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ORIGINAL ARTICLE



Maintaining crop nutrient status under natural farming

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ABSTRACT

In the green revolution era, the synthetic chemical fertilizers were used extensively to meet the fertility requirement of various crops. However, with the passage of time, scientific surveys and evidences indicated a number of hazards associated with their overuse. There are reports of killing of various beneficial macro and microorganisms in the soil and contamination of soil, air, surface and ground water. There is eutrophication or hypertrophication of fresh water, meaning that bodies of fresh water become heavily enriched with minerals and nutrients due to runoff from land. This induces unwarranted growth of water plants and algae which can kill off marine animals, as well as overgrowth of Cyanobacteria that produces harmful toxins that can accumulate in the food chain and harm humans. The effects of chemical fertilizers on soil include: acidification, which limits the nutrient bioavailability, accumulation of toxic elements like, cadmium, fluoride, radioactive elements, lead, arsenic, chromium, and nickel and finally disruption of the biology of the soil. Direct contact with these chemicals can burn skin, damage the respiratory system, aggravate existing health conditions and increase the risk of developing certain diseases. People with existing kidney, liver, urinary or respiratory problems are particularly at high risk. To surmount the noxious effects of synthetic fertilizer based farming, a more sustainable farming system is much needed which could reduce the dependence on such

expensive external inputs and simultaneously take care of their ill effects. Natural farming as suggested by ShriSubhashPalekar is a feasible and sustainable alternative. The idea is to let nature play a central role to the maximum extent possible. In natural farming, plant nutrient requirement is fulfilled through application of natural inputs. The farmers supply the nutrients to the crops with the help of natural products prepared easily by them on-farm from local cow based resources at almost negligible cost. Palekar has detailed the procedures of preparation and application of these man-made inputs. He has stressed on the use of ghanjeevamrita and jeevamrita for meeting out the nutrient requirement of the crops.

Keywords: natural farming, ghanjeevamrit, jeevamrit, nutrients

INTRODUCTION

Zero budget natural farming now called natural farming, has been originally proposed and promoted by Maharashtra agriculturist and Padma Shri recipient SubhashPalekar, in India in 2016 as a substitute to the chemical farming; that involves intense irrigation. He asserted that the mounting cost of the external inputs purchased for crop cultivation was the prime cause of indebtedness and suicides among farmers, along with the presence of toxic residues in different components of environment. He propounded that in natural farming, there is no necessity to expend money on these inputs or take loans to buy them. This approach will whittle down the cost of production and farming made into a close to “zero budget” exercise, breaking the debt chain for many small farmers. Natural farming is a method of chemical- devoid agriculture drawing from traditional Indian practices.

As opined by Sh. SubhashPalekar, natural farming is a set of farming techniques that entails zero credit for agriculture and zero use of chemical fertilizers. It became known as a farming movement in Karnataka resulting from the alliance between agriculturist SubhashPalekarji and state farmers association Karnataka RajyaRaithaSangha (KRRS). Also, states like Andhra and Himachal Pradesh have been espousing this model at hammer and tongs.

FOUR PILLARS OF NATURAL FARMING:

1. **Jeevamrita/Jeevamrutha:** It is a fermented microbial culture prepared from mixture of dung and urine of indigenous (*desi*) cow, pulse flour and undisturbed soil which acts as inoculate of native sp. of microbes and organisms. This culture furthers the activity of beneficial micro-organisms, earthworms and increases the quantity of organic carbon in soil. This makes the essential nutrients present in soil available to the plants which were earlier unavailable. It maintains fertility level of soil and also helps in preventing the attack of various fungal and bacterial diseases.
2. **Beejamrita/Beejamrutha:** It is prepared from dung and urine of *desi* cow and burnt lime. It is used for the treatment of seeds, seedlings and other planting material. It

shield the plants from the attack of seed and soil borne diseases and roots from the attack of fungus.

3. **Mulching (Achhadana):** The upper layer of soil is covered with mulch to cut down evaporation. It improves micro-climate in soil, increases humus content, safeguards upper layer of soil, preserves soil moisture, increases the amount of essential nutrients and microbial population in the soil and represses weeds. According to Palekar, the mulch can be either soil mulch, straw mulch or live mulch.
4. **Moisture (Whapasa):** Palekar states that the roots of plants require water vapour instead of water. Whapasa is the condition where there both air and water molecules exist in soil. By adding jeevamrita and achhadana to soil, whapasa is generated which enables faster production of humus and better water management in the soil. Palekar prescribes reduced irrigation, irrigating only at noon and in alternate furrows.

KEY ASPECTS OF NATURAL FARMING:

1. This method of farming is based on nature, science, spirituality and non-violence.
2. This farming abstains from the use of synthetic fertilizers, insecticides, fungicides, weedicides, farm yard manure, biofertilizers, and vermicompost.
3. Only 1 indigenous cow is adequate for carrying out natural farming on 30 acres of land.
4. This method of farming conserves water and electricity by utilizing just 10 per cent water and 10 per cent electricity.
5. The production is more as compared to that obtained through conventional and organic farming.
6. The produce so obtained with this farming is poison and residue free, of high quality, nutritious and of better taste.
7. Natural farming is non toxic to human beings, birds, animals, water and different components of environment unlike conventional and organic farming.
8. Only the dung from local, Indian cows is effective in the re-enrichment of barren soil.
9. To get the most out of the cow dung and urine, the dung should be as fresh as possible (upto 7 days old) and urine as stale as possible (more than 5 days).

PRINCIPLES OF NATURAL FARMING:

1. **Intercropping:** In natural farming, intercrops are grown along with the main crops so as to supply nitrogen, phosphorus, potash and other nutrients to the main crop. The nitrogen fixing bacteria like *Rhizobium*, *Azotobacter*, *Azospirillum* etc present in the root nodules of intercrops help in right development of plants. The main crop is also sheltered from insect-pests attack as the intercrops trap them. The chief intent of growing intercrops is that any cost incurred on main crop shall be compensated by the income from intercrops thus making farming a close to zero budget activity.

2. **Contours and bunds:** These are made in the field to collect rain water which keep the land moist and make the water available to plants for a long time. These also help in proper drainage of water in fields during rainy season.
3. **Local species of earthworms:** Palekar recommends the revival of local deep species of earthworms through increased organic matter and opposes the use of vermicomposting that adds foreign earthworms (European red wiggler- *Eiseniafoetida*) to Indian soils. He claims that these worms absorb toxicants and poison groundwater and soil. So, he emphasizes on promoting the activity of local species of earthworms in Indian soils, by mulching. Mulching creates darkness in soil which builds a micro-climate in soil appropriate for the activity of earthworms. Earthworms increase the humus content in soil thereby enhancing nutrient availability, drainage and a more stable soil structure, all of which help improve crop productivity. When earthworms eat, they leave behind castings that serve as a priceless source of fertilizer.
4. **Cow:** Natural farming is completely cow-based. One gram dung of indigenous (*desi*) cow holds up to 300 to 500 crores of beneficial microorganisms as compared to foreign breeds that have only 78 lakh beneficial microorganisms. The activity of earthworms is also more in soil treated with dung and urine of *desi* cow which increases the fertility status of soil with their castings. There are 16 major nutrients in dung of *desi* cow which satisfies the nutrient requirement of plants needed for proper growth and development. Hence dung and urine of indigenous cow is the best for natural farming.
5. **Ploughing:** Deep ploughing is avoided as it leads to an increase in soil temperature to a level that the carbon from the soil starts vapourizing; this prohibits the humus production in soil decreasing its fertility level.
6. **Water management:** In natural farming, the plants are irrigated from some distance so that only 10 per cent of water is used; remaining 90 per cent is saved. The root length and stem width of plants is enhanced, that increases the overall plant height. All this boosts the crop production.
7. **Plant direction:** The plants are grown in north-south direction so that they entrap sunlight for longer span of time. Greater plant to plant spacing triggers better growth of each plant by enhanced interception of sunlight. Thus, the plants become healthy and deter the attack of insect-pests and diseases. The plants accumulate nutrients in desired quantities and the production increases by 20 per cent.
8. **Microclimate:** Mulching helps to maintain optimum conditions under natural farming like 65 to 72 per cent moisture, 25 to 32 °C air temperature, darkness, humus and warmth in soil.
9. **Capillary action:** In natural farming, the plants tap nutrients from deeper layers of soil through capillary action, which augments the activities of micro organisms in soil. The micro organisms are bountiful at a depth of 5 inches in soil. When synthetic fertilizers are added, the capillary action is impeded because it requires 50 per cent moisture and 50 per cent air between two soil particles. Since the synthetic fertilizers contain salt, so

their application fills the space between soil particles with salt. As the capillary action is hindered, so the plants cannot extract these nutrients even though they are available in plenty in soil. However, in natural farming, the activities of local earthworms increase and they develop the required 50 per cent moisture and 50 per cent air in soil. The plants are thus able to uptake the nutrients properly from the soil and the farmers can harvest good produce from such crops.

10. Local seed/varieties: The requirement of local seeds/varieties for nutrients is less but they give more production. Such varieties are also less susceptible to insect-pests and diseases because they possess characters of wild races. So they are adopted under natural farming and use of hybrids is discouraged.

NUTRIENT REQUIREMENT OF CROPS

The crop nutrient requirement under natural farming can be met by application of jeevamrita and ghanjeevamrita, their methods of preparation and uses are given below:

A. JEEVAMRITA

USES: It is a fermented microbial culture of crores of micro organisms that promotes the activity of beneficial microorganisms and earthworms in soil. This helps in making unavailable essential nutrients in soil, available to plants. It also helps to prevent fungal and bacterial plant diseases and increases the quantity of organic carbon in soil. One gram of *desi* cow contains 300 to 500 crores of micro organisms. When we prepare jeevamrit, we add 10 kg of cow dung in 200 litres water, thereby adding 30 lakh crores micro organisms, which multiply and double in 20 minutes and become innumerable after 72 hours, they. When jeevamrit is added in soil, it starts providing nutrients to the crops enabling their vigorous growth and development. It reaches 10 to 15 feet deep into the soil and disturbs dormant earthworms and other organisms which then become active and reach upper layers of the soil where they work by adding humus and nutrients to the soil through their castings and droppings.

MATERIAL REQUIRED FOR PREPARATION

<i>Sr. No.</i>	<i>Material</i>	<i>Quantity</i>
1.	Dung of <i>desi</i> cow	10 kg
2.	Urine of <i>desi</i> cow	5-10 litres
3.	<i>Gur</i>	1-2 kg
4.	Gram flour	1-2 kg
5.	Water	200 litres
6.	Soil around the bark of big tree	200 g

METHOD OF PREPARATION

1. Add the above contents in a plastic barrel and stir with a wooden stick.
2. Keep this solution in shade for 2-3 days for fermentation.

3. Stir the solution daily in morning and evening for 2 minutes with a wooden stick in clock-wise direction and cover with a jute bag.
4. Filter through the cloth and store. Use the prepared solution within 7 days.

RATE OF APPLICATION IN SOIL

Field crops: Once or twice a month at the rate of 200 litres per acre along with the irrigation water.

Fruit crops: Apply at noon under the shade of tree at the rate of 2 to 5 litres around the tree.

RATE OF APPLICATION IN STANDING CROPS AS FOLIAR SPRAYS

For 60-90 days duration crop:

First spray: 21 days after sowing @ 5 litres in 100 litres water/acre.

Second spray: 21 days after first spray @ 20 litres in 200 litres water/acre.

For 90-120 days duration crop:

First spray: 21 days after sowing @ 50 litres in 100 litres water/acre.

Second spray: 21 days after first spray @ 10 litres in 150 litres water/acre.

Third spray: 21 days after second spray @ 20 litres in 200 litres water/acre.

For 120-135 days duration crop:

First spray: one month after sowing @ 5 litres in 200 litres water/acre.

Second spray: 21 days after first spray @ 10 litres in 150 litres water/acre.

Third spray: 42 days after third spray @ 20 litres in 200 litres water/acre.

For 135-150 days duration crop:

First spray: one month after sowing @ 5 litre in 100 litre water/acre.

Second spray: 21 days after first spray @ 10 litre in 150 litre water/acre.

Third spray: 42 days after third spray @ 20 litre in 200 litre water/acre.

Fourth spray: 21 days after fourth spray @ 20 litre in 200 litre water/acre.

For 165-180 days duration crop:

First spray: one month after sowing @ 5 litre in 150 litre water/acre.

Second spray: 21 days after first spray @ 10 litre in 150 litre water/acre.

Third spray: 42 days after third spray @ 20 litre in 200 litre water/acre.

Fourth spray: 21 days after fourth spray @ 20 litre in 200 litre water/acre.

Fifth spray: At fruiting stage, spray @ 20 litres in 200 litres water/acre.

FRUIT CROPS

In fruit crops, spray jeevamrit twice a month. For this, strain 20 to 30 litres jeevamrit through a cloth and mix in 200 litres water and use for spraying.

PRECAUTIONS

1. There should be enough moisture in the land at the time of application of jeevamrit

B. GHANJEEVAMRITA:

Uses: It is the source of millions of beneficial microorganisms. It can be used on rainfed areas for better crop growth.

MATERIAL REQUIRED FOR PREPARATION

Sr. No.	Material	Quantity
1.	Dung of <i>desi</i> cow	20 kg
2.	<i>Gur</i>	200 g
3.	Pulse flour	200 g
4.	Soil around the bark of big tree	5 g
5.	Cow urine	2 litres

METHOD OF PREPARATION

Method 1

1. Mix the above contents and knead them well.
2. Cover with jute bag for 4 days. Sprinkle water on it. In winters, keep it for 7-14 days.
3. Make *laddoos* of this mixture when it becomes thick and add cow urine if needed.
4. Dry in shade and store them. They are ready to use.

RATE OF APPLICATION

Keep the *laddoos* of ghanjeevamrita around the transplanted seedlings and cover with dry grass. They can also be placed near fruit plants where they will reach roots.

Method 2

MATERIAL REQUIRED FOR PREPARATION

Sr. No.	Material	Quantity
1.	Dung of <i>desi</i> cow	200 kg
2.	<i>Gur</i>	200 g
3.	Gram flour	200 g
4.	Soil under the big tree	50 g
5.	Urine of <i>desi</i> cow	2 litres

METHOD OF PREPARATION:

1. Dry 200 kg cow dung in sunlight.
2. Break the clods of dung into finer mixture and pass through sieve.
3. Add 200 g *gur* and 200 g gram flour.
4. Then add 50 g soil collected under big tree and 2 litres cow urine. Protect the mixture from sunlight and rainfall and cover with a jute bag.
5. Time of preparation is 4 days in summers and rainy season, 7-14 days in winter season,
12-14 days in severe winters.

6. Spread the mixture on tarpaulin sheet in thin layer and dry in sunlight.
7. Turn the mixture daily upside-down so that entire mixture receives sunlight.
8. Break it into fine mixture and store in a jute bag.

RATE OF APPLICATION

Mix 100 kg ghanjeevamrita with 100 kg cow dung per acre and add in soil at the time of sowing of any crop.

For fulfilling the food requirement of ever burgeoning population in a country like India and to assuage the hazardous effects of synthetic chemical fertilizers used in agriculture, a more sustainable, eco-friendly and cost effective farming is required which will take care of the ill effects of chemicalbased farming. The natural farming as promulgated by Shri Palekar is one such innovative farming which alleviates all these tribulations. This is a cheap to run method of farming which will preclude farmers from taking loans for raising their crops and consequently decline the number of resultant suicides associated with non-payment of loans. Natural farming fulfills the nutrient demand of crops through application of on-farm produced jeevamrit and ghanjeevamrit with locally available inputs. However, for bolstering this approach, multi-location studies are needed to scientifically corroborate the long-term impact and feasibility of the model before it can be scaled up and advocated throughout the country.