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# Comparative advantages of natural farming, organic and inorganic system of nutrients

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**Abstract**
Current excessive environmental developments end in a growing range of artificial facilities, and also the impact of human activities ends up in the destruction and loss of the many natural habitats, whereas the remaining habitats square measure isolated and fragmented, and square measure additional replaced by more artificial facilities. The soil consists of a pool of nutrients in a natural manner but sometimes we must add additional nutrients externally for plant growth in organic and inorganic form. The application of nutrients by natural farming (Mulching, Bijamrit, Jivamrit: 100%), organic (sawdust, poultry dropping, and cow dung: 5q/ha), and inorganic fertilizers (NPK: 5q/ha). But the effects of natural, organic, and inorganic farming are different on crop growth, yield, soil quality, and soil health. The result reviled that the recommended package of practices (RPP) gets a higher grain yield, straw yield than organic farming and natural farming.

**Keywords:** Bijamrita, Jivamrit, saw dust, poultry dropping, vermicompost FYM, Organic matter, Nitrogenous, Phosphatic, and Potassic

## Introduction
Agriculture policy is to get a higher yield by applying low inputs that should not affect soil, animals, and human health. In India, the agriculture sector plays a major role in the economy. We have to write this article because sometimes farmers apply unnecessary fertilizer than recommended dose to get a higher yield that affects soil properties as well as soil, animal, and plant health. How we can control the overuse of fertilizers and get appropriate yield. To revert this system, there were some alternative ways of agriculture that have been popped up such as organic farming and natural farming practices. This is the first time when natural farming, organic, inorganic farming were studied together with their advantages.
Zero-budget natural farming is an interesting topic in the present time brought up in India by Subash Palekar (Indian Agriculturist and Padma Shri Recipient) who is also known as the father of Zero Budget Natural Farming, this natural farming system has been renamed as Subash Palekar Natural Farming. In the current situation, the comparative studies were compared on the impact of natural farming, organic and inorganic nutrients on the basic difference in their yield.

## Natural Farming
(Behera, 2022) [3] The grain yield reduction in the best treatment (cow urine @ 50% + jeevamrutha @ 100%) was 16% lesser than RPP and 2% higher than OF. The grain and straw yield by organic farming practices (3012 and 5422 kg $ha^{-1}$) and natural farming practices (3066 and 3710 kg $ha^{-1}$). However, the yield of straw is much lesser than organic farming. The microorganism content is increased by natural farming in comparison to inorganic farming. Nature farming is the use of organic substances that improves soil vitality, fertility, productivity.

### Natural farming is depending on 4 pillars
### 1. Jivamrit
Jivamrit = Cow-dung (100 g) + Urine (100 ml) + Jaggery (20 g) + Gram flour (20 g) + soil (3-10 gm) + 2 L water. Make it diluted @ 10%, @ 500 lt/ha.
The mixture is fermented for 48 hours with regular stirring thrice a day. It provides nutriment to a microorganism that is present in soil and helps them to enhance their activities. It is needed for the first three years of the transition from chemical to natural farming, after which the system becomes self-sustaining.

**2. Bijamrit**

Bijamrit = Cow dung (200 g) + Urine (200 ml) + Lime (2 g) + Water (800 ml) + soil (8 g) this is used as a seed/seedling treat or any plant part. It is fruitful in keeping safe young roots from fungus. It is useful against seed and soil-borne pathogens. It protects young seedlings against fungal attacks. It assists in the production of IAA and GA.

**3. Mulching**

Mulching is a protective covering (as of sawdust, compost, or paper) spread or left on the ground to reduce evaporation, maintain even soil temperature, prevent erosion, control unwanted plants. It provides a favourable environment condition for microorganisms to full fill their activities.

**4. Waaphasa (Aeration in soil)**

Waaphasa is that microclimate in the soil, by which the soil organisms and roots can live freely with the availability of sufficient air and essential moisture in the soil (Palekar). In one sentence, shortly, the Waaphasa means the mixture of 50% air and 50% water vapours in the cavities between two soil particles (B & Jangid, 2021) [2].

**Benefits of ZNBF**

- Improves growth, yield, and quality of the farm produce.
- Improves soils' Physio-chemical and biological properties and fertility status.
- Effective pest control in ZNBF avoids toxic chemicals, therefore, reducing the risk of biomagnification, food poisoning, and pollution.

**Economic and Environmental Concerns**

Wide-scale adoption of ZBNF would help reduce the release of harmful and toxic chemicals to soil, plant and atmospheric continuum. As a result, it will minimize the adverse impacts on farmer and consumer health, and on biodiversity. ZBNF is absolutely environmentally safe and no doubt with its name, it is economically feasible and sustainable for farmers, especially small and medium farmers (B & Jangid, 2021) [2].

**Reasons for Adoption**

1. Increase in net returns
2. Assistance from Government
3. Input materials are readily available
4. Ease of preparation of material (inputs)
5. Availability of extension staff
6. The plants will be healthier
7. Initial push by the government
8. Fertilizer and pesticide cost was reduced
9. Chemical-free food (SHYAM, DIXIT, & NUNE, 2019) [16].

**Table 1:** Chemical properties of Ghanamrutham and Jeevamrutham

| Particulars | OC (%) | Total N (PPM) | Total N (%) | Available N (PPM) | Available P (%) | Exch-K (PPM) | Available K (%) | Available Z (PPM) | Available B (PPM) | Available S (PPM) |
|---|---|---|---|---|---|---|---|---|---|---|
| Ghanamrutham 1 | 8.72 | 10805 | 1.08 | 288.87 | 0.029 | 10412 | 1.014 | 5.31 | 6.32 | 492 |
| Ghanamrutham 2 | 14.76 | 15273 | 1.53 | 238.56 | 0.024 | 2976 | 0.298 | 11.46 | 3.30 | 138.28 |
| Ghanamrutham 3 | 15.69 | 19437 | 1.94 | 673 | 0.067 | 20547 | 2.055 | 6.61 | 7.62 | 493.30 |
| Ghanamrutham 4 | 15.79 | 17251 | 1.73 | 408.80 | 0.041 | 13428 | 2.055 | 12.22 | 4.06 | 139.04 |
| Average | 13.74 | 15693 | 1.57 | 402.31 | 0.004 | 7340.75 | 0.007 | 8.90 | 5.30 | 315.60 |
| Liquid Jeevamrutham 1 | 4.56 | 5667 | 0.57 | 165.96 | 0.017 | 2925 | 0.293 | 1.12 | 2.74 | 117.60 |
| Liquid Jeevamrutham 2 | 4.05 | 4327 | 0.43 | 44 | 0.004 | 4767 | 0.477 | 0.48 | 1.89 | 98 |
| Average | 4.305 | 4997 | 0.05 | 104.98 | 0.010 | 3846 | 0.380 | 0.80 | 2.32 | 107.80 |

N = Nitrogen, P = Phosphorous, K = Potassium, Zn = Zinc, B = Boron, S = Sulphur, ppm = parts per million (Shyam, Dixit, & Nune, 2019) [16].

**Organic System of Nutrients**

Analysis of results during 2007-08 at A. R. Farm showed the relationship T3> T2. That clearly shows yield by organic farming is higher than inorganic farming. On this experiment it clearly mentions that the combination of FYM and recommended dose of NPK gets higher yield. (Abbas & Ullah, 2012) [1].

On the decomposition of plant and animal waste by microorganisms provides nutrients to soil which is later on use by plants for growth and development.

a) **Bulky organic manures:** Farm Yard Manure (FYM), compost from organic waste, night soil, sludge, sewage, green manures.
b) **Concentrated organic manures:** Oilcakes (edible, non-edible), blood meal, fishmeal and bone meal. (Motewas)

**Table 2:** Organic Manure

| Bulky Organic Manure | Concentrated Organic Manure |
|---|---|
| FYM | Oil cake |
| Compost | Blood meal |
| Vermicompost | Meat meal |
| Sheep and goat manure | Fish meal |
| Poultry manure | |

**Table 3:** N, P, K (%) content in Organic manure

| S. No. | Content | Available N (%) | Available P (%) | Available K (%) |
|---|---|---|---|---|
| **Bulky O.M.** | | | | |
| 1 | FYM | 0.5 | 0.2 | 0.5 |
| 2 | Compost | 1.4 | 1.0 | 1.4 |
| 3 | Vermicompost | 3.0 | 1.0 | 1.5 |
| 4 | Sheep and Goat manure | 3.0 | 1.0 | 2.0 |
| 5 | Poultry manure | 3.03 | 2.63 | 1.4 |
| **Concentrated O.M** | | | | |
| 1 | Edible-oil cake | 5.2 | 1.8 | 1.2 |
| 2 | NON-Edible oil cake | 3.0 | 1.8 | 1.6 |
| 3 | Blood Meal | 10-12 | 1-2 | 1 |
| 4 | Meat meal | 10.5 | 2.5 | 0.5 |
| 5 | Fish meal | 4-10 | 3-9 | 0.3-1.5 |

(REDDY, 2010) [13].

**Benefits of organic farming**

1. Conventional farmers can actually reduce production cost by over 25%.
2. Eliminating the use of synthetic fertilizers, artificial flavors, preservatives and pesticides. 3. Minimizing soil erosion by up to 50% and increasing crop yield up to five-fold within 5 years.

3. Eating organic foods may in fact, reduce the risk of heart attack, strokes and cancer.
4. It generates employment.
5. Environment friendly.
6. Increase long term fertility of soil.
7. Supports the local farms and farmers, and the local economy.
8. Pure- no artificial colors, flavors, additives, preservatives, sweeteners. (Mishra & Gupta, 2021) [9].

**Inorganic system of Nutrients**

"A fertilizer is any material of natural or synthetic origin that is applied to soil or to plant tissues to supply one or more plant nutrients essential to the growth of plants". We often neglect to deeply study the 3 major nutrients, N/P/K. This report aims to summarize modern inorganic fertilizers by delineating the unique role of these elements, both in terms of their molecular function and their practical role in yield increase. (Christodoulos, 2020) [4].

Nitrogen comprises the most common macronutrient in fertilizers. It constitutes a crucial part of amino acids, proteins, enzymes and nucleic acids. It is commonly absorbed by plants in the form of NO-3 or NH+4 (Griffen, 2015) [5] and is responsible for higher crop yields. Also, it is a great factor in food quality improvement and leaf area production. Multiple pieces of research summarized by Leghari *et al*. (2016) [8] reinforce this view, as nitrogen increases production in common plants such as wheat, rice, cotton, sugarcane. Its role is likewise in fruit trees such as mango or citrus, along with vegetables (Leghari, S.J., & Lashari, 2016) [8]. To conclude, its importance is most evident in the darkening and growth of leaves, stems and roots. (Christodoulos, 2020) [4].

Phosphorus is an element contributing to various nucleic acids and phospholipids, whereas its role in ATP -a vital energy molecule- should not be neglected. Furthermore, two significant reactions, phosphorylation and glucose activation are based on P molecules bound to ATP (Scherer, H.W., & Severin, 2009) [9]. Therefore, a deficiency of P might relate to symptoms of grey dark green colour, while overall growth rates are hindered. Phosphorus is in the form of $P_2O_5$ in fertilizers and is often absorbed as $H_2PO_4$ 4-or HPO4-2(Griffen, 2015) [5]. Further, there exists a significant correlation between N and P when it comes to metabolic reactions, as well as the increase in photosynthesis when leaf-P is abundant (Reich & Elser, 2010) [14]. Moreover, biomass concentration is affected by P concentration, as well as root length and width. The same authors state that phosphorus is an irreplaceable nutrient, underlining that only a fraction is uptake by plants. They end up saying that when it comes to roots, phosphorus seems to be an adversary of mycorrhization. (Christodoulos, 2020) [4].

Potassium, is the nutrient that plants do absorb most prominently (Scherer, H.W., & Severin, 2009) [9]. It is known that K cations are found at great concentrations inside cells, while their role in depolarization of cells is rather important, as they can move in or out of membranes (Scherer, H.W., & Severin, 2009) [9]. A strong indication of K deficiency is the respiration of carbohydrates to keep ATP at adequate levels, resulting in low energy status of plants, thus making them susceptible to multiple diseases and attacks. The molecular role of K should not be underestimated, as drought stress pathway, water uptake, osmotic adjustment and stomatal regulation are all procedures dictated by K+. Potassium can increase biotic stress resistance. Most cultivations are indeed susceptible to pathogen attacks and as shown, K deficiency tends to increase this fact; therefore, a rather simple appliance of K-rich fertilizers does improve yields (Zheng & Shen, 2020) [19]. Most often, potassium is in the form of K2O in fertilizers, listed as potash, while it is absorbed as K+ by plants (Griffen, 2015) [5]. Furthermore, potash is positively related to salt stress resistance; as mentioned earlier, osmotic adjustments are a K+ related function, if we consider that they are connected to salt stress resistance, we comprehend the importance of potassium. To continue, K is also relevant to low temperature stress mitigation, which is a common cause of yield losses, and at the same time, it is connected to water-logging resistance (Zheng & Shen, 2020) [19]. Finally, potassium is crucial for flower and fruit formation, both in size and quality. (Zekri & Obreza, 2020) [18].

**Concusion**

As we use Jivamrit, Bijamrit, mulching, and Waaphasa in natural farming which creates the suitable environmental condition for micro-organisms in the soil and also improves soil fertility as well as soil micro-organisms. Ultimately these micro-organisms fix essential nutrients in the soil. But in the case of organic nutrients by FYM, compost, etc., they provide all types of nutrients, and improvement of soil texture is only by FYM, compost. However, it also improves soil micro-organisms but not in direct form. Natural farming and the organic system of nutrients is depended upon micro-organisms. Where one is formed in the presence of micro-organisms and the other is formed by the decomposition of micro-organisms. Inorganic fertilizers are completely different from natural and organic nutrients. In this only specific nutrient can apply which is in deficient in soil like urea for nitrogen and so on, these are present in inorganic form. There is not much interference with micro-organisms.

Hence, according to studies the natural farming is much better that organic and inorganic. It reduces lot of input cost whereas the yield of inorganic farming is much higher than organic and natural farming but the population of micro-organisms in soil get reduce with time, which ultimately shows effects soil health. In case of natural farming, it improves the soil micro-organisms populations that improves soil quality and soil health.

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