

## Fours Pillars of Natural Farming

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### **Introduction**

Natural farming is a chemical-free traditional method of farming. The principle behind natural farming is collaborating with natural forces rather than opposing them. The ultimate goal is to encourage agricultural systems that are both sustainable and in equilibrium with nature. It also aims to steadily build-up the soil organic matter in a natural way as if in forest eco system. Natural Farming mainly relies on adoption of diversified multi-cropping systems, desi cow based on-farm inputs for nutrient and soil enrichment and various botanical concoctions for plant protection.

### **Four pillars of zero budget Natural Farming**

In natural farming it is expected that the nutrient required for the plant growth is available in the soil. If we allow the microbial cycles to operate as in natural ecosystem it will take care of the nutrient requirement of plants. The only thing the farmer is expected to do is to add as much quantity of organic matter, that too from the same farm land, back to soil. For the successful natural farming four main components (pillars) are proposed and are as follows.

1. Bijamrit for seed treatment
2. Jeevamrit to supply nutrients to plants through enhanced microbial activity
3. Acchadana - mulching - crop residue management for weeds, nutrients and water
4. Whapasa - soil aeration and moisture conservation

### **Bijamrit:**

Bijamrit is the formulation prepared for treating the seeds and protecting the crop from soil borne pathogens and to give an initial thrust to the plants to grow faster and healthier. By soaking the seeds in Bijamrit, it gives a protection to the seeds or act as a defence mechanism against seed related diseases, leading to improved germination rates.



Bijamrit is a proportionate mix of water, cow dung, cow urine, lime, and forest soil. In Bijamrit cow dung is used as an effective natural fungicide, cow urine is used because it has robust antibacterial property and soil adds required microbial load to the bijamrit preparation.

#### **Application of Bijamrit:**

- Coat the crop seeds by hand-mixing with Bijamrit and shade dry the seeds before sowing.
- For pulse crops, a quick dip in Bijamrit followed by shade drying is enough.
- For medicinal or ornamental propagating materials, dip the vegetative parts in Bijamrit before planting.
- Grafts for fruit crops should be dipped in Bijamrit before planting.
- Research indicates that Bijamrit enriched with beneficial microorganisms offers protection against harmful soil-borne pathogens. It also shields roots of young seedling from fungal infections and common soil and seed borne diseases. Moreover, Bijamrit has been found to produce plant growth promoters like auxins and gibberellins.

#### **Preparation of Bijamrit:**

The composition includes 20 liters of water, 5 kg of cow dung, 5 liters of cow urine, 50 g of lime, and a handful of soil.

- In a plastic or cement tank, mix all the ingredients. Stir the mixture with a wooden stick, rotating it clockwise.
- Cover the tank with a jute sack or polynet and ensure that it must be placed in a shaded area, shielded from direct sunlight and rain.
- After a day, the Bijamrit will be ready for seed treatment.

**Preparation Time:** 12-24 hours

**Storage:** Use the Bijamrit for seed disinfection. It can be stored for up to 7 days.

#### **Jeevamrit**

The soil contains nutrients but majority of the nutrients are present in the forms which are unavailable to the plant. Jeevamrit, an organic fertilizer, contains beneficial microorganisms that convert these nutrients to available form when added to the soil. It can be sprayed or added through irrigation water every 10-15 days until the soil improves.



Jeevamrit is an organic alternative to chemical fertilizers, rich in nutrients like carbon, nitrogen, phosphorus, and calcium. It boosts soil microorganisms, enhancing soil fertility and crop yield. It's made from cow dung and urine, promoting nutrient availability and microbial activity. This leads to more earthworms and fertile soil. Jeevamrit is a bio-fertilizer which enhances plant growth by stimulating soil microbes and earthworms. It includes important microorganisms like rhizobacteria, cyanobacteria, mycorrhizal fungi, and nitrogen-fixing bacteria etc. This product catalyzes nutrient conversion and helps fight plant diseases.

Subash Palekar recommends Jeevamrit for nutrient conversion in soil rhizosphere. It contains plant growth promoters, cyanobacteria, phosphorus solubilizing bacteria (PSB), mycorrhizal fungi, and nitrogen fixing bacteria, aiding nutrient absorption and disease control. Soil microorganisms actively improve soil fertility by recycling nutrients essential for plant growth. Jeevamrit is a fermented culture that not only provides nutrients but also stimulates microbial activity and earthworms. It is beneficial against fungal and bacterial diseases. According to Palekar, it's necessary for the initial 3 years of transition to a self-sustaining system.

### **Types of Jeevamrit**

- The liquid state of Jeevamrit.
- The semi-solid state of Jeevamrit.
- Dry Jeevamritm (Ghana Jeevamrit).

### **Method of preparation and application of liquid Jeevamrit**

**Preparation:** The process to prepare Jeevamrit is as follows:

Fill a barrel with 200 liters with water. Add 10 kg of fresh local cow dung and 5 to 10 liters of cow urine. Further add to it 2 kg of jaggery, 2 kg of pulse flour and a handful of farm soil. Mix all the ingredients thoroughly and let it ferment for 48 hours under the shade. For one acre of land, 200 litres of Jeevamrit is sufficient. Apply it to the crops twice a month either through irrigation water or as a 10% foliar spray. Application of Jeevamrit should be repeated every 15 days until the soil is enriched. During the 48-hour fermentation process, aerobic and anaerobic bacteria in the cow dung and urine multiply as they consume organic ingredients, including pulse flour. Handful of undisturbed soil added to the mixture serve as inoculants of native beneficial soil microbes.

**Precautions to be taken:**

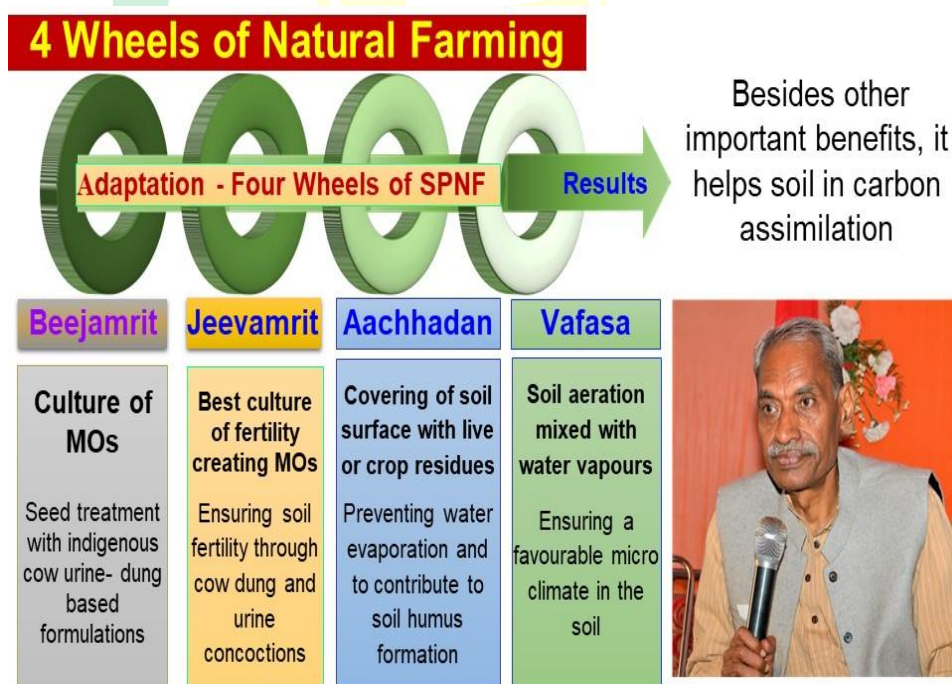
Avoid using brass or copper materials for the barrel. After fermentation, Jeevamrita should be applied within 15 days, but it's most effective when used between 7 to 12 days after fermentation.

**Preparation of dry Jeevamrita (Ghan-Jeevamrita)**

This method is suitable for regions with limited water availability in dryland or rainfed areas for Jeevamrita application.

- Gather 100 kg of local cow dung, 2 kg of jaggery, 2 kg of pulse flour, and a handful of farm soil.
- Thoroughly mix the ingredients, adding a small quantity of cow urine.
- Spread the mixture in a shaded area for drying.
- Once dried, manually sieve it to create a powdered form and store it in gunny bags.

This powdered mixture remains viable for up to a year.



**For application:**

During ploughing or prior to the final ploughing for every acre of land, spread 200 kg of Ghana-Jeevamrit evenly across the soil. It can also be used for basal application during sowing. For each acre, use 100 kg of Ghana-Jeevamrit for broadcasting.

## Uses of Jeevamrit

Jeevamrit enriches the soil with nutrients and increases the soil fertility. Soil application of jeevamrit create favorable conditions for the availability of nutrients by increasing pH in acidic soils and decreasing the pH in alkaline soils and maximizing nutrient availability at pH 6.5 to 7.8

**Table 1. Different microbial populations present in Jeevamrit**

Organisms	Colony count (cfu/ml)
Bacteria	$20.4 \times 10^5$
Fungi	$13.8 \times 10^3$
Actinomycetes	$3.6 \times 10^3$
Phosphate solubilizing organisms	$4.5 \times 10^2$
Free living N <sub>2</sub> -fixers	$5.0 \times 10^2$

Jeevamrit showed increased growth and yield when applied as seed treatment, foliar spray and soil application also. To the tune of 5- 11% yield is increased when Jeevamrit is applied as seed treatment. Spray of Jeevamrit @ 200-500 liters/acre in field bean resulted in 15 to 40% of its yield. Jivamri with the combination of other liquid formulations such as Panchagavya has yielded good results in capsicum.

## Acchadana/Mulching:

Grain crops and healthy orchard trees thrive with a ground cover of vegetables, weeds, and white clover. Mulching with straw enhances soil moisture and encourages microorganisms and earthworms, fostering seed germination without tillage. There can be three types of mulching:

- a. **Soil mulch:** Protects topsoil during cultivation, promoting aeration and water retention within the upper 4.5 to 6 inches (10-15 cm) layer. Avoid deep ploughing as recommended in Natural farming.
- b. **Straw mulch:** Comprising dried biomass waste or any dead organic material, it contributes to soil fertility by decomposing through microbial activity.
- c. **Live mulch (Symbiotic Intercrops and Mixed Crops):** Diverse cropping patterns supply essential elements to soil and crops. Legumes (dicots) fix nitrogen, while monocots like rice and wheat provide other nutrients.





Cover crops like legumes reduce weeds, enhance water infiltration, and fix atmospheric nitrogen for crops. Surface residues increase microbial degradation and nutrient release. It conserves soil moisture, improves seed germination, and regulates soil temperature.

Under natural farming, soil mulching, straw mulching, and live mulching offer numerous benefits like:

- Reduces Tillage: Lessens the need for tilling.
- Enhances Biological Activity: Boosts soil biological processes.
- Replenishes Nutrients: Reinvigorates soil nutrient content.
- Retains Moisture: Prevents water loss from evaporation.
- Controls Evaporation: Manages water evaporation.
- Improves Water Holding Capacity: Increases soil's water retention capacity.

### **Whapasa/Moisture**

Waaphasa refers to a soil condition with a balanced mixture of 50% air and 50% water vapor between soil particles. This state reduces irrigation needs and is a foundational concept of natural farming. This technique enhances water use efficiency and has led to decreased irrigation demands among the natural farming farmers.

In natural farming, water conservation and precise water application based on crop requirements are paramount. By focusing on irrigation during noon in alternate furrows, the goal is to maintain a balance of air and water molecules in the soil. This practice capitalizes on the fact that younger, more active roots absorb water and nutrients more effectively.

It's crucial to strike a balance, as excessive water can limit soil aeration and lead to oxygen deficiency, potentially harming plants. Soil aeration is vital for plant growth, so longer intervals between water applications are advisable. Overall, whapasa aims to optimize water use and foster healthier plant growth while conserving water resources.

### **Different Asthras for pest management in ZBNF for Plant Protection:**

#### **Neemastra:**

Neemastra is used to prevent or cure diseases, and kill insects or larvae that eat plant foliage and suck plant sap. This also helps in controlling the reproduction of harmful insects. Neemastra is very easy to prepare and is an effective pest repellent and bio-insecticide for Natural Farming.

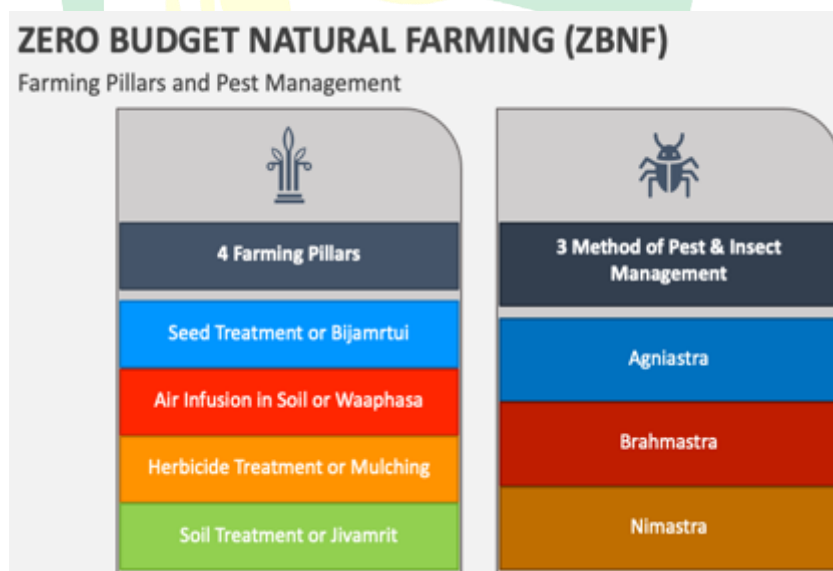
**Inputs needed:** 200 litre water, 2 kg cow dung, 10 litre cow urine, 10 kg fine paste of neem leaves.

#### Preparation of Neemastra:

- **Step 1:** Take 200 litre of water into a drum and add 10 litre of cow urine. Then add 2 kg of local cow dung. Next, add 10 kg of fine paste of neem leaves or 10 kg neem seed pulp.
- **Step 2:** Then stir it clockwise with a long stick and cover it with a gunny bag. Keep it in shade as it should not be exposed to either sunlight or rainfall. Stir the solution every morning and evening in clockwise direction.
- **Step 3:** After 48 hours, it is ready for use. It may be stored for use up to 6 months. It should not be diluted with water.
- **Step 4:** Filter the prepared solution with a muslin cloth and apply directly on the crop through foliar spray.

#### Controls:

All the sucking pests, jassids, aphids, white fly and small caterpillars are controlled by Neemastra.



#### Brahmastra:

This is a natural insecticide prepared from leaves which have specific alkaloids to repel pests. It controls all sucking pests and hidden caterpillars that are present in pods and fruits.

**Inputs needed:**

20 litre cow urine, 2 kg neem leaves, 2 kg karanj leaves, 2 kg custard apple leaves and 2 kg datura leaves.

**Preparation of Brahmastra:**

- **Step 1:** Take 20 litre of cow urine in a vessel and add 2 kg of fine paste of neem leaves, 2 kg of paste prepared from leaves of karanj, 2 kg paste of custard apple leaves, 2 kg paste of castor leaves, and 2 kg paste of datura leaves into it.
- **Step 2:** Boil it on a small flame, till one or two foams (overflow level). Stir in clockwise direction, then cover the vessel with a lid and keep on boiling it.
- **Step 3:** After formation of second foam, stop boiling and allow it to cool for 48 hours so that the alkaloids present in the leaves are released into the urine. After 48 hours, filter solution using a muslin cloth and store it. It is better to store in pots (earthen pots) or plastic drums under shade. The solution may be stored for use up to 6 months.

**Application:**

6-8 litre of Brahmastra diluted in 200 litre of water can be used as the foliar spray on the standing crop. This ratio may be changed depending upon the severity of pest attack as follows:

100 litres of water +3 litres of Brahmastra

15 litres of water +500 ml of Brahmastra

10 litres of water + 300 ml of Brahmastra

**Agniastra:**

It is used to control all sucking pests and caterpillars.

**Inputs needed:**

20 litre cow urine, 2 kg pulp of neem leaves, 500 gm tobacco powder, 500 gm green chilli, 250 gm garlic paste and 200 gm turmeric powder

**Preparation of Agniastra:**

- **Step 1:** Add 200 litres of cow urine to a container. Then add 2 kg neem leaves paste, 500-gram tobacco powder, 500 gram green chilli paste, 250 gram garlic paste and 200 grams turmeric powder.
- **Step 2:** Stir the solution in clockwise direction and cover it with a lid and allow it for boiling till we get foam.



- **Step 3:** Remove from fire and keep the vessel under shade, away from direct sunlight for cooling for 48 hours. During this fermentation period stir the components twice a day.
- **Step 4:** After 48 hours, filter with a thin muslin cloth and store it. It can be stored for 3 months.

**Application:**

6-8 litres of agniastra should be taken and diluted in 200 litres of water for spraying.

The following ratios are to be followed based on the severity of pest attack.

- 100 litres of water + 3 litres of agniastra
- 15 litres of water + 500 litres of agniastra
- 10 litres of water + 300 litres of agniastra

**Dashaparni:**

Dashaparni ark acts as substitute for Neemastra, Bramhastra, and Agniastra. It is used to control all types of pests and used depending on the level of infestation.

**Inputs needed:**

200 litre water, 20 litre cow urine, 2 kg cow dung, 500 grams turmeric powder, 10 grams Asafoetida, 1 kg tobacco powder, 1 kg chilly pulp, 500-gram garlic paste, 200 gram of ginger paste, Any 10 leaves\*.

**Preparation of Dashaparni:**

- **Step 1:** Take 200 litres of water in a drum; add 20 litres of cow urine and 2 kg of cow dung. Mix it well and cover with the gunny bag and keep aside for 2 hours. **Step 2:** Add 500 gram of turmeric powder, 200 gram of ginger paste, 10 grams of Asafoetida into the mixture. Stir it well in the clockwise direction; cover with gunny bag and keep overnight.
- **Step 3:** Next morning, add 1 kg of tobacco powder, 2 kg of hot green chilli paste and 500 gram of garlic paste and stir it well with wooden stick in the clockwise direction, cover with gunny bag and leave for 24 hours under shade.
- **Step 4:** Next morning, add paste of any 10 types of leaves\* (from the list given at the bottom) to the mixture.

- **Step 5:** Stir thoroughly and cover with the gunny bag. Keep it for 30-40 days for fermentation so that the alkaloids present in the leaves will get dissolve in the mixture. Stir twice a day
- **Step 6:** Filter this after 40 days with a muslin cloth and use it.

#### **Application:**

The prepared kashayam of 6-8 litres should be diluted in 200 litres of water for spraying.

\*Neem leaves – 3 kg, Leaves of Karanj (*Pongamia pinnata*) – 2 kg, Leaves of Custard apple (*Annona squamosa*)- 2 kg, Castor leaves (*Ricinus communis*) – 2 kg, Datura leaves (*Datura metel*)- 2 kg, Leaves of Gaint milkweed (*Calatropis procera*) – 2 kg, Leaves of nirgundi (*Vitex negundo*) – 2 kg, Leaves of Dhatura (*Datura stramonium*) – 2 kg, Leaves of Karavira (*Nerium indica*) – 2 kg, Leaves of Chinrose (*Hibiscus rosa*) – 2 kg, Mango leaves (*Mangifera indica*) – 2 kg, Leaves of Lantana (*Lantana camara*) – 2 kg, Leaves of Chakramarda (*Casia tora*) – 2 kg, Leaves of Guava (*Psidium guava*) – 2 kg, Leaves of Pomegranate (*Punica granatum*) – 2 kg, Leaves of Drumstick (*Moringa oleifera*) – 2 kg, Leaves of Coffee (*Coffea arabica*) – 2 kg, Leaves of Mahua (*Maduca indica*) – 2 kg, Coco leaves (*Theobroma cacao*) – 2 kg, Leaves of babul (*Acacia nilotica*) – 2 kg, Leaves of Sitavari (*Psoralea corylifolia*) – 2 kg, Leaves of Bitter Gourd (*Momordica charantia*) – 2 kg.

#### **Fungicide:**

Fungicide prepared with cow milk and curd is found to be very effective in controlling fungus.

#### **Preparation:**

Take 3 litres of milk and prepare curd from it. Remove the creamy layer and leave for 3 to 5 days till grey layer of fungus is formed. Churn it well, mix it with water and spray on infected crops after filtering.

#### **Conclusion:**

Adoption of this farming approach wherever possible will ease the ride of the country towards regenerative agriculture. At the same time, we should not forget about food security of the populous country like India. Hence, long-term impact and viability of natural farming system has to be validated scientifically.

**“Once the soil health is taken care it will take care of all the life on the earth”.**