



Natural Farming: A Sustainable way to Agriculture

(*Mahiwal Singh Sisodiya)

ICAR-ATARI, Zone –II, Jodhpur (Raj.)

*Corresponding Author's email: mssjodhpur@outlook.com

Abstract

Natural farming can be thought of as a resource-based farming approach that conserves water, soil, and life. Additionally, this approach would use only 10% of the irrigation water typically used in farming. Therefore, agricultural practises that relied more heavily on biological inputs than on extensive use of chemical fertilisers and pesticides are being reevaluated by scientists and policy makers. Natural farming can provide high-quality food without harming the environment or the health of the soil, but it is uncertain if large-scale organic farming would be able to feed India's enormous population. The necessity, various inputs, and management techniques for natural farming are discussed in this chapter in order to meet the objectives of sustainable development.

Introduction

Modern organic farming is typically credited to the British Botanist Sir Albert Howard, and a different farming method was devised in the 1930s by the Japanese farmer and philosopher Masanobu Fukuoka. "Kyusei Nature Farming is a simple and effective method of growing quality food crops, without harming the environment," noted Mokichi Okada in 1993, a few decades ago. Low Budget Natural Farming (LBNF), also known as Low Budget Spiritual Farming (LBSF), is a recently popular agriculture practise among farmers as a result of the detrimental consequences of chemical farming. Southern India, particularly Karnataka, where it first developed, has seen significant success with it (Kumar, 2012). It is currently expanding so quickly and actively throughout India. The procedure calls for locally available natural, biodegradable materials that have been traditional agricultural methods based on naturally occurring biological processes combined with current technology and ecological science. Shri Subhash Palekar brought this idea to light, for which he was awarded the Padma Shri in 2016 (Anon, 2016). Heavy use of chemical fertilisers and pesticides, particularly those containing heavy metals as Cd, Cu, Mn, and Zn, can contaminate the soil profile and seep into the groundwater (Barabasz et al., 2002). Different microbial communities are present in the soil root zone, and these communities have positive effects on crop productivity. The soil microbial community declined as pesticide use persisted (Agoramorthy, 2008). Farmers' livelihoods suffer when they spend more money on inputs but do not receive satisfactory results because of the occurrence of pests and diseases, as well as/or unfavourable climatic conditions/poor soil qualities. Sustainable food and agricultural production cannot be produced using high input, resource-intensive traditional agriculture practises (Babu et al., 2020). As a result, the demand for affordable and environmentally friendly alternatives in agriculture is urgently needed to assure sustainability (Devarinti, 2016). The Natural Farming method is centred on the farmers rather than the production. It encourages sustainability, effective input usage, safe and wholesome food production, effective supply chains, and increased farmer revenue. It is an agro-ecological farming method that depends on farm

inputs and resources (Palekar, 2014). Its primary objectives are to alter social dynamics, empower farmers, add value locally, and support short value chains. When used singly or in combination, techniques like crop diversification, legume intercropping, mulching, seed priming, and increased water retention through less tillage, etc., are likely to increase crop yield and adaptability to changing climatic conditions (Khadse et al., 2019). substituting natural inputs for chemical inputs in some ecosystem may promote better and well distributed root system and the ability to interact with beneficial soil microorganisms; contributing to soil, crop and seed health, good product quality, better yield levels and yield stability (Andow and Hidaka, 1998).

The Natural Farming approach is farmers centric instead of production centric. It promotes sustainability, input use efficiency, healthy and safe foods, efficient supply chains and farmer's income. It is an agro-ecology based farming approach which relies on on-farm resources and inputs (Palekar, 2014). It focuses on changing social relations, empowering farmers, local value addition, and promoting short value chain. Methods like diversification of cropping, legume intercropping, mulching, seed priming and increased water retention through less tillage, etc. when used individually or in combination are likely to improve crop yield and adaptability under changing climatic conditions (Khadse et al., 2019). Replacing chemical inputs with natural inputs in certain ecosystem may promote better and well distributed root system and the ability to interact with beneficial soil microorganisms; contributing to soil, crop and seed health, good product quality, better yield levels and yield stability (Andow and Hidaka, 1998). Thus, natural farming in specific identified areas can help India to move towards achieving many SDGs by mitigating hunger, conserving natural resources and ensuring food and nutritional security in a sustainable manner (NITI Ayog, 2022). However, not many studies and information are available on this very important aspect of safe food production system which conserves and promotes all round sustainability of ecosystem and the well-being of humanity. In India, Natural farming is promoted as Bharatiya Prakritik Krishi Paddhati Programme (BPKP) under centrally sponsored scheme-Paramparagat Krishi Vikas Yojana (PKVY). BPKP is aimed at promoting traditional indigenous practices which reduces externally purchased inputs. The BPKP programme has been adopted in State of Andhra Pradesh, Karnataka, Himachal Pradesh, Gujarat, Uttar Pradesh and Kerala. Several studies have reported the effectiveness of natural farming- BPKP in terms of increase in production, sustainability, saving of water use, improvement in soil health and farmland ecosystem. NITI Aayog along with Ministry of Agriculture & Farmers welfare had convened several high level discussions with global experts on Natural farming practices. It is roughly estimated that around 2.5 million farmers in India are already practicing regenerative agriculture. (Anonymas.,2020). In the next 5 years, it is expected to reach 20 lakhs hectares- in any form of organic farming, including natural farming, of which 12 lakh hectares are under BPKP. (NITI Ayog, 2021)



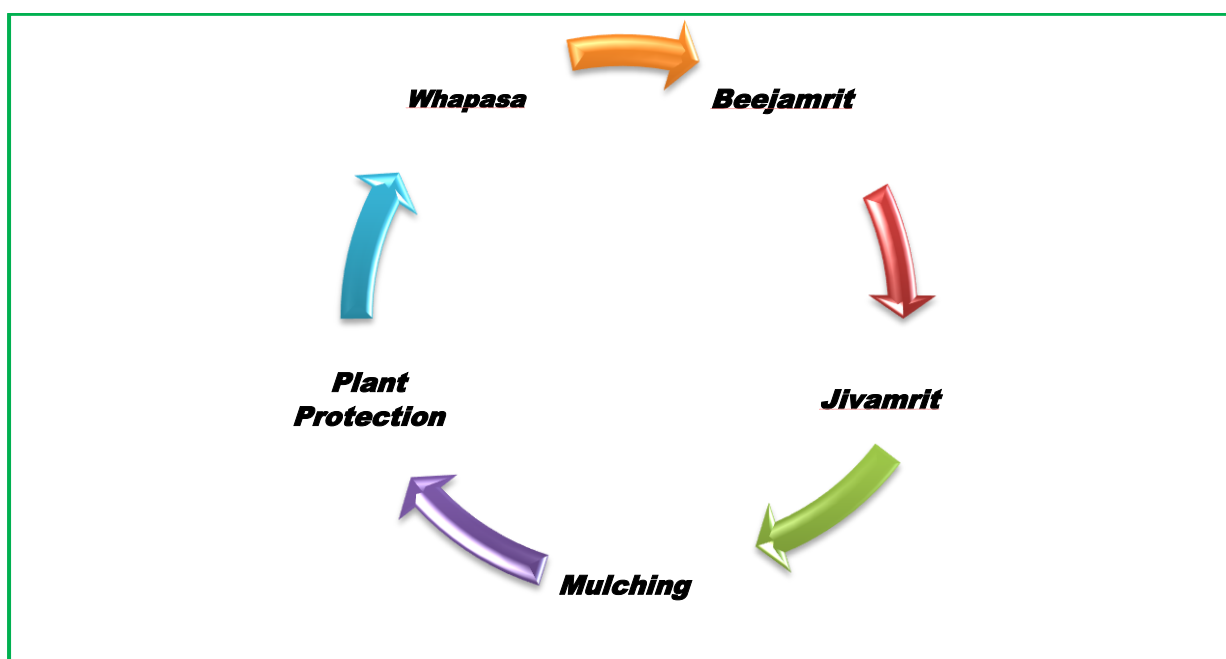
Source: Krishi Vigyan Kendras Pali-I, Ambala, Kurukshetra

Need of Natural Farming

- Agro-ecological practices like Natural Farming being a cost effective and ecologically compatible alternative would be an enabler for the nation in achieving the Sustainable Development Goals. By reducing the input costs, this can ensure better income and financial stability which would in turn help alleviate poverty, bring in gender equality and ensure sustainable production and consumption patterns.
- This method would ensure food security and zero hunger through better yield, diversity in cropping and access to a suite of nutritional sources and income generating crops throughout the year.
- The water conserving and ecological preservation aspects of Natural Farming contribute to availability and sustainable management of water, reduction of CO₂ emissions in various stages of agricultural value chain.
- The reduced use of chemical inputs in agriculture in turn would result in arrest of land degradation; reduce ocean acidification and marine pollution from land-based activities.
- Natural Farming farms have been found to be resilient to extreme weather conditions which have resulted out of the phenomena of climate change.
- Natural Farming by virtue of being free of chemical inputs would ensure good health of farmers and the produce by virtue of being green would ensure better health of its consumers and can potentially reduce the risk of various diseases in the community.
- Natural farming reduces dependency on purchased inputs and will help to ease smallholder farmers from credit burden. It has good scope for raising employment and rural development.

Apart from this the need for natural farming is increasing day by day due to some following reasons, India is the world's highest livestock owner with the sector having a growth rate of 4.6% per annum as per the 20th Livestock census. Further, emphasis on livestock sector which provides multiple livelihood benefits may be revived due to promotion of natural farming, thus reducing risks associated with farming. Such practice may also lead to saving of huge amount spent on fertilizer and electricity.

Components of Natural farming



Components of Natural Farming

1. Beejamrit

Beejamrit is an ancient, sustainable agriculture technique. It is used for seeds, seedlings or any planting material. It is effective in protecting young roots from fungus. Beejamrit is a fermented microbial solution, with loads of plant-beneficial microbes, and is applied as seed treatment. It is expected that the beneficial microbes would colonize the roots and leaves of the germinating seeds and help in the healthy growth of the plants.

Inputs needed: 5 kg cow dung, 5-liter cow urine, 50-gram lime, 1kg bund soil, 20-liter water (for 100 kg seed).

Preparation of Beejamrit:

Step 1: Take 5 kg cow dung in a cloth and bind it using tape. Hang the cloth in 20 litre water for up to 12 hours.

Step 2: Simultaneously, take one-liter water and add 50-gram lime in it, keep stable for overnight.

Step 3: Next morning, continuously squeeze the bundle in the water thrice, so that all the essence of cow dung is mixed in the water.

Step 4: Add handful of soil, approximately 1 kg in the water solution and stir well.

Step 5: Add 5-liter desi cow urine in the solution and limewater, and stir it well.

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

Jivamrit acts as a bio-stimulant by promoting the activity of microorganisms in the soil and also the activity of phyllospheric microorganisms when sprayed on foliage. It acts like a primer for microbial activity, and also increases the population of native earthworms.

- **Inputs needed:** 10 kg of fresh cow dung, 5-10-liter cow urine, 50-gram lime, 2 kg jaggery, 2 kg pulses' flour 1 kg uncontaminated soil and 200 liters' water
- **Preparation of Jivamrit:** The materials should be mixed in 200-liter water and stirred well. The mixture should then be allowed to ferment for 48 hours in shade. It should be stirred by a wooden stick twice, once in the morning and once in the evening. This process is to be continued for 5-7 days. The ready solution should be applied on the crops
- **Application of Jivamrit:** This mixture should be applied every fortnight. It should be either sprayed directly on the crops or mixed with irrigation water. In the case of fruit plants, it should be applied on individual plants. The mixture can be stored for up to 15 days.

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.

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. The process involves activating earthworms in soil in order to create water vapor conditions.

Following preparations are being used in plant protection

1. 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.
- **Application:** The prepared kashayam of 6-8 litres should be diluted in 200 liters of water for spraying.

Neemastra Application

Neem leaves – 3 kg	Mango leaves (<i>Mangifera indica</i>) – 2 kg.
Leaves of <i>Pongamia pinnata</i> – 2 kg	Leaves of <i>Lantana camara</i> – 2 kg.
Leaves of <i>Annona squamosa</i> - 2 kg	Leaves of <i>Casia tora</i> – 2 kg.
Castor leaves (<i>Ricinus communis</i>) – 2 kg.	Leaves of Guava (<i>Psidium guava</i>) – 2 kg.
Datura leaves (<i>Datura metel</i>)- 2 kg,	Leaves of Pomegranate (<i>Punica granatum</i>) – 2 kg.
Leaves of <i>Calatropis procera</i> – 2 kg.	Leaves of Drumstick (<i>Moringa oleifera</i>) – 2 kg.
Leaves of <i>Vitex negundo</i> – 2 kg	Leaves of Coffee (<i>Coffea arabica</i>) – 2 kg.
Leaves of <i>Datura stramonium</i> – 2 kg.	Leaves of Mahua (<i>Maduca indica</i>) – 2 kg.
Leaves of <i>Nerium indica</i> – 2 kg	Coco leaves (<i>Theobroma cacao</i>) – 2 kg
Leaves of <i>Hibiscus rosa</i> – 2 kg	Leaves of <i>Acacia nilotica</i> – 2 kg.
	Leaves of <i>Psoralea corylifolia</i> – 2 kg.
	Leaves of Bitter Gourd (<i>Momordica charantia</i>)- 2 kg.

Source - NITI, Aayog, Natural Farming

2. 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-liter 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 liter 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 liter of Brahmastra diluted in 200 liter 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 liters of water +3 liters of Brahmastra
- 15 liters of water +500 ml of Brahmastra
- 10 liters of water + 300 ml of Brahmastra

3. 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-liter cow urine to a container. Then add 2 kg neem leaves paste, 500-gram tobacco powder, 500 grams' 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 up to 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 liters of agniastra should be taken and diluted in 200 liters of water for spraying. The following ratio are to be followed based on the severity of pest attack.

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

4. Dashparn Ark

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 ginger paste, Any 10 leaves.

Preparation of Dashparni:

- **Step 1:** Take 200 liters of water in a drum, add 20 liters 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.

5. Fungicide

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

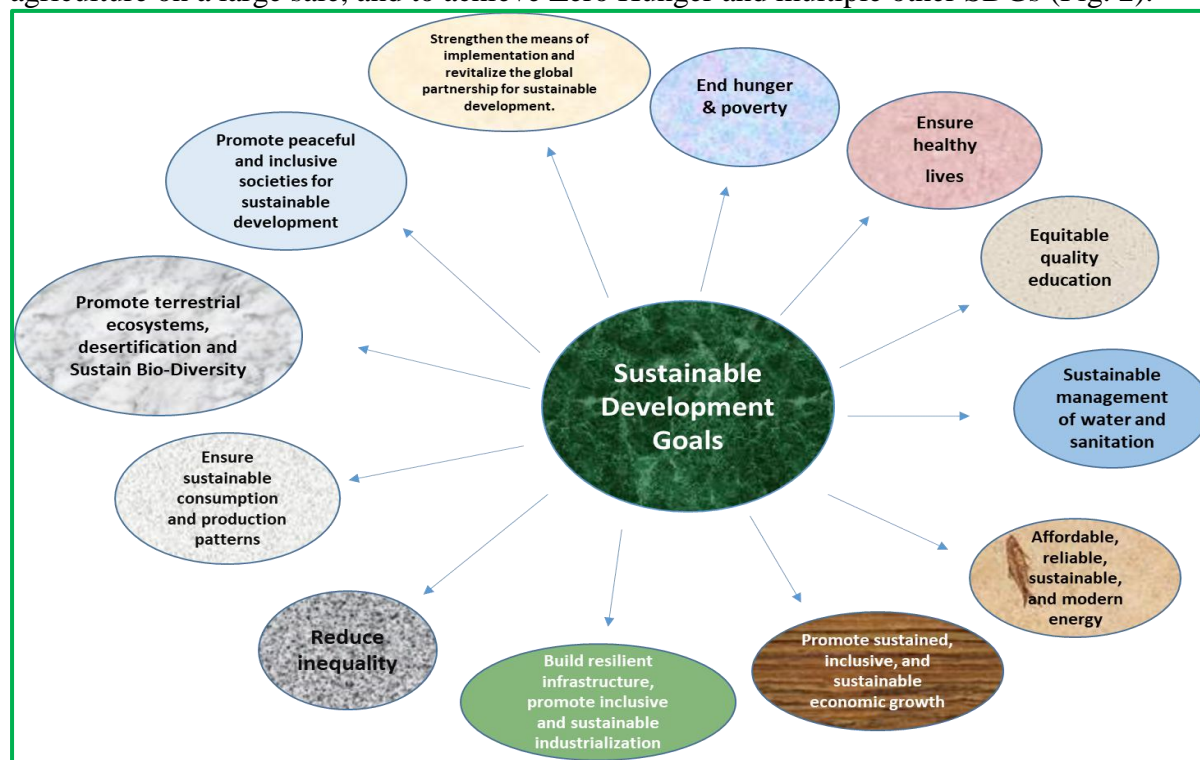
- **Preparation:** Take 3-liter milk and prepare curd from it. Remove the creamy layer and leave for 3 to 5 days till the formation of a grey layer of fungus. Churn it well, mix it with water and spray on infected crops after filtering.
- **Termite control:** - Crush 3.5 kg karaj leaves and 3 kg neem leaves well and boil it after mixing it in 10 liters of water. Remove when half the water remains. When it cools down, filter it and keep it in a box. Mix 1 liter of castor oil / castor oil (benjavat vapas) and 10 grams of surf powder well in it. This medicine can be used for 6 months.

Usage Method: Per 1 L Spray by mixing 10 ml in water. For complete control, apply a second spray in 10 to 12 days.

Natural Farming for Sustainable Development Goals

- Natural farming practices Socio-economic, environment- friendly farming will support in achieving the UN- Sustainable Development Goals by 2030.
- Agro-ecology is considered a guiding path for sustainable food and agriculture.
- It has entered the discourse of international and UN institutions and is recognized worldwide as an alternative approach to reduce massive deforestation, water scarcity, biodiversity loss, soil depletion and high levels of greenhouse gas emissions.
- The Food and Agriculture Organization defines agro-ecology as an integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of food and agricultural systems.
- It seeks to optimize the interactions between plants, animals, humans and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system.

FAO has also highlighted the following 10 elements of Agro-ecology for guiding countries to transform their food and agricultural systems, to mainstream sustainable agriculture on a large scale, and to achieve Zero Hunger and multiple other SDGs (Fig. 2).



Sustainable Development Goals

Future Prospects and Conclusion

Natural Farming practices to be first initiated in traditional crops especially pulses followed by oilseed, vegetable crops, cereals, fruit crops, etc. Natural farming's input production center to be established/promoted at village level. Women to be empowered in Natural farming and input production thereof. Skill development for production of Natural farming's inputs among the stakeholders. Natural farming production groups and input production group to be promoted. FPO of Natural Farming producers to be promoted. Marketing hubs of natural farming products to be identified & promoted. Branding of product of Natural farming need to be promoted. Standards for Certification of Natural Farming need to be formulated. Identification of potential districts, locations and products. Capacity building of stakeholders for production, processing and marketing. Credit and marketing support to producers and marketing agencies. Packaging, branding, and marketing strategies. Promotion of natural product-based FPOs/ FPCs. Development of infrastructures for transportation, storage, processing, and marketing and certification as natural farming products should be done. A full-fledged Research Centre and Departments in various agricultural organizations on Natural Farming need to be established.

References

1. Agoramoorthy, G. (2008). Can India meet the increasing food demand by 2020? *Futures*, 40, 503-506.
2. Andow, D.A. and Hidaka, K. (1998). Yield loss in conventional and natural rice farming systems. *Agriculture Ecosystem and Environment*, 74, 137-155.
3. Barabasz, W., Albińska, D., Jaśkowska, M. and Lipiec, J. (2002). Biological Effects of Mineral Nitrogen Fertilization on Soil Microorganisms. *Polish Journal of Environmental Studies*, 11, 193-198.
4. Devarinti, S.R. (2016). Natural Farming: Eco-Friendly and Sustainable? *Agro Technology 5(2)*, 1-3. *GEF, 2019*. Report of the Global Environment Facility to the Fourteenth Session of the Conference of the Parties to the United Nations Convention to Combat Desertification.
5. DAC. (2008). Guidelines on The National Project on Management of Soil Health and Fertility, Department of Agriculture & Cooperation, Ministry of Agriculture and Farmers welfare.
6. FAO. (2010). Elements of ecology. <https://www.fao.org/3/i9037en/i9037en.pdf>
7. Gupta, N., Tripathi, S. and Dholakia, H.H. (2020). Can Zero Budget Natural Farming Save Input Costs and Fertiliser Subsidies Evidence from Andhra Pradesh. New Delhi: Council on Energy, Environment and Water.
8. Khadse, A. and Rosset, P. M. (2019). Zero budget natural farming in India-from inception to institutionalization. *Agroecology and Sustainable Food Systems*, 43, 848-871.
9. MoA& FW, 2019. Annual Report 2019-20. Department of Agriculture, Cooperation & Farmers' Welfare Ministry of Agriculture & Farmers' Welfare Government of India KrishiBhawan, New Delhi-110 001
10. NITI Aayog. (2021) <https://naturalfarming.niti.gov.in/bharatiya-prakritik-krishi-paddhati-bpkp/>