamrutha should be done in the morning hours just after sun rise or during cool time after irrigation.

2.3 Acchadana/Mulching

Mulching is done by soil mulch, straw mulch or live mulch (spreading legumes) it conserves soil moisture, by reducing evaporation. The use of various mulching techniques by ZBNF farmers improves the fertility and moisture retention capacity of the soil. ZBNF stresses on the conservation of moisture or water vapour requirements of the plant roots. The soil must contain a sufficient mix of water and air molecules. This has been shown to reduce water input requirement, improve water efficiency in agriculture, and also make crops drought resilient without affecting crop yields (Tripathi et al., 2018). Kesarwani (2007) reported that application of organic manures according to Subhash Palekar's method by, beejamrutha as seed treatment + Jeevamrutha as soil application + Straw mulch to sweet sorghum improved the ear head weight per plant, 100 grain weight and

total biomass production which were on par with 100 per cent recommended dose of fertilizer.

Upendra (2017) from his study reported that, application of jeevamrutha + mulching resulted in significantly higher grain yield (1376 kg per ha), stover yield (5585 kg per ha) and harvest index (0.20) of foxtail millet over the control treatment which received no manure, no jeevamrutha and no mulching application (736 kg ha⁻¹, 5225 kg ha⁻¹ and 0.12, respectively). Upendra Naik et al. (2018) conducted experiment to know the effect of different organic manures on growth and yield of foxtail millet under Integrated Organic Farming System. They obtained, higher plant height (183.11 cm), leaf area (22.60 cm² plant⁻¹), dry matter production (22.08 g plant⁻¹), total number of tillers at harvest (2.73), grain yield (1814 kg ha⁻¹), stover yield (7066 kg ha⁻¹) and harvest index (0.21) increased significantly due to the application of jeevamrutha + mulching + IFS compost + vermicompost + panchagavya over the control treatment. Sahil (2024) stated that natural farming practices places a prominence role on effective water management by adopting techniques like mulching, drip irrigation, and rainwater harvesting. This helps in minimizing water loss and soil erosion.

Mulching is of the practice followed by the farmers for management of weeds and conservation of soil moisture here in ZBNF/SPNF naturally available materials will be used for mulching. These is one of the most important pillar for success of the natural farming practice, since it create a favourable micro-climate for microbial multiplication which is very much essential for active functioning of jeevamrutha since it is microbial consortia. On the other hand the material used for mulching is decomposable in the soil upon decomposition they are converted to organic nutrient sources. Jeevamrutha also helps in decomposition of the organic mulches along with nutrient mobilization.

2.4 Waaphasa

The Vedas describe water as the life forces of soil, emphasizing that its role depends on Waaphasa—a balanced microclimate within the soil. When present, Waaphasa allows soil organisms and plant roots to thrive with ample air and moisture; without it, water can harm plants and soil life. Waaphasa is maintenance of soil particle spaces with 50 percent air and 50 percent water vapor (Palekar, 2006), Waaphasa

promotes soil aeration through a favorable microclimate.

Farming practices must prioritize a balance between soil air and soil water. However, conventional methods following intensive chemical use, heavy machinery, and limited organic inputs—have disrupted this balance, leading to common issues like soil compaction. This compaction negatively impacts both crop performance and soil health. Maintaining Waaphasa or the equilibrium between soil air and water, is crucial and can be effectively achieved through natural farming practices, which help sustain this vital balance.

For pest and insect control, Zero Budget Natural Farming (ZBNF) recommends using kashayams (herbal decoctions) popularly known as astras (neemastra, agniastra, shuntiastra) made from cow dung, cow urine, neem, green chilies and various others naturally available materials (Tripathi et al., 2018)

Keeping the facts in view the possible problems and prospects of natural farming are listed below by considering the present agricultural scenario.

3. PROBLEMS OF NATURAL FARMING

- The prime food challenge: due to possible yield reduction in initial years
- In stability – due to uncertain rainfall, field variability, intensive agricultural practice
- Natural farming is a long run process transformation from conventional to natural farming takes time and source of suitable cultivars is very meager
- Management of weed, insect pests and diseases is biggest challenge due to less availability of standard pest and disease management practices.
- Lack of awareness regarding scientific natural farming methods
- Small farm holdings have less scope for natural farming in commercial crops
- Performance in annual crop is questionable
- Lack of scientific data, region specific research on natural farming and also awareness
- Same practices of natural farming are not suitable for all the farming situations
- Apart all these the major the problem is desi cows which is much required and integral part of this natural farming but the preference from the farmers for desi breeds is less due to low milk yield.

4. PROSPECTS

- Production of healthy and chemical free safe food
- Premium price for the produce produced in natural farming
- Reduction in production cost due to least dependence on external source
- Conservation indigenous seeds and cultivars
- Additional source of income from desi cow milk and other cow based products
- Beneficial in improving the productivity of plantation crops with least production cost and better quality in long run
- Improving the soil health and micro climate over a period of time
- Helps in obtaining the income from various source due to diversified cropping
- Improving the nutritional level of farm families

5. CONCLUSION

Natural farming has emerged as a promising practice that can help farmers reduce production costs by minimizing reliance on external inputs. Natural farming is potential economic and productivity benefits, it has broader environmental and social implications. It promotes a healthier soil ecosystem by supporting beneficial soil microflora, which are essential for nutrient cycling and overall soil health. This practice also contributes to a pollution-free environment by completely avoiding chemicals and any kind of synthetic inputs. Ultimately, the widespread adoption of natural farming can support a healthier society by providing pesticide-free, nutritious food. Through comprehensive research and an understanding of these interlinked benefits, natural farming could become a basis of sustainable agriculture, benefiting both farmers and the ecosystem. However, questions remain about the productivity levels that can be achieved through this method. This uncertainty largely stems from a lack of extensive scientific research on Zero Budget Natural Farming (ZBNF) as compared to conventional agricultural practices. To bridge this knowledge gap, there is a pressing need for scientific validation of ZBNF, which will allow for a clearer understanding of its potential and limitations. Such research would be invaluable for accurately communicating ZBNF's benefits and challenges to the farming community. Moreover, integrating natural farming with organic farming methods could lead to synergistic effects, potentially enhancing overall productivity and sustainability. Therefore, future research efforts should explore the combination

of these practices to assess their impact on crop yield, soil health, and long-term farm sustainability. This approach may provide an effective model, particularly for perennial tree crops, where natural farming principles—centered on minimal external inputs—have shown promise in sustaining yields while reducing input costs. Also there is a need to develop region specific natural farming based integrated farming system models for the benefit of farmers by including all the economic and environmental benefits. By considering all the factors natural farming practices will be beneficial to large scale farmers with perennial crops than small and marginal farmers cultivating commercial annual crops.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that used AI tool for paraphrasing.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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