

NATURAL FARMING AND VERMICOMPOSTING TECHNOLOGY

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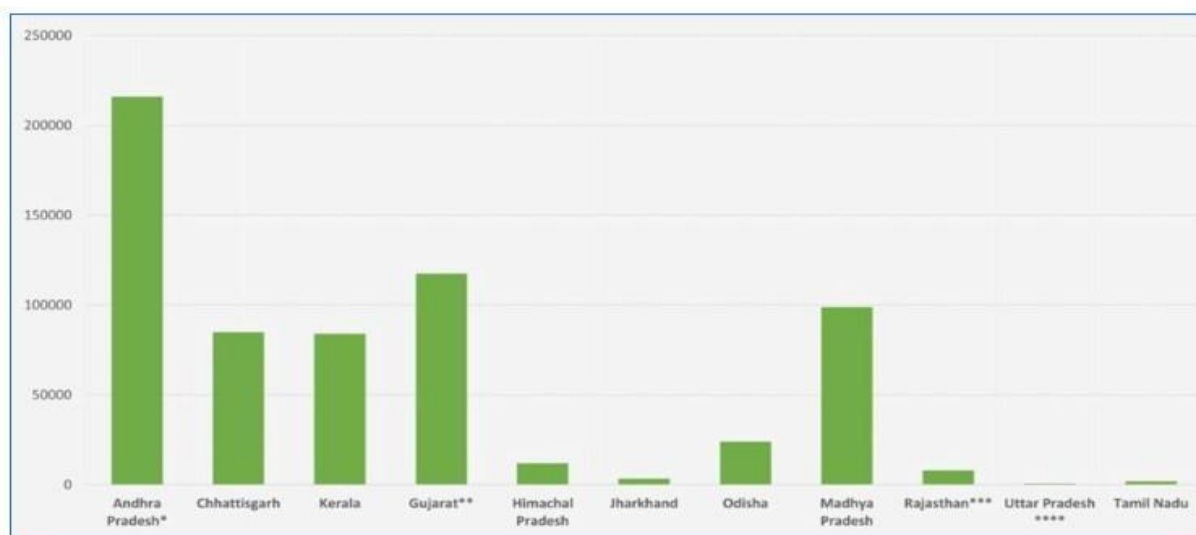
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NATURAL FARMING

Natural farming (NF) by our ancestors in older days served us harmless food products without disturbing the soil fertility and sustainability of nature.

Natural Farming is a chemical-free farming system rooted in Indian tradition enriched with modern understanding of ecology, resource recycling and on-farm resource optimization. It is considered as agro-ecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity. It is largely based on on-farm biomass recycling with major stress on biomass mulching, use of on-farm cow dung-urine formulations; maintaining soil aeration and exclusion of all synthetic chemical inputs. Natural farming is expected to reduce dependency on purchased inputs. It is considered as a cost- effective farming practice with scope for increasing employment and rural development. Many states are already following natural farming and have developed successful models. State of Andhra Pradesh, Karnataka, Himachal Pradesh, Gujarat, Uttar Pradesh, and Kerala are among the leading states. Currently, the acceptance and adoption of natural farming systems are at early stages and gradually gaining acceptance among the farming community.



Natural farming aims at restoring soil health, maintenance of diversity, ensure animal welfare, stress on efficient use of natural/local resources and promote ecological fairness. Natural farming is an ecological farming approach where farming system works with the natural biodiversity, encouraging the soil's biological activity and managing the complexity of living organisms both plant and animal to thrive along with food production system. Important practices, essential for adoption of natural farming includes:

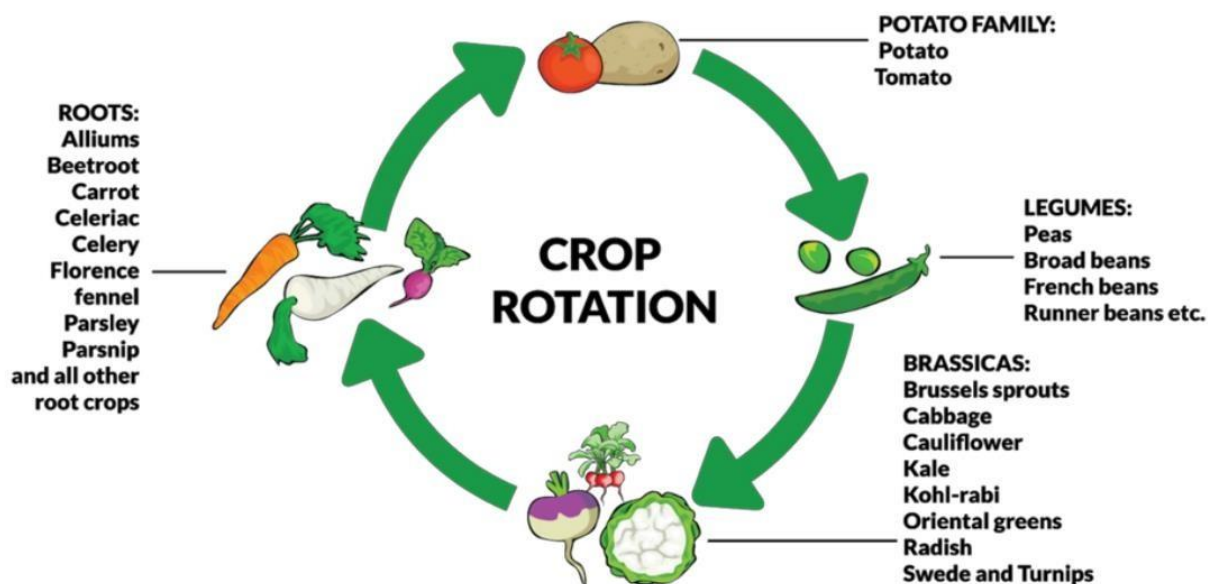
- ❖ No external inputs
- ❖ Local seeds (use of local varieties)
- ❖ On-farm produced microbial formulation for seed treatment (such as bijamrita)
- ❖ On-farm made microbial inoculants (Jivamrita) for soil enrichment
- ❖ Cover crops and mulching with green and dry organic matter for nutrient recycling and for creating a suitable micro-climate for maximum beneficial microbial activity in soil
- ❖ Mixed cropping
- ❖ Managing diversity on farm through integration of trees

- ❖ Management of pests through diversity and local on-farm made botanical concoctions (such as neemastra, agniastra, neem ark, dashparni ark etc)
- ❖ Integration of livestock, especially of native breed for cow dung and cow urine as essential inputs for several practices and
- ❖ Water and moisture conservation.



Natural Farming can be achieved through following specific principles:

- Adoption of diversified cropping system-based agriculture
- Recycling of naturally available nutrients in fields
- Recycling of on-farm generated biomass
- Use of locally developed and refined practices based on plant, animal and microbial source as raw materials
- Innovative practices continuously evolve on the field of farmers based on the cropping pattern, local climatic conditions, altitude, soil quality, severity and variability of insects and pests etc.



The improved yield, ensured better soil health, environment Conservation, Increased Farmers' Income and Employment Generation are the major benefits of Natural farming.

NATIONAL MISSION ON NATURAL FARMING

On 25th Nov, 2024, the Union Cabinet on Monday has approved the launch of the National Mission on Natural Farming (NMNF) as a standalone centrally sponsored scheme under the Ministry of Agriculture & Farmers' Welfare. The initiative aims to promote sustainable agricultural practices and reduce dependency on chemical inputs in farming. Union Minister Ashwini Vaishnaw announced the scheme's details, highlighting a total financial outlay of Rs 2,481 crore. Of this, the Government of India will contribute Rs 1,584 crore, while the remaining Rs 897 crore will be borne by the states. The funding will extend up to the 15th Finance Commission period, ending in 2025-26.

Natural farming follows local agro-ecological principles rooted in local knowledge, location specific technologies and is evolved as per the local agro-ecology. Rooted in the traditional knowledge inherited from their forefathers, farmers will practice the natural farming as a chemical free farming which involves local livestock integrated natural farming methods, diversified crop systems.



The mission aims at promoting natural farming practices for providing safe & nutritious food for all. It is designed to support farmers to reduce input cost of cultivation and dependency to externally purchased inputs. Natural farming will build & maintain healthy soil ecosystems, promote biodiversity and encourage diverse cropping systems to enhance resilience as suitable to the local agro-ecology are the benefits of natural farming.

The National Mission on Natural Farming is launched as a shift to scientifically revive and strengthen agriculture practices towards sustainability, climate resilience and healthy food for farmer families and consumers.

In the next two years, the mission will be implemented in 15,000 clusters in gram panchayats, which are willing, & reach 1 crore farmers and initiate natural farming in 7.5 lakh Ha area. Preference will be given to areas having prevalence of practicing NF farmers, SRLM or PACS or FPOs, etc. "Further, need-based 10,000 bio-input resource centres will be set-up to provide easy availability and accessibility to ready-to-use natural farming inputs for farmers.

Under NMNF, around 2,000 NF Model Demonstration Farms shall be established at Krishi Vigyan Kendras or KVKs, Agricultural Universities or AUs and farmers' fields, and shall be supported by experienced and trained Farmer Master Trainers. The willing farmers will be trained in Model Demonstration Farms on the NF package of practices, preparation of NF inputs, etc. near their villages in KVKs, AUs and practicing NF farmers' fields. 18.75 lakh trained willing farmers will prepare inputs like Jeevamrit, Beejamrit, etc. by using their livestock or procure from BRCs. 30,000 Krishi Sakhis/ CRPs will be deployed for awareness generation, mobilization and handholding of willing farmers in the clusters.

Natural farming practices will help farmers to reduce input cost of cultivation and dependency on externally purchased inputs while rejuvenating soil health, fertility & quality and building resilience to climate risks like waterlogging, flood, drought, etc.

These practices also reduce health risks from exposure to fertilisers, pesticides, etc. and provide healthy & nutritious food for the farmers' family. Further, through natural farming, a

healthy mother earth is bequeathed to the future generations. Through improvement of soil carbon content & water use efficiency, there is an increase in soil microorganisms and biodiversity in natural farming.

Farmers will be provided with an easy simple certification system and dedicated common branding to provide access to market their natural farming produce. Real time geo-tagged & referenced monitoring of NMNF implementation shall be done through an online portal (<https://naturalfarming.dac.gov.in/NaturalFarming>). Convergence with existing schemes and support structures of government of India or state governments or national & international organizations shall be explored for enhancing local livestock population, development of NF model demonstration farms at Central cattle breeding farms or regional fodder stations, provide market linkages at district or block or GP levels through convergence for local farmers' markets, APMC mandis, haats, depots, etc. Additionally, students will be engaged in NMNF through the RAWE program and dedicated Undergraduate, Postgraduate & Diploma courses on NF.





In due course of time, pressure on our farming community to grow more food for the nation compelled us to go for increased intensive farming with improved agricultural techniques through green revolution, which were attributed to use of high yielding varieties, more use of inputs like fertilizers, pesticides, insecticides etc.

Thus chemicalization of agriculture has resulted in the deterioration of soil health, accumulation of chemical residues in food and reduction in bio diversity putting sustainability of conventional farming in question. Standing on this ground, a necessity emerged for identifying organic farming as a holistic and potential alternative of conventional agriculture.

Basic principle of organic farming and natural farming is to enhance organic matter content of the soil, which has a profound impact on soil quality by enhancing soil structure & fertility along with increasing water infiltration and storage. Practical organic farming relies on preparing the inputs by the farmers themselves and one important component of it is Vermin Compost.

VERMI COMPOSTING

Vermi Composting is defined as the practice of using concentration of earth worms to convert any bio degradable organic matter into usable compost or worm castings.

VERMI COMPOST

Vermi Compost (also known as Worm Compost, Vermi cast, worm casting, worm humus or worm manure) is a stable fine granular nutrient rich organic end product of the breakdown of organic matters by some species of earth worm during the process of Vermi Composting.

VERMI WASH

The dark brown waste liquid that drains out into the bottom of some Vermi Composting systems, as water rich food breaks down, is known as Vermi wash. It acts as an excellent liquid fertilizer for the crops.

Earth worms (Commonly known as “Farmer’s friend” or “Digestive Canal of soil”) are nature’s clean-up crew, aiding in the production of humus rich top soil from plant residues and animal materials.



They have important functions by virtue of their general behavioral activities like burrowing, feeding, digesting, excreting with decomposing by micro organisms and supporting further decomposition of bio degradable matters. Because of their upward & downward movement, they promote soil aeration, drainage facility during rainy season. It also helps to increase the moisture holding capacity of the soil and decrease soil erosion.

Advantages of Vermicompost:

1. Rich in all essential plant nutrients.
2. Provides excellent effect on overall plant growth, encourages faster growth of new shoots/leaves, improves quality and shelf life of the produce and increases crop yield.
3. Produces crop with a better taste, luster and lasting quality, without toxic residues for better market price.
4. Improves soil texture, structure, aeration and increases water holding capacity and decreases soil erosion.
5. Rich in beneficial micro flora such as N- fixers, P-solubilizers, Cellulose decomposing micro flora etc.
6. Enrich soil in biotic activity, adds plant hormones like auxins, Cytokinin, Gibberellic Acid and enzymes like phosphatase and cellulase.
7. Contains earthworm cocoons and increases population and activity of earthworm in soil.
8. Prevents nutrient losses and increases chemical fertilizer use efficiency.
9. Induces resistance against pests & diseases.
10. Corrects micro nutrient deficiencies.
11. Controls growth of nematodes.
12. Reduce soil salinity & acidity.
13. Easy to produce and low in cost.

COMPARISON	
Chemical Fertilizer	Vermicompost
1. Expensive	1. Very cheap
2. Continuous use reduces soil fertility	2. Increases soil fertility
3. Chemicals pollute environment	3. Environment friendly.
4. More water required for irrigation	4. Water requirement is less.
5. Use of pesticides required.	5. Induce resistance to pests & disease.
6. Taste difference noticed.	6. Natural taste preserved.

CHEMICAL COMPOSITION OF VERMI COMPOST	
❖ pH-6.5 to 7.5	❖ Nitrogen-1.8 to 2.5 %
❖ Phosphorous-1.3 to 1.9 %	❖ Potash-1.28 to 1.50%
❖ Organic Carbon-20.48 to 30.31%	❖ Carbon to Nitrogen-14 to 15%
❖ Calcium-3 to 4%	❖ Magnesium-0.4 to 0.7 %
❖ Sodium-0.02 to 0.3%	❖ Sulphur-Trace up to 0.04%
❖ Iron-0.3 to 0.7%	❖ Zinc-0.02 to 0.036 %
❖ Manganese-Trace to 0.04%	❖ Copper-0.0027 to 0.0123%
❖ Boron-0.0034 to 0.0075%	❖ Aluminium-Traces to 0.071%

VERMI COMPOSTING AND VERMI TECHNOLOGY

Suitable environment: Earth worms prefer warm, humid and shady places. They work in dark areas and reacts negatively to open sunlight. Worms used for composting, work better in 15 to 30°C. Temperature should not drop below freezing or rise above 32°C. pH of the organic materials should be between 7 to 8.5 and a moisture content of 40 to 60% is suitable for enhancing earthworm multiplication and quality Vermi Compost production.



Sources of Organic wastes & their processing for Vermi Composting:

All sorts of bio degradable and decomposable organic residues which are half decomposed should be used as feeding materials during Vermi Composting. If half decomposed materials are used, the earth worms can quickly take them as their feed and start converting them to Vermi compost.

Commonly used composting materials are:

- a. Agri. Wastes & residues (all items discarded after harvesting & threshing, stem, leaves, husks, Vegetable wastes)
- b. Cattle manure,
- c. Forestry Wastes,
- d. Sericulture residues from silk production,
- e. Dairy & poultry Wastes,
- f. Municipal Solid Wastes,
- g. Bio gas slurry,
- h. Bagasse from sugarcane factory,
- i. Waste paper and Cotton cloth,
- j. Kitchen Wastes etc.

Worms to be used for Vermi Composting

Diversity in earth worm species varies with different types of soils and hence choice for local native species is important. Suitable earth worm species have been identified based on their ability to tolerate wide range of environmental conditions and fluctuations, handling and disruption to the worm bed, and their growth & breeding rate.

Species with short re-generation time, i.e. a relatively short life span and rapid growth and reproductive rate are ideal and effective, as high concentration of juvenile worms are present in their population. Juvenile worms like human teenager are voracious consumer, keeping the processing rate of the system high, thus ensuring an ongoing succession of young worms.

Epigeic phytophagous earthworms which are non-burrowing in nature and dwell in upper layer of soil are found to be most suitable for commercial Vermi Composting.



PROCESS OF VERMICOMPOST PREPARATION:

LOW COST VERMI COMPOST UNIT:

HEAP (BED) METHOD

It is suitable for both commercial and small farm unit. Abandoned cattle shed, poultry shed or any other low cost thatched shed which can protect worms from sun and rain is sufficient.

Size of the shed varies depending upon the availability of raw materials and production requirement. Length of the bed may vary as desired but the width should not be more than 1 m. and needs to be protected from rain, sunlight and predators like birds, rodents, ants etc.

PRODUCTION PROCESS:

PRE TREATMENT OF COMPOSTING MATERIALS:

- Avoid fresh cow dung, green leaves, or any part of living plant which is hard. Also the non-biodegradable materials such as polythene bags, plastics etc. are to be avoided.
- Use partly decaying or partly digested organic matter as substrate for worms.
- Add cattle dung up- to 50% to provide bacterial inoculation for enhancing decomposition.
- Spread in alternate layers of cow dung and leaf-litter or any organic waste.
- Partial decomposition in open area, in a peat or heap is strongly recommended.
- Periodic watering quickens partial decomposition.
- 4-5 weeks required for partial decomposition.

FORMATION OF BED:

- Spread Course sand at the base upon soil surface, which helps to absorb soil moisture and protects the worms from escaping.
- Spread 10 cm thick layer of decomposable organic matter such as grasses, coconut fiber, sugarcane waste etc. as bedding materials.
- Spread partially decomposed cow dung and organic waste or dry bio-gas slurry on top of the bedding layer in an inverted 'U' shape till a height of 0.75 m.
- Water regularly to keep it moist all the time.

INOCULATION AND MAINTENANCE OF BED:

- Inoculate the worms in the compost bed when it is properly cooled.
- Release worms on top of the bed @ 1000 per sq.mt. of bed space by spreading on top of the bed.
- Sprinkle water regularly to keep the surface of the bed moist but not soggy. Excess water flooding will be harmful.
- Cover the heap with a moist gunny cloth on top of the bed and protect it from sunlight.
- Maintain favourable moisture (40-50%) and cool condition (25-40°C).

HARVESTING OF COMPOST, PACKING AND STORAGE:

- ❖ Initially the first lot or cycle of Compost processing may take 75-90 days. Subsequent cycles may take only 60-70 days depending on the increased density of earthworms.
- ❖ Stop Watering the Vermi bed 2-3 days before harvesting.
- ❖ The finished compost is heaped in conical shaped piles on the surface of the bed (preferably under bright lights inside) which allows the earthworms to burrow into the bottom of the bed.
- ❖ Collect the finished Compost from the top portion of the pile in stages using hand or spade in the following ways-
 - Make conical piles of the prepared compost and leave over night.
 - The worms will burrow down.
 - Remove the top portion of the piled compost next day.
 - Again make conical piles of the left over compost and let the worms burrow down again.
 - Remove another layer of the compost.
 - Repeat the process till 75% of the compost has been removed.
 - Sieve the removed compost and pack it in air tight container to protect from further drying and loss of nutrients.
 - Store the packed Vermi Compost in a cool place for further use.