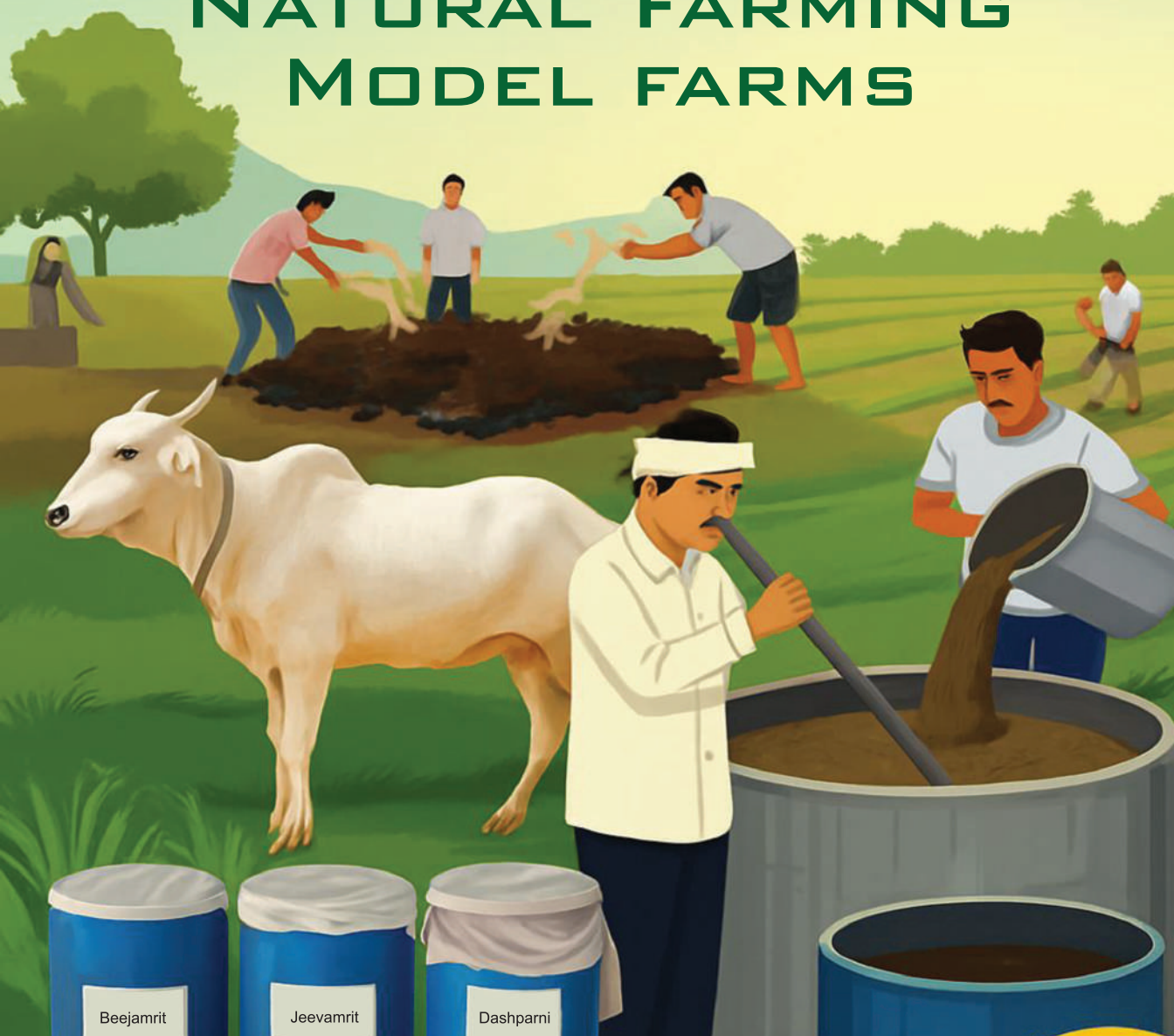




FIELD MANUAL FOR NATURAL FARMING MODEL FARMS



National Mission on Natural Farming (NMNF)
ICAR-Indian Institute of Farming Systems Research, Modipuram
Indian Council of Agricultural Research (ICAR)

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Dr M. L. Jat
SECRETARY (DARE) & DIRECTOR GENERAL (ICAR)

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भारतीय कृषि अनुसंधान परिषद
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Foreword

Agriculture today stands at a crossroads. Increasing climatic variability, declining soil fertility, and the escalating cost of inputs demand approaches that are both productive and sustainable. Natural farming — grounded in ecological principles and enriched with scientific validation — offers one such path. It is not simply a set of alternative practices, but a systems-based approach that harmonises crop productivity with environmental stewardship and long-term resilience.

By bridging traditional ecological knowledge with modern technical understanding, the manual not only seeks to improve productivity and farm profitability but also to enhance nutritional security and ecological balance. This compendium has been developed as a practical and authoritative reference for practitioners, extension personnel, researchers as well as farmers who will find structured methodologies, measurement protocols, and science-based frameworks to design, assess, and refine interventions. This work also recognises that farming is a dynamic process. The protocols herein are designed for iterative application: observe, measure, adapt, and improve.

Natural farming is neither a nostalgic return to the past nor an untested experiment; it is an evolving, evidence-led practice with the potential to regenerate soils, conserve biodiversity, and enhance rural livelihoods. As you navigate its pages, you are invited to see this not merely as a manual, but as a field companion — a living guide that grows with your experience and the changing needs of your land.

It is my sincere hope that this manual will empower to make informed decisions, strengthen local farming systems, and contribute to a resilient agricultural future that is as productive as it is sustainable.

Dated the 21st August, 2025
New Delhi

(M.L. Jat)
Secretary (DARE) & DG (ICAR)

Preface

Natural farming is more than a cultivation practice—it is a way of working in harmony with nature to restore soil vitality, enhance crop resilience, and ensure safe, nutritious food for all. Rooted in traditional wisdom and strengthened by scientific validation, natural farming reduces dependence on synthetic inputs and fosters a self-sustaining farm ecosystem.

This field manual has been prepared to serve as a practical guide for farmers, extension workers, and agricultural practitioners who wish to adopt and promote natural farming methods. It brings together step-by-step instructions, time-tested formulations, crop-specific recommendations, and integrated pest and nutrient management practices suitable for diverse agro-climatic zones. The manual emphasizes four core principles: *Soil health regeneration* through organic amendments and microbial enrichment; *Biodiversity enhancement* via mixed cropping, trap crops, and beneficial plant associations; *Minimal external inputs* by harnessing locally available resources; and *Farmer empowerment* through knowledge sharing, cost reduction, and increased farm profitability.

By following the methods outlined here, practitioners can gradually shift towards a farming system that nurtures the land, conserves natural resources, and improves the livelihoods of rural communities. The instructions are designed to be simple, field-tested, and adaptable, ensuring that even smallholder farmers with limited resources can be benefitted.

We hope this manual not only provides technical clarity but also inspires a deeper commitment to protecting our natural heritage. As the challenges of climate change, soil degradation, and rising input costs continue to impact agriculture, the natural farming offers a pathway towards resilience and sustainability.

(Authors)

Acknowledgement

The authors sincerely acknowledge the vision, guidance, and encouragement provided by Dr. M. L. Jat, Secretary (DARE) & Director General, ICAR, whose leadership has been instrumental in strengthening natural farming initiatives across the country. We express our deep gratitude to Dr. A. K. Nayak, Deputy Director General (NRM), ICAR, for his constant support, technical guidance, and strategic direction in implementing the National Mission on Natural Farming (NMNF) Model Farms and research activities under the NRM Division.

We also thank Dr. A. Velmurugan, Assistant Director General (SWM & AAFCC), ICAR, for his technical inputs and facilitation of collaborative efforts to enhance the scope and impact of natural farming practices. Our sincere appreciation goes to the Department of Agriculture & Farmers' Welfare (DA&FW), Government of India, for sponsoring the NMNF–Model Farms and Research projects to the NRM Division of ICAR, which has enabled the development and field validation of scientific protocols for natural farming.

We gratefully acknowledge the contributions of researchers, field staff, and participating farmers for their invaluable efforts in implementing, documenting, and refining the practices presented in this Field Manual. Their dedication and hard work form the backbone of this initiative, aimed at promoting sustainable and eco-friendly agricultural systems for the benefit of present and future generations.

Authors

CONTENTS

S. No.	PARTICULARS	PAGE NO.
	Foreword	iii
	Preface	v
	Acknowledgement	vii
	Introduction	1
1	Selection of Crops and Varieties	5
2	Tillage and Sowing	7
3	Summer/Fallow Cropping	8
4	Poly/Inter Cropping	11
5	Natural Formulations	13
6	Mulching (Acchadana)	20
7	Whapasa (Soil Aeration)	23
8	Weeding	24
9	Botanical Concoctions - Insect Management	25
10	Botanical Concoctions - Disease Management	31
11	Harvesting	34
	References	35
Annexure-I	Minimum Data Sets (MDS): Natural Farming	36
Annexure-II	Model Farms Natural Farming Model Farms Map (Agro Climatic Zone Wise)	40
Annexure-III	Natural Farming Model Farms Map (Agro Ecological Zone Wise)	41
Annexure-IV	Natural Farming Model Farms Map (Agro Ecological Sub Region Wise)	42
Annexure-V	Name of AU/Research Station identified by States for NF Model Farms	43

INTRODUCTION

The National Mission on Natural Farming (NMNF), launched as a standalone Centrally Sponsored Scheme under the Department of Agriculture & Farmers Welfare (DA&FW), Ministry of Agriculture & Farmers Welfare, represents a significant shift towards sustainable, climate-resilient, and safe food production systems in India. With a total outlay of ₹2,481 crore (₹1,584 crore as Government of India share and ₹897 crore as State share), NMNF aims to promote nature-based farming practices that reduce dependency on externally purchased inputs, encourage on-farm bio-input production, restore soil health, and strengthen ecological balance.

Natural Farming (NF) is not a new concept to Indian agriculture; it builds upon centuries-old indigenous knowledge, revalidated and enhanced through modern scientific research. The approach emphasizes the use of on-farm prepared bio-formulations such as Beejamrit, Jeevamrit, Ghanajeevamrit, Neemastra, Brahmastra, Agniastra, and Dashparni ark, enabling farmers to achieve chemical-free, nutritionally rich, and ecologically sustainable crop production.

Purpose of the Field Manual

This Field Manual is designed to serve as a practical guide for the establishment, management, and monitoring of Natural Farming Model Farms under NMNF. It consolidates, standardized input preparation protocols, field-tested packages of practices (PoPs) for various cropping systems and observations, ensuring that these farms act as centres of research data collection, demonstration, capacity building, and farmer-to-farmer knowledge dissemination. Model Farms are pivotal in:

- Showcasing location-specific NF practices adapted to local agro-climatic conditions.
- Demonstrating integrated crop-livestock systems with emphasis on indigenous cattle breeds.
- Serving as training hubs for Community Resource Persons (CRPs), farmers, and extension personnel.
- Acting as data collection sites for Monitoring, Verification, and Reporting (MVR) under NMNF.

Scientific Foundation and ICAR's Role

The Indian Council of Agricultural Research (ICAR), through its Natural Resource Management (NRM), Agricultural Extension, and Agricultural Education divisions, has been spearheading NF research, education and extension from 2020 under various programmes including the All-India Network Programme on Natural Farming. Multi-location experiments in 20 locations across 16 States have enabled the characterization of NF inputs, development of PoPs for major cropping systems, and formulation of generic NF protocols for adoption across the country. The outcomes include:

- Development and publication of a Technical Manual on Natural Farming in collaboration with the Integrated Nutrient Management (INM) Division, DA&FW.
- Standardization of bio-input characteristics to support the establishment of 10,000 bio-input centres

under NMNF.

- Formulation of guidelines for institutional and farmer field model farms.
- Launch of a dedicated NMNF Research Portal for Competitive Research Grants (CRGs) and model farm tracking.

Scope of Model Farms under NMNF

Under the NMNF framework:

- 400 NF Model Farms are proposed in 25 States (100 at ICAR/State Agricultural University farms and 300 at farmers' fields) with a budget of ₹555.50 lakhs.
- 530 Krishi Vigyan Kendras (KVKs) will establish institutional and farmer field model farms, organize training programs, and facilitate farmer engagement.

Relevance of the Manual

This Field Manual is a ready reference for:

- Researchers – to align field trials with standardized NF protocols.
- Extension Workers & KVK Staff – to demonstrate, train, and monitor NF practices effectively.
- Farmers – to adopt low-cost, sustainable methods ensuring profitability and environmental stewardship.
- Policy Implementers – to monitor outcomes and scale up NF adoption in targeted zones.

The Manual aligns with NITI Aayog's vision of expanding natural farming to 20% of India's cultivated area by 2030, contributing to national priorities of soil rejuvenation, water conservation, biodiversity enhancement, and climate change mitigation. By bridging traditional wisdom with scientific rigor, these Model Farms will catalyse a nationwide transformation towards chemical-free agriculture.



Conceptual Framework for assessing Natural Farming (adapted from Rao, 2020)

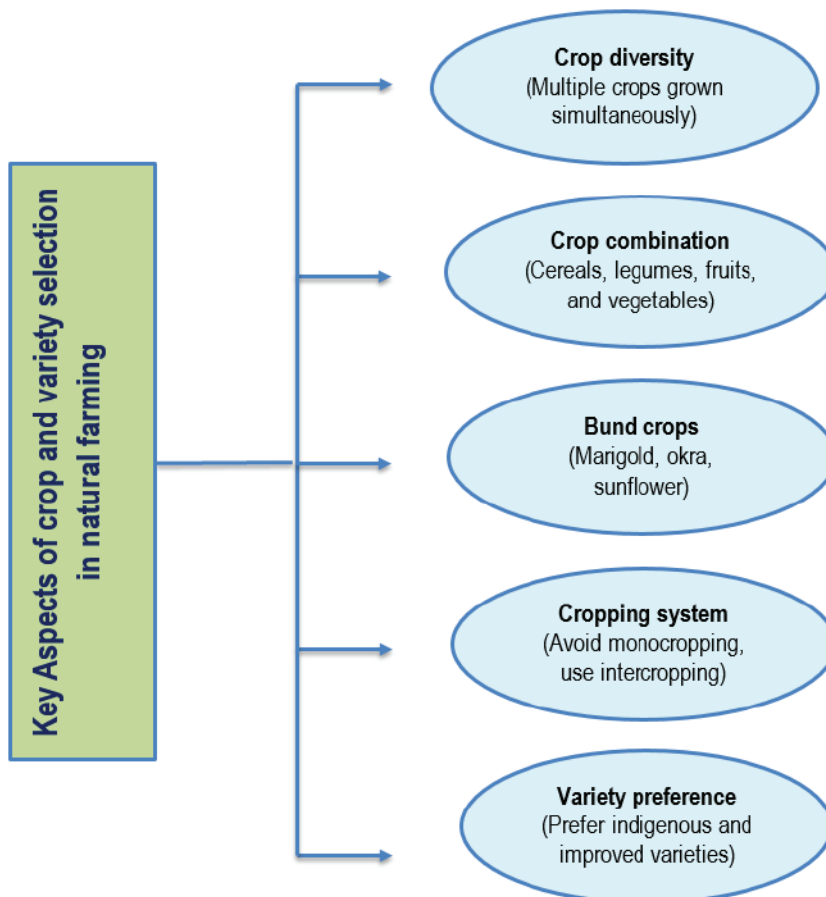
Selection of centres for NF Model Farms:

The selection of centres for Natural Farming Model Farms followed a systematic and inclusive approach to ensure broad representation and effectiveness. Initially, State Nodal Officers of the National Mission on Natural Farming (NMNF) recommended suitable centres within their respective states, based on local expertise, infrastructure, and outreach capacity. These recommendations were aimed at leveraging existing institutional strengths and ensuring alignment with state-level priorities. Subsequently, institutions from the Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs) were identified to provide scientific support and technical guidance. Care was taken to cover all major agro-climatic zones of the country, ranging from arid and semi-arid regions to humid and high rainfall areas, ensuring region-specific adaptability of natural farming practices. The selection also considered agro-ecological diversity, capturing variations in soil types, rainfall patterns, cropping systems, and farming challenges. This comprehensive coverage allows for the development of location-specific NF models that can be replicated and scaled across similar environments. By integrating state, national, and regional strengths, the approach ensures both scientific rigor and local relevance in promoting sustainable farming systems.

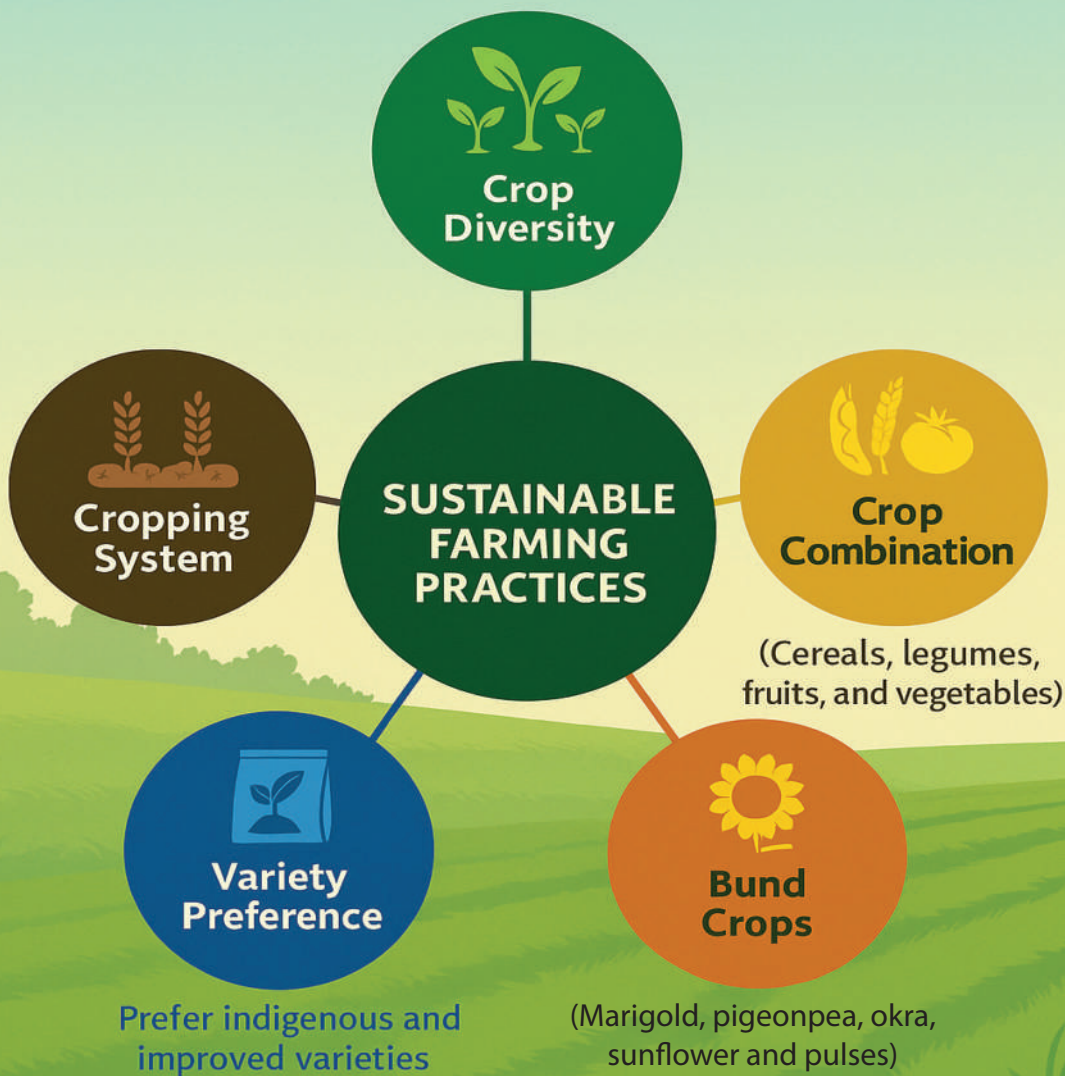
01

Selection of Crops and Varieties

- Natural farming promotes crop diversity, having multiple crops grown simultaneously.
- A combination of cereals, legumes, fruits, and vegetables, along with trap/indicator crops such as marigold, okra, sunflower, etc., on bunds is the preferred choice.
- Avoid monocropping.
- Use recommended intercropping methods suitable for your region.
- Generally, prefer indigenous/traditional varieties; but also use improved varieties within natural farming practices.



Key Aspects for Sustainable Crop Planning



02

Tillage and Sowing

- Adopt reduced/no tillage, especially in summer (no till).
- Use shallow tillage (10–15 cm) during *kharif* and *rabi*.
- Avoid deep tillage; use manual or shallow mechanical seed drills.



Manual tillage and sowing operations in agriculture

03

Summer/Fallow Cropping

- a) Pre-Monsoon Dry Seeding (PMDS) (rainfed areas): PMDS enables farmers to cultivate crops during non-farming seasons or when there is no crop cover.
- This method can be practiced before the monsoon, during summer, after *Kharif*, and before *Rabi* planting.
 - It involves raising 8 to 15 diverse crops, which fosters better seed germination through Beejamrit seed coating and improves survival during dry periods.
 - Mulching helps capture early morning dew, allowing it to percolate into the soil while minimizing evaporation.
 - PMDS is best practiced from March to May/June, leading into *Kharif*, Pre-*Rabi* Dry Sowing (PRDS), and *Rabi* crops.





Promoting sustainable farming through PMDS

- Crops from PMDS and PRDS serve as green manure after 35 days, providing cash income, food, and fodder for livestock.
- b) Multivariate cropping (irrigated areas):
 - Fields are generally left fallow.
 - During summer, green manure crops are planted.
 - Common crops include *Sesbania aculeata*, *Sesbania rostrata*, and sun hemp.
 - Deep tillage is performed prior to planting.
 - In natural farming, practice green manuring with crops like *Sesbania aculeata*, *Sesbania rostrata*, sun hemp, or moong, or engage in multivariate cropping during the fallow period in irrigated areas.
 - Utilize no-till or reduced-till methods to keep the soil covered and promote microbial activity through root exudates.
 - Incorporate biomass with varying carbon to nitrogen (C: N) ratios to ensure a longer decomposition period and extended nutrient release.
 - Grow crops of different durations and types, including cereals, pulses, oilseeds, fiber crops, and green manures, together in a mixed planting system (multivariate cropping).

Field Manual for Natural Farming Model Farms

- Mix and broadcast a minimum of nine different crop seeds during the summer or fallow period.
- Use about 25% of the seed rate of a sole crop for each crop in the mix.
- Before sowing or planting the main crop, incorporate the biomass from the multivariate cropping into the soil after harvesting any economic produce.
- Benefits of multivariate cropping include the reduction of soil-borne pathogens through annidation and allelopathy.



Growing green manure crops and incorporating before planting the main crop

04

Poly/Inter Cropping

- Seasonal Guidance

Kharif & Rabi → Practice polyculture/intercropping for soil health and yield enhancement and nutrient diversity
- Recommended Intercropping
 - ▣ Proven Methods → Follow recommended row ratios
 - ▣ Legumes preferred → e.g., pigeonpea, cowpea etc
- Trap & Indicator Crops
 - Trap Crops : marigold, okra, sorghum etc
 - Indicator Crops : Sunflower
(Plant along bunds & borders)



Multivariate cropping

- Special Note for Rice Fields
 - ▣ No intercropping/mulching in fully inundated paddy due to anaerobic conditions.
- Rice Cultivation under Natural Farming
 - ▣ Intercrop with Dhaincha
 - ▣ Grow trap crops & legumes on bunds
 - ▣ Mulch with Azolla
- Azolla + Rice System
 - ▣ Grow Azolla alongside rice
 - ▣ Continuous Azolla harvest → extra income for farmers
- Green Manuring with *Sesbania*
 - ▣ *Sesbania aculeata* / *Sesbania rostrata*
 - ▣ Incorporate into soil after 30–35 days using cono weeders
- Direct Seeding
 - ▣ Machines available for simultaneous sowing of rice + green manure
- Benefits of Green Manure Intercropping
 - o Weed suppression
 - o Nitrogen fixation
 - o Improves soil organic matter



NF Model Farms at Rahuri

05

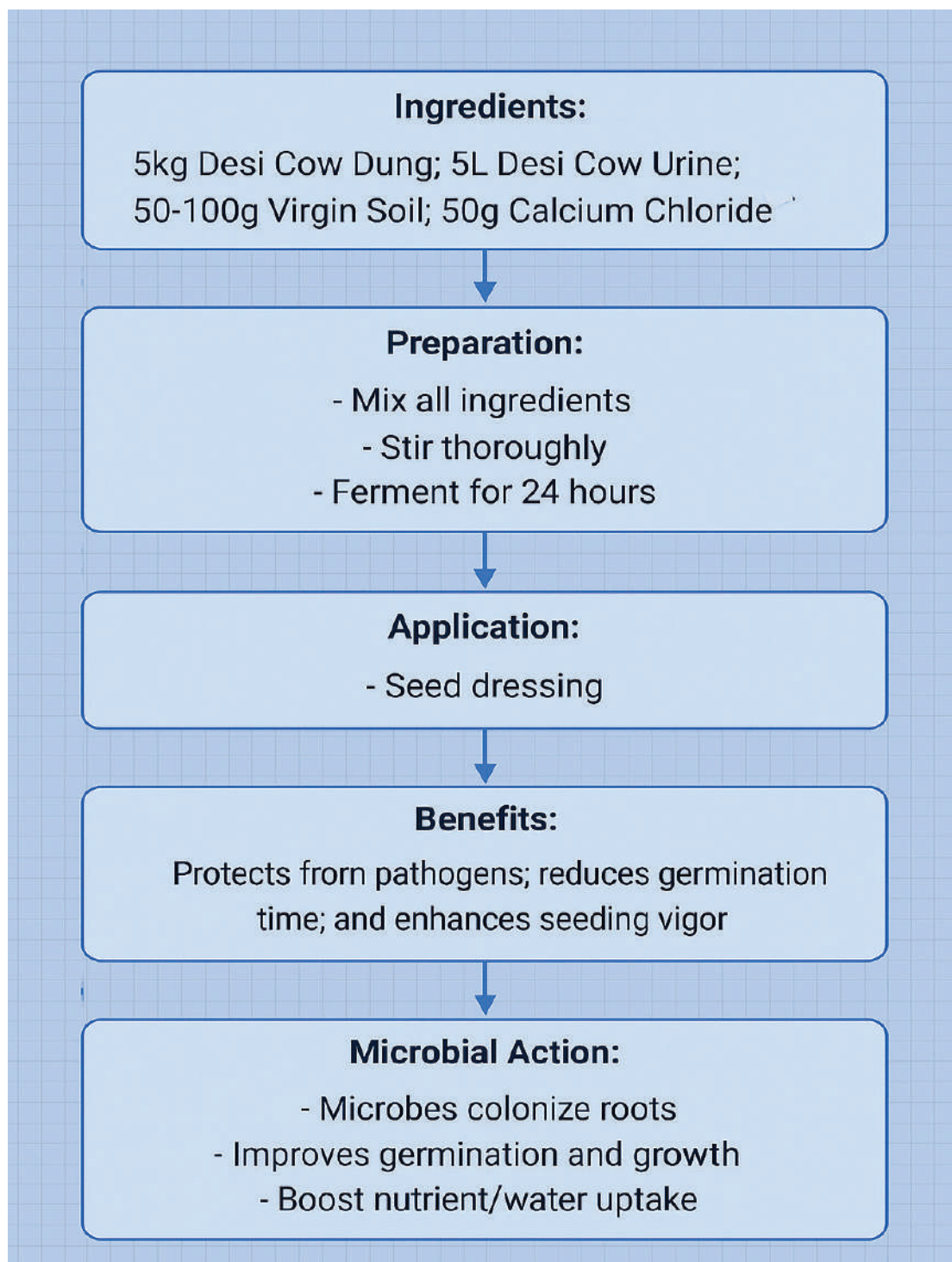
Natural Formulations

a. **Beejamrit** (Beejamrutha or Bheejamrutham)

- It is a microbial paste made using 5 kg of fresh dung from desi cows, 5 liters of desi cow urine, 50-100 g of virgin soil (preferably from forests, banyan trees, or termite mounds), 50 g of calcium chloride, and 20 liters of water.
- The mixture is thoroughly stirred and fermented for 24 hours.
- It is used for seed dressing or dipping seedling roots.
- Seed dressing involves coating seeds with beejamrut before sowing and drying them in the shade.
- Beejamrut has been shown to protect seeds and young seedling roots from soil-borne and seed-borne pathogens, reduce germination time, and enhance seedling vigor, leading to better growth.
- The application of beneficial microbes to seeds effectively places microbial inocula in the soil, positioning them to colonize seedling roots and protect them against soil-borne diseases and pests.
- Microbes improve seed germination, shoot and root length, seedling vigor, and crop performance.
- Beejamrut promotes root dry weight and root proliferation, enhancing nitrogen, nutrient, and water uptake by crop plants.



NF Model Farm in NEH & cover cropping



Flow chart-Beejamrit Preparation and Benefits



Preparation of Beejamrita

b. Ghanjeevamrit:

- It is solid in form and is prepared using ingredients such as desi cow dung (150 kg), jaggery (1 kg), pulse flour (2 kg), virgin fertile soil for microbial culture (50-100g) and native/desi cow's urine as required.
- Make a pile of fresh cow dung partially dried up to 3-4 days up to a height of 1.5 feet. Size of the pile might be as per convenience (say (12 X 3 feet).
- Make holes with a wooden log at a distance of about 1 feet and fill up these holes with already prepared jeevamrit.
- Turn the dung pile up and down after one week.
- Then again make the holes and fill up these holes with jeevamrut and turn up the pile again after one week. This way the process is repeated 2-3 times.
- The Ghanjeevamrit will be ready in 30-35 days.
- Then, after pounding it into small-sized particles, it can be broadcasted uniformly in the field or stored in shade after covering with gunny bags.

Generally, it is recommended to use 800 to 1000 kg per acre as a basal dose. However, this can be applied as top dressing.



Ghanjeevamrit preparation



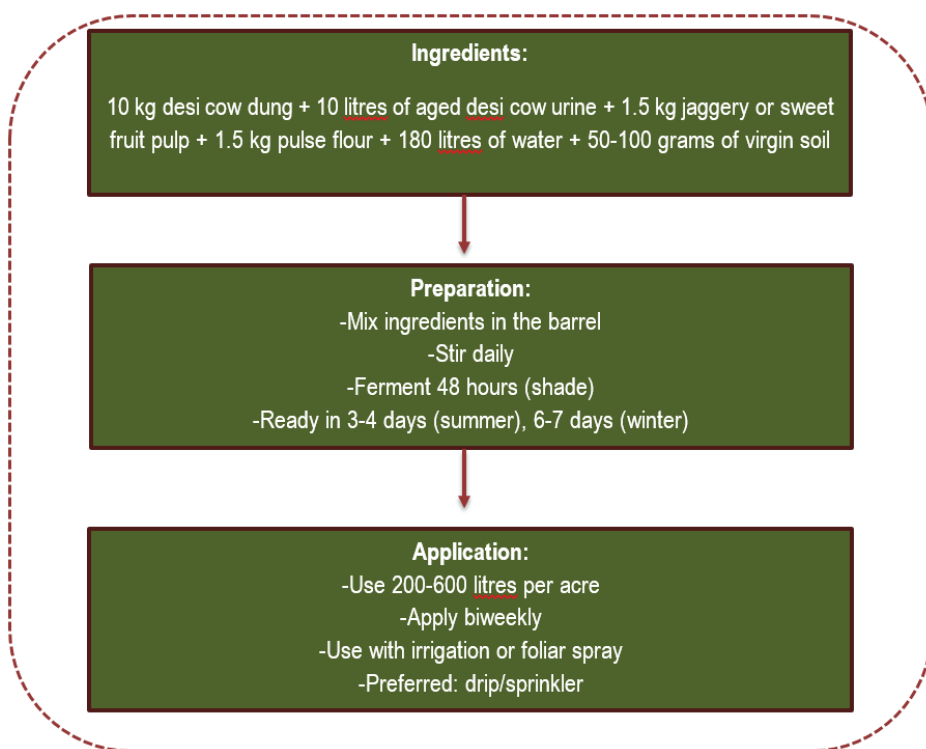
Ghanjeevamrit preparation

C. Jeevamrit (Jivamrita or jeevamruta or Jeevamrutha or Jeevamrutham):

- It is a fermented microbial culture made from on-farm ingredients: 10 kg of fresh dung from desi cows, 10 liters of aged desi cow urine, 1.5 kg of cane jaggery (sugar) or sweet fruit pulp, and 1.5 kg of pulse flour mixed in a barrel with 180 liters of water.
- A handful (50-100 g) of virgin soil from banyan tree areas, forests, or termite mounds is added as a local microflora inoculant.
- The mixture is stirred daily and fermented for 48 hours in the shade.
- During fermentation, aerobic and anaerobic bacteria in cow dung and urine multiply as they decompose the organic ingredients.
- Cane jaggery enhances fermentation, and pulse flour provides protein energy.
- Jeevamrit is ready after 3-4 days in summer and 6-7 days in winter and is applied to soil twice a month at a rate of 200 to 600 liters per acre, depending upon crops and soil conditions, either through irrigation water or as a foliar spray.
- Application of Jeevamrit or Ghanjeevamrit through drip or sprinkler irrigation is preferred.
- Jeevamrut acts as a catalyst, promoting soil microorganism activity, including earthworms, and making nutrients available to crops. Indigenous cow dung and urine produce the best Jeevamrut due to higher beneficial microbial populations.



Jeevamrit Preparation



Preparation and application of Jeevamrit



06

Mulching (Acchadana)

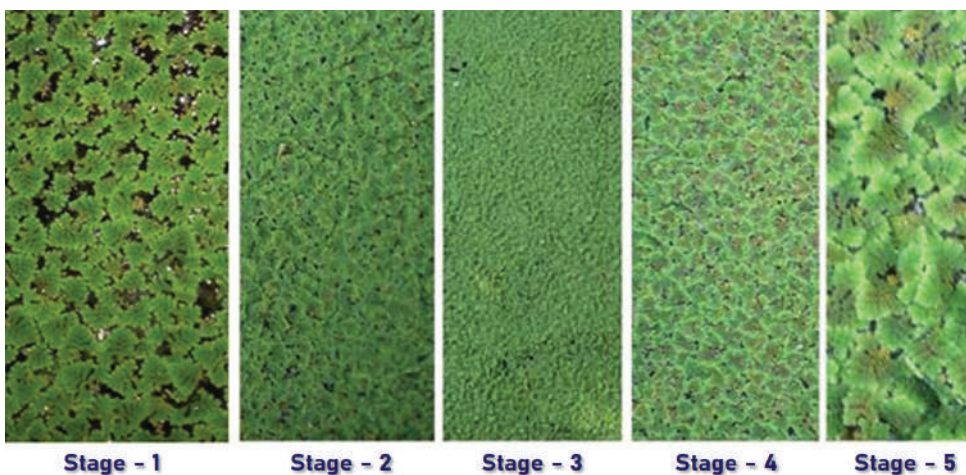
- Types: Soil mulching, straw mulching, and live mulching.
 - (i) Soil mulching (tillage of the soil as normal, but to a reduced depth of 10-15 cm),
 - (ii) Straw mulching (spread dried crop residues or straw from the previous crop), and
 - (iii) Live mulching (raising diverse legume intercrops with cereals for supplying phosphorus, potassium, and sulphur to monocotyledons, such as rice, wheat, ragi, etc.).



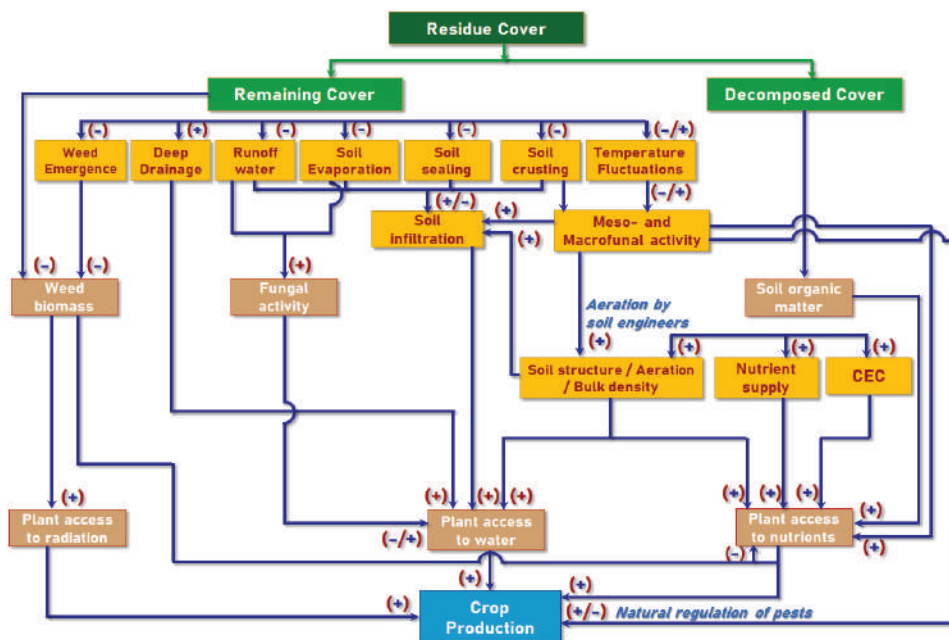
Straw Mulching

- Crop residue mulching should be applied immediately after sowing the crops to reduce the germination of weeds in the field.
- Depending upon the crop residues, generally 5 to 7 tonnes are required to cover one ha area for all the crops except rice, in which Azolla should be used as mulching material under natural farming.

- Mulching should be done in all seasons.
- Some of the leguminous cover crops which can be introduced in natural farming are spreading type viz., cowpea, horsegram and calapagonium.
- Application of Jeevamrut through drip/micro irrigation has an accelerating effect on multi/relay crops, and polythene mulching may also be recommended depending upon the soil condition and requirement.

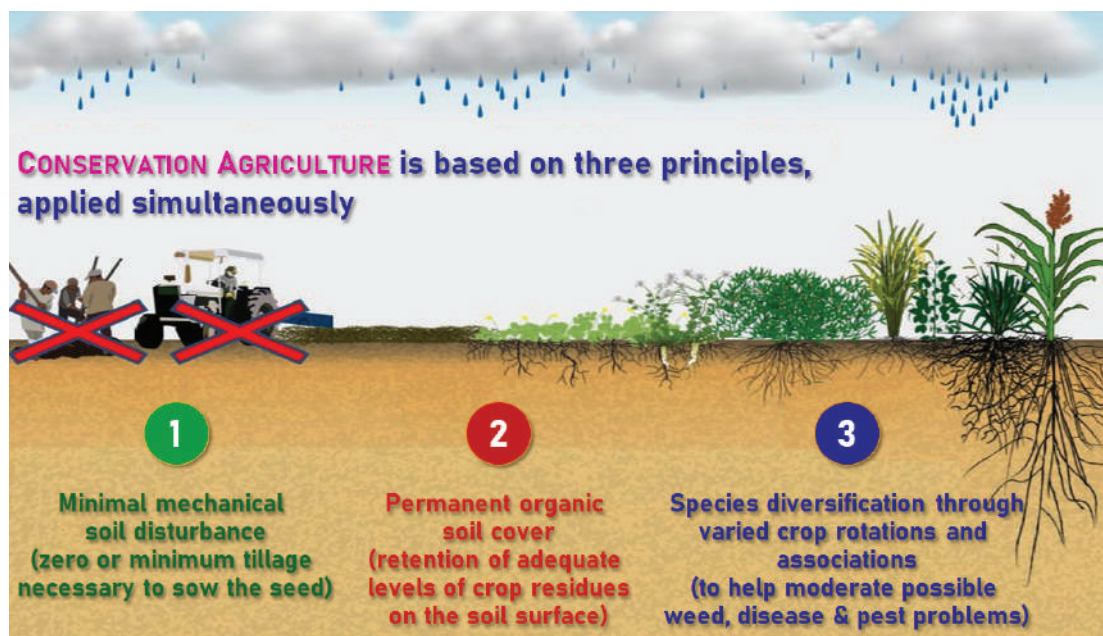


Various stages in the formation of a dense Azolla mat



Agro-ecological functions of surface crop residues, positive (+) and negative (–) effects (adapted from Ranaivoson et al., 2017)

Yet farmers have been practicing several variations of the constitutive ZBNF elements long before the term was coined. Further, the three components of ZBNF to a greater extent represent the three principles of modern conservation agriculture (Ranaivoson et al., 2017).



Principles of conservation agriculture (adapted from FAO, 2017)



Mulching and mechanical application of Jeevamrit

07

Whapasa (Soil Aeration)

- It refers to the soil condition where a balanced concentration of water and air molecules exists in the crop root zone.
- Natural farming promotes this state of soil condition through the application of minimal irrigation, reduced tillage, and enhanced soil humus, achieved through residue mulching and the addition of concoctions.
- By maintaining Whapasa, the water use by crops can be reduced significantly.
- Whapasa soil condition in the crop root zone under field conditions is feasible through application of jeevamrit using precision technologies such as micro irrigation systems, such as drip and sprinkler irrigation, including sensors, controllers, etc., to deliver a measured quantity of water with jeevamrit precisely in the vicinity of roots to achieve optimal soil-water-plant relations.
- Alternate furrow irrigation and surge irrigation can also be adopted. Flood irrigation should be avoided.



Different types of minimal irrigation for Whapasa

08

Weeding

- Adopt mulching, intercropping, and polycropping to suppress weeds.
- Time and quantity of mulching play a very important role in reducing the weed infestation. Generally dense mulching with crop residues immediately after sowing is preferred to manage the weeds effectively in the early stages of the crop.
- Non-Chemical weed management approaches such as hand weeding, shallow hoeing with tools, reduced spacing of crops, stale seed bed, and other indigenous techniques can also be practiced as per need under natural farming.



Manual hand weeding and reduced spacing for weed management

09

Botanical Concoctions - Insect Management

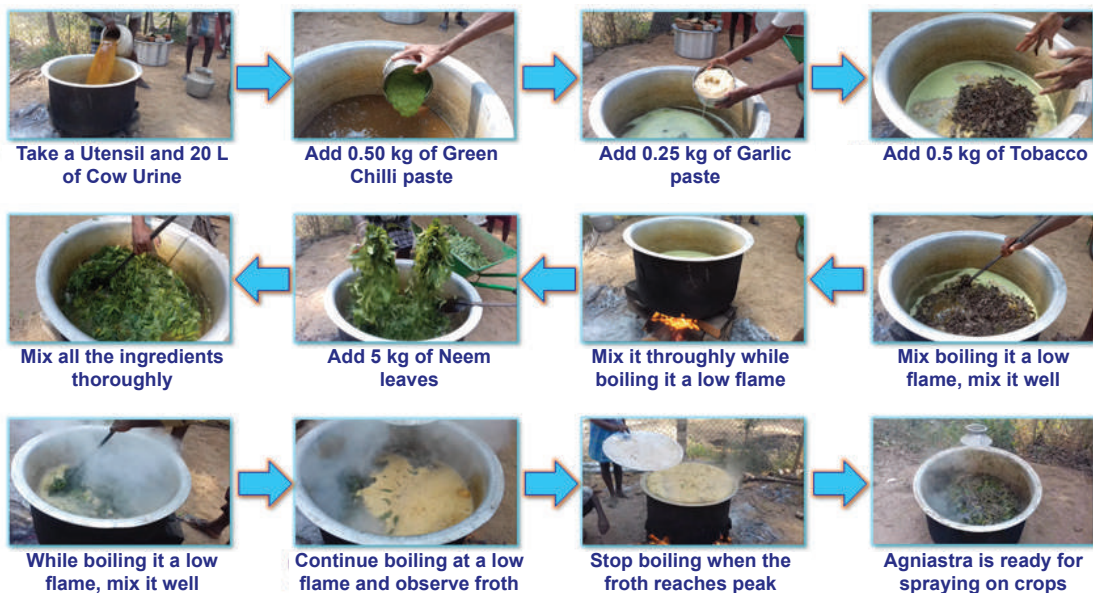
Natural Farming promotes the use of various kashaya (decoctions) from locally sourced ingredients like cow urine, neem leaves, green chilies, garlic, tobacco, sour buttermilk, etc., to act as natural fungicides and pesticides. Some of the prominent ones used are Agniastra, Bramhastra, Neemastra, and Dashparni ark. Prophylactic spray of these botanical concoctions every 15 days or in a month, depending upon the crops, is recommended under natural farming.

a. Agniastra:

- **Ingredients:**
20 L cow urine, 500 g tobacco, 0.5 kg green chili, 0.25 kg garlic, and 5 kg neem leaves
- **Preparation:**
Boil → Cool → Ferment 48 hrs → Filter
- **Usage:**
6–8 L in 200 L water → Spray on 1 acre
- **Effect:**
Controls leaf/stem/fruit/pod borers
- **Shelf Life:**
Use within 3 months



Jeevamrit application through drip irrigation



Preparation of Agniastra (adapted from Rao, 2020)

b. Bramhastra

Ingredients:

10 L cow urine, 2 kg each of neem, karanj, custard apple, castor, and datura leaves

Preparation:

Boil → Froth → Filter → Ferment 48 hrs (shade), stir twice daily

Usage:

6–8 L in 200 L water → 1 acre



NF Model Farm at Srivilliputhur



Preparation of Bramhastra (adapted from Rao, 2020)

- ❑ Effect:
 - Controls sucking pests, fruit & pod borers
- ❑ Shelf Life:
 - Use within 1 month
- c. Neemastra
- Ingredients:
 - o 5 L cow urine, 1 kg cow dung, 5 kg neem leaf paste, 100 L water or 20 L Cow Urine, 2 kg cow dung, 10 kg neem leaf paste, 200 L water.
- Preparation:
 - o Ferment 48–96 hrs → Stir twice daily → Filter
- Usage:
 - o Full volume of 200 L for 2 acre
- Effect:
 - o Controls sucking pests, and leaf eating caterpillars



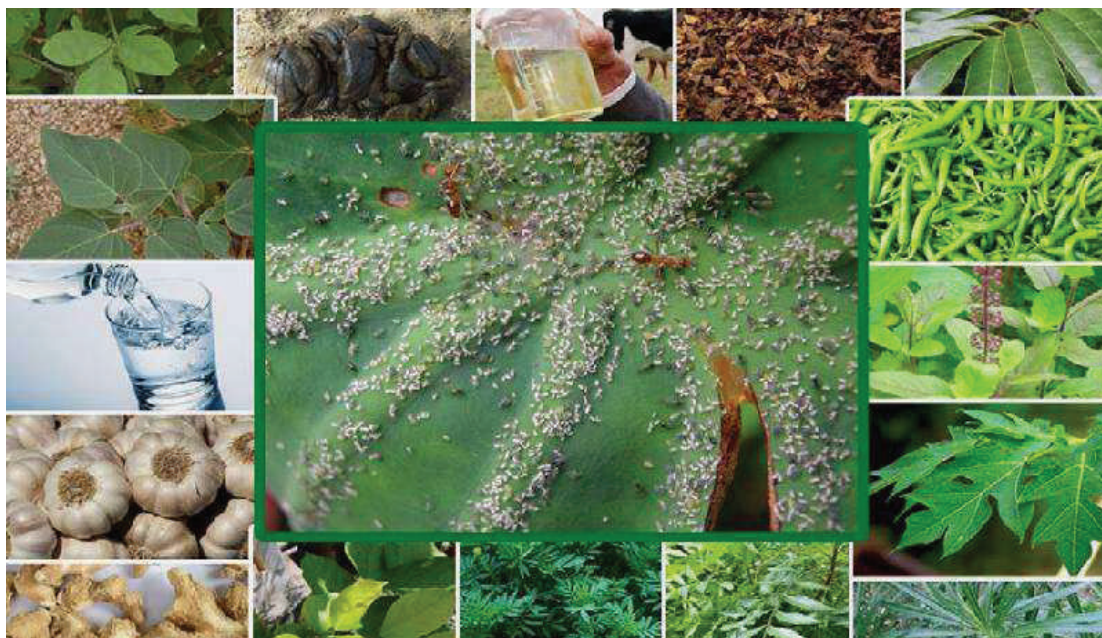
Preparation of Neemastra (adapted from Rao, 2020)

d. Dashparni ark

- Ingredients:
 - o 200 L water, 20 L cow urine, 2 kg dung, 2 kg each of 10 medicinal leaves (Neem, Tulsi, Mango, etc.), turmeric, heeng, dry ginger, tobacco, chili, garlic
- Preparation:
 - o Soak, mix, crush → Ferment for 30–40 days → Stir daily
- Usage:
 - o 6–8 L in 200 L water → 1 acre
- Effect:
 - o Controls borers, maggots, and caterpillars



Jeevamrit preparation in NF Model Farm in Karnataka



Dashparni ark preparation



Preparation process of Dashparni Ark for insect management



NF experiment under AINP-Natural Farming

10

Botanical Concoctions - Disease Management

a. Sonthastra: Natural Antifungal Spray

Ingredients

- 200 g dry ginger
- 5 litres of desi cow's milk
- 200 litres of water

Step-by-Step preparation

Step 1: Ginger Decoction

- Grind ginger into powder
- Mix in 2 litres of water → Boil → Reduce to 1 litre
- Let it cool

Step 2: Milk Preparation

- Boil 5 litres of desi cow milk once
- Cool it
- Remove the cream (can be used at home)

Step 3: Mixing

- Filter both: ginger decoction & milk
- Mix both into 200 litres of water

Application

- Spray the final solution on 1 acre of crop
- Benefits: Controls fungal infections effectively

b. Khatti Lassi (Sour Butter Milk): Natural Antifungal & Antiviral Solution (For 1 Acre)

Ingredients

- 100 litres of water
- 5 liters of khatti lassi (3–5 days old sour buttermilk)
- 1 small piece of copper

- 50 grams of turmeric powder

Step-by-Step Preparation

- Soak copper in khatti lassi for 3–5 days
- Mix 5 liters khatti lassi + 100 liters water
- Add 50 g turmeric powder and stir well

Application

- Spray the mixture uniformly on 1 acre of crops.

Benefits

- Controls fungal diseases
- Works as a natural virus killer
- Cost-effective & chemical-free plant protection

c. Cow Urine Application: Natural Disease Control

1. Pre-Sowing Use

- Apply 30–40 litres of cow urine
- Mix with irrigation water
- Controls:
- Soil-borne diseases
- Seed-borne diseases
- Seedling & wilt infections

2. Canopy Disease Control (Field Crops)

- Use 10–20% dilution (1–2 L cow urine in 10 L water)
- Spray on crop canopy
- Controls fungal and bacterial infections in foliage

3. Orchard Planting (Fruit Crops)

- At planting:
- Apply 10% cow urine solution in pits
- Mix pits with soil + cow dung/ghanjeevamrit
- Post-planting:
- Spray 10–20% diluted cow urine as per need and at regular interval

Benefits

Natural protection against:

- Soil-borne pathogens
- Canopy diseases
- Wilt and bacterial infections

- Boosts immunity of plants
- Eco-friendly & cost-effective

d. Saptdhanyankur Ark

Ingredients

- 100 g each of sesame (oilseed) + Moong + Urd + Cowpea +Moth +Gram + Wheat

Step-by-Step Preparation

Step 1: Soaking

- Day 1: Soak sesame overnight
- Day 2: Mix all seeds and soak overnight

Step 2: Sprouting

- Day 3: Drain water (keep it aside); tie seeds in coarse cotton cloth; and hang them inside the house to sprout

Step 3: Mixing the Ark

- Grind sprouted seeds into a paste (chutney)
- Mix in:
 - 200 litres of water
 - 10 litres of cow urine
 - Soaked seed water
 - Stir thoroughly with a wooden stick

Step 4: Fermentation & Filtration

- Cover with a gunny bag
- Leave for 2 hours
- Filter the solution with a cloth

Application

- Use within 48 hours
- Spray during:
 - Milk stage of grains
 - Infancy of fruits
 - Bud stage in flower crops

Benefits:

- Enhances grain shine & weight
- Reduces flower & fruit drop

In addition to the above, depending upon the requirement, mechanical traps, pheromone traps, yellow sticky traps, bio-control agents such as *Trichoderma*, *Pseudomonas*, *Trichogramma*, *Bacillus* etc., can also be used in the natural farming to manage insect and diseases in crops.

11

Harvesting

- Manual or mechanical harvesting, depending on crop and tools available.
- Adapt post-harvest practices to maintain grain quality and soil health.



Harvesting in NF Model Farm in Uttarakhand



NF experiment at Bhopal

References

1. FAO (2017). Conservation Agriculture. Food and Agriculture Organization of the United Nations Viale delle Terme di Caracalla, 00153 Rome, Italy. Available at <https://openknowledge.fao.org/server/api/core/bitstreams/d571cf1a-7ff4-4565-8af9-eb25d198b41a/content>
2. <https://naturalfarming.niti.gov.in/andhra-pradesh/>
3. Hari Om, Baljeet Singh Saharan, Vijay and V.P. Chahal. 2024. Natural Farming and Science, Twenty First Century Publications, Patiala, p. 191
4. Meena, R.K., Hardev Ram, Anurag Saxena and Rakesh Kumar.2024. Natural Farming: Basics and Application, ICAR-National Dairy Research Institute, Karnal, India p.149.
5. Ranaivoson, L., Naudin, K., Ripoche, A., Affholder, F., Rabeharisoa, L., & Corbeels, M. (2017). Agro-ecological functions of crop residues under conservation agriculture. A review. Agronomy for sustainable development, 37(4), 26.
6. Ravisankar, N., V. Praveen Rao, J.K. Thakur, R. Krishnan, Meenu Rani, Himanshu Joshi, A.K. Prusty, M. Shamim, Meraj Alam Ansari, Raghuveer Singh, Raghavendra, KJ, T.P. Swarnam, Azad Singh Panwar, S. Bhaskar, Sunil Kumar and Rajbir Singh.2024. Science of Natural Farming: Proven Practices and their role in soil health and sustainability, Journal of the Indian Society of Soil Science, 72 (Special issue): 151-167.
7. Sharma, SK, N. Ravisankar, N.K. Jain and S.K. Sarangi.2023. Natural Farming: Current status, research and case studies, Indian Journal of Agronomy 68 (XXII Biennial National Symposium Special issue):S1-S15.
8. Shibasis Mukherjee, Suchana Sen, Md. Nasim Ali, Rupak Goswami, Argha Chakraborty, Krishnendu Ray, Rantim Bhattacharjee, Bhubaneswar Pradhan, N. Ravisankar, Gautam Chatterjee.2022. Microbiological properties of beejamrut, an ancient Indian traditional knowledge, uncover a dynamic plant beneficial microbial network, World Journal of Microbiology and Biotechnology, 38 (111): 1-12.
9. Suganthi, M., P. Janaki, E. Parameswari, R.Krishnan, P.S. Kavitha, M. Ramasubramanian and M.K. Kalarani. 2023. Natural farming: present status and future prospects, Tamil Nadu Agricultural University, Coimbatore, India p.487

Minimum Data Sets (MDS): Natural Farming Model Farms

Mandatory Data Sets

S. No.	Parameter	Method/Device	Unit
1. General			
1.1	Latitude	Handheld GPS/GNSS receiver or mobile GPS app; record in decimal degrees; average ≥ 30 sec fix	degrees
1.2	Longitude	Handheld GPS/GNSS receiver or mobile GPS app; record in decimal degrees; average ≥ 30 sec fix	degrees
1.3	Altitude	GPS altitude/barometric altimeter; cross-check with SRTM/DEM if available	meter
1.4	.kml file	Export waypoints/field boundary from GPS/mobile app (e.g., SW Maps, QField, Google Earth) as .kml	-
1.5	Water source – Ground water	Field survey & farmer interview; GPS-tag well/bore locations; photograph	-
1.6	Water source – Surface water	Field survey & farmer interview; GPS-tag canal/pond locations; photograph	-
2. Below ground			
2.1	Soil type (nomenclature)	Field survey & profile description; classify as per NBSS&LUP/Soil Taxonomy/WRB	-
2.2	Soil depth	Auger/probe and profile pit measurement at representative points	cm
2.3	Series	Assign soil series using NBSS&LUP soil maps/legends & field correlation	-
2.4	Texture (sand/silt/clay)	Laboratory hydrometer (Bouyoucos) or pipette method on <2 mm fraction	-
2.5	Bulk density	Undisturbed core method (cylindrical core of known volume); oven-dry at 105 °C	g/cc
2.6	Penetration	Cone penetrometer (hand/digital) to required depth; record peak resistance	m
2.7	SOC at 0–15 and 15–30 cm depth	Walkley–Black wet oxidation	%
2.8	Soil pH	pH meter in 1:2.5 soil:water suspension after 30 min equilibration	-
2.9	EC	EC meter on 1:2.5 soil:water extract at 25 °C	dS/m

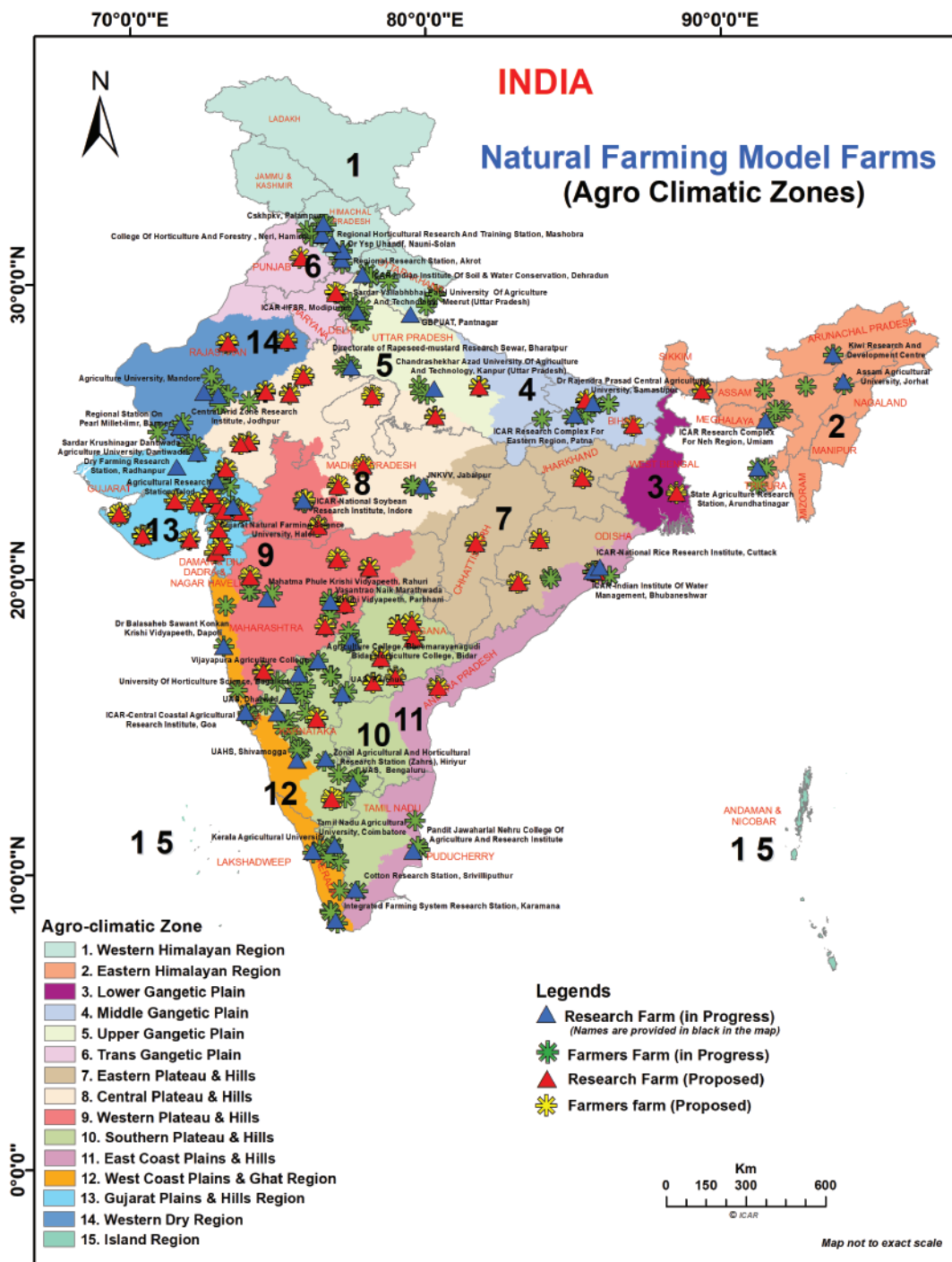
S. No.	Parameter	Method/Device	Unit
2.9	Total and Available NPK	Total N: Kjeldahl; Available N: alkaline KMnO_4 (Subbiah & Asija); Available P: Olsen ($\text{pH} \geq 7$) or Bray-I ($\text{pH} < 7$); Available K: 1N NH_4OAc extraction with flame photometer/ICP-OES	kg/ha
2.10	Water table level from surface	Observation well/piezometer with electric water level indicator or measuring tape	m
2.11	Earthworm count	Fixed quadrat hand-sorting and/or dilute formalin (0.2%) expulsion; count per m^2	no/ m^2
3. Above ground (Season-wise for <i>Kharif</i> , <i>Rabi</i> and Summer separately)			
3.1	Crop	Field record/farmer register	-
3.2	Variety	Seed lot/label & farmer record verification; photo-documentation	-
3.3	Sowing/Harvest date	Field log/farmer register; cross-check with photo timestamps	-
3.4	Germination	Field count using fixed quadrat/row-length at 7–10 DAS; compute %	%
3.5	Weed count & dry weight using quadrat method	0.5x0.5 m (or 1x1 m) quadrat; count species; oven-dry at 65 °C to constant weight, type of weeds	g/ m^2
3.6	Major insects	Weekly scouting on fixed plants/transects; sweep net/pheromone traps; count per area, Economic Threshold level (ETL)	no/ m^2
3.7	Major diseases	Visual scoring on standard scales (0–9); incidence/severity from fixed plots, ETL	no/ m^2
3.8	Major nematodes	Soil/root sampling; Baermann funnel/modified Cobb's sieving; identification & count	no/ m^2
3.9	Yield (main/by-product)	Crop-cutting on net plot (e.g., 5x5 m); thresh, dry to standard moisture; weigh	kg/ha
3.10	Method of irrigation	Field observation & records (flood/basin/furrow/sprinkler/drip)	-
3.11	Irrigation water applied	Inline water meter/Parshall flume & time-flow method; convert to depth (cm)	cm
4. Other details			
4.1	Rainfall	Standard/automatic rain gauge (AWS/IMD-spec); daily readings (mm)	mm
4.2	Rainfall distribution	Daily RG records aggregated to dekadal/monthly; hyetograph plotting	Rainy days

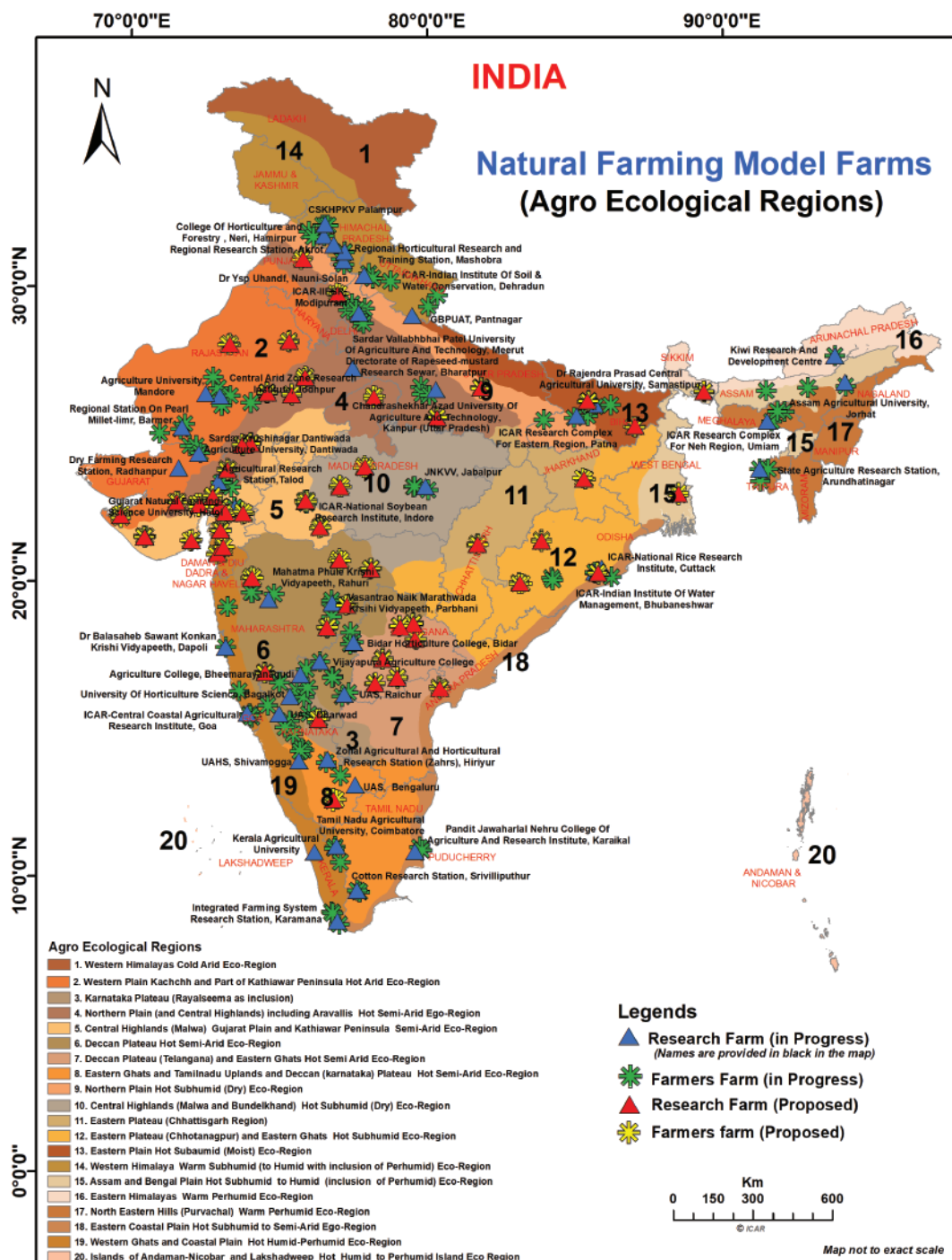
S. No.	Parameter	Method/Device	Unit
4.3	Temperature	Automatic Weather Station or max–min thermometers; daily T_max/T_min	°C
5. Economics			
5.1	Cost of cultivation	Enterprise budgeting from farm records; include imputed family labour	INR/ha
5.2	Gross/Net returns	Gross: yield × farm-gate price; Net: Gross – Cost of cultivation	INR/ha
5.3	B:C ratio	Benefit–Cost ratio = Gross returns / Cost of cultivation	-
5.4	Labour use	Daily labour sheets; convert to man-days per hectare	man-days/ha
5.5	Input cost reduction	Compare baseline vs current input costs; compute % reduction	%
6. Extreme conditions			
6.1	Flood	Incident log with GPS/photo; cross-verify with IMD/State disaster reports	duration in days
6.2	Drought	Incident log; IMD rainfall anomaly; SPI/SPEI indices where available	duration in days
6.3	Hailstorm	Damage scoring on 0–10 scale; photo evidence; IMD nowcast records	0-10 scale
6.4	Others	Incident record with description, date, GPS/photo; verified with official sources	-
7. Others			
7.1	Mandatory upload (10 photos + 2 videos/season)	Capture via smartphone/digital camera; geotag; compress before upload	Kb
Time	Above Ground: Seasonal	Record every crop season at key phenophase (sowing, vegetative, flowering, harvest)	-
Time	Below Ground: Baseline & end of cropping year	Sample before start of interventions (baseline) and at end of each cropping year	-

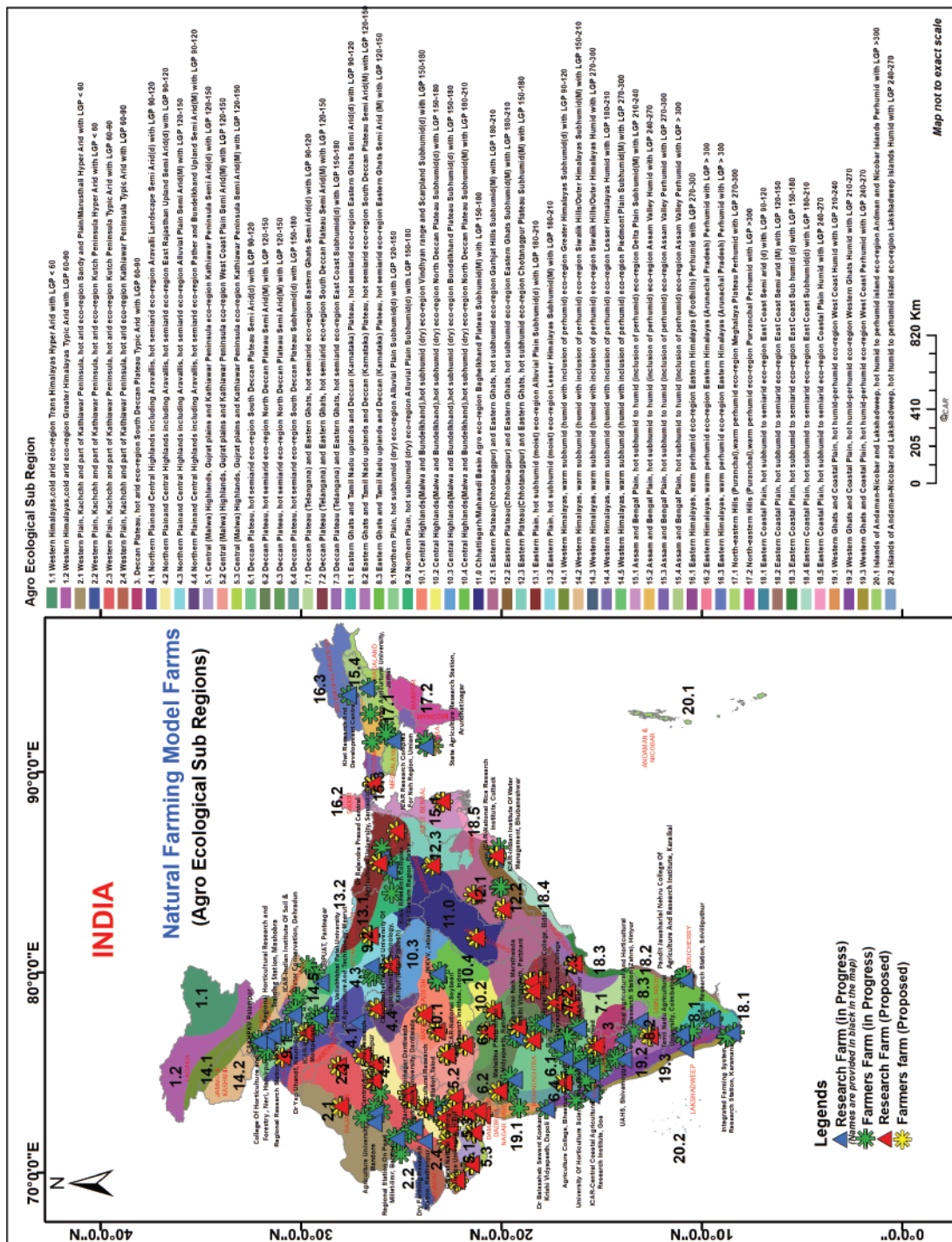
Optional Data Sets

S. No.	Parameter	Method/Device	Unit
O1	Particulate Organic Carbon	Size fractionation (sieving/density) to isolate POC; TOC analyzer for C content	%

S. No.	Parameter	Method/Device	Unit
O2.1	Boron	Hot water extraction; quantify by Azomethine-H colorimetry or ICP-OES	mg/100g
O2.2	Zinc	DTPA (pH 7.3) extraction; AAS/ICP-OES determination	mg/100g
O2.3	Iron	DTPA (pH 7.3) extraction; AAS/ICP-OES determination	mg/100g
O3	Soil Microbial Count	Serial dilution & pour/spread plating on appropriate media; CFU counting	CFU/g
O4.1	Dehydrogenase	TTC reduction to TPF; spectrophotometric measurement	$\mu\text{g TPF g}^{-1} \text{h}^{-1}$
O4.2	Phosphatase	p-Nitrophenyl phosphate assay; spectrophotometric measurement	$\mu\text{mol g}^{-1} \text{h}^{-1}$
O5	Soil microbiome/ metagenomics	DNA extraction; 16S/18S rRNA amplicon sequencing; bioinformatics pipeline	16S/18S
O6	Microbial Biomass Carbon	Chloroform fumigation–extraction (Vance et al.) with KEC factor	mg/kg
O7.1	Brix	Handheld refractometer on fresh juice/extract	%
O7.2	Protein	Kjeldahl nitrogen $\times$ 6.25 (or NIR calibration where available)	%
O8	Oil	Soxhlet extraction (petroleum ether/hexane) or NMR/NIR methods	%
O9	Vitamin A	HPLC (retinol/ β -carotene quantification) after proper extraction	IU/100g
O10	Soil Arthropods	Pitfall traps/soil cores; Berlese funnel for litter extraction; count per area	No./m ²
O11	Arthropod biodiversity – mole cricket count	Fixed quadrat or pitfall traps along transects; identify and count	No./m ²
O12	Mycorrhizal Colonization	Root clearing & trypan blue staining; gridline intersect microscopy (Giovannetti & Mosse)	%







NMNF: Model Farms

S.No.	State	Name of AU/Research Station identified by States for NF Model Farm
1	Andhra Pradesh	1. Regional Agricultural Research Stations, ANGRAU, Maruteru
2	Arunachal Pradesh	2. Kiwi Research & Development Centre
3	Assam	3. Assam Agricultural University, Jorhat
4	Bihar	4. Dr. Rajendra Prasad Central Agricultural University, Samastipur
		5. ICAR Research Complex for Eastern Region, Patna
		6. ICAR- NRC on Litchi, Muzaffarpur
		7. Bihar Agricultural University, Bhagalpur
5	Chhattisgarh	8. Indira Gandhi Krishi Vishwavidyalaya, Raipur
6	Goa	9. ICAR-Central Coastal Agricultural Research Institute, Goa
7	Gujarat	10. Gujarat Natural Farming Science University, Halol, Panchmahal
		11. Dry Farming Research Station -Radhanpur, SDAU, Patan
		12. Agricultural Research Station, Talod, SDAU, Sabarkantha
		13. Sardar Krushinagar Dantiwada Agriculture University, Dantiwada
		14. Wheat Research Station, Bardoli, Nau, Surat
		15. Agricultural Research Station, AAU, Sansoli-387130, Kheda
		16. Agriculture College, Jabugam
		17. Anand Agricultural University, Anand
		18. College of Agriculture, NAU, Maktampur, Bharuch
		19. Junagadh Agricultural University, Junagadh
		20. Navsari Agriculture University, Navsari
		21. Agricultural Research Station (Fruit Crops), JAU, Ta- Mahuva, Bhavnagar
		22. Agricultural Research Station, Arnej, Taluka, Dhandhuka, Ahmedabad
		23. Cotton Research Station, Kukada Farm, JAU, Surendranagar
		24. Dry Farming Research Station, Jam-khambhaliya, JAU, Devbhumi Dwarka
		25. Fruit Research Station, JAU, Mangrol, Junagadh
		26. Maize Research Station, Bhiloda, SDAU, Arvalli
		27. Pulse Research Scheme AAU, Vadodara
8	Haryana	28. Regional Research Station, Karnal

S.No.	State	Name of AU/Research Station identified by States for NF Model Farm
9	Himachal Pradesh	29. Dr. YSP UHANDF, Nauni-Solan
		30. CSKHPKV, Palampur
		31. College of Horticulture and Forestry, Neri, Hamirpur
		32. Regional Horticultural Research and Training Station, Mashobra
		33. Regional Research Station, Akrot
10	Jharkhand	34. Birsa Agricultural University, Ranchi
11	Karnataka	35. UAHS, Shivamogga
		36. Hiriya Horticulture College
		37. UAS, Raichur
		38. Vijayapura Agriculture College
		39. University of Horticulture Science, Bagalkot
		40. UAS, Dharwad
		41. Agriculture College, Bheemarayanagudi
		42. Bidar Horticulture College
		43. UAS, Bengaluru
		44. Munirabad Horticulture College
		45. Agriculture College, V.C. Farm, Mandya
12	Kerala	46. Integrated Farming System Research Station, KAU, Karamana
		47. Kerala Agricultural University
13	Madhya Pradesh	48. ICAR-National Soybean Research Institute, Indore
		49. JNKVV, Jabalpur
		50. Agriculture College, Sehore
		51. College of Agriculture, Khandwa
		52. College of Agriculture, Indore
		53. College of Agriculture, Ganjbasoda, Vidisha
		54. Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior
14	Maharashtra	55. Mahatma Phule Krishi Vidyapeeth, Rahuri
		56. Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli
		57. Vasantrao Naik Marathwada Krsihi Vidyapeeth, Parbhani
		58. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
		59. Wheat Research Station, Niphad, Nashik
		60. Agriculture Research Center, Kasabe Digraj
		61. College of Agriculture, Latur

S.No.	State	Name of AU/Research Station identified by States for NF Model Farm
		62. College of Agriculture, Nanded
		63. Agriculture Research Station, Waghapur Road
15	Meghalaya	64. ICAR Research Complex for NEH Region, Umiam
16	Odisha	65. ICAR-Indian Institute of Water Management, Bhubaneswar
		66. ICAR-National Rice Research Institute, Cuttack
		67. College of Agriculture, OUAT, Bhawanipatna, Kalahandi
		68. College of Agriculture, OUAT, Chiplima, Sambalpur
		69. College of Agriculture, OUAT, Bhubaneswar
17	Puducherry	70. Pandit Jawaharlal Nehru College of Agriculture and Research Institute
18	Punjab	71. Punjab Agricultural University, Ludhiana
19	Rajasthan	72. Central Arid Zone Research Institute, Near Industrial Training Institute (ITI), Jodhpur
		73. Regional Station on Pearl Millet-IIMR, Industrial Area, Gudamalani, Barmer
		74. Agriculture University, Mandore, Jodhpur
		75. Adaptive Trail Center, Rajasthan Government, Tabaji Farm, Ajmer
		76. Adaptive Trail Center, Rajasthan Government, Abusar, Jhunjhunu
		77. Maharana Pratap University of Agriculture & Technology, Pahada, Udaipur
		78. National Research Centre on Seed Spices Tabiji, Ajmer
		79. Directorate of Rapeseed-Mustard Research Sear, Bharatpur
		80. Rajasthan University of Veterinary and Animal Sciences, Near Deen Dayal Upadhyay Circle, Bikaner
		81. Post Graduate Institute of Veterinary Education & Research, N.H. 11, Agra Road, Jamdoli, Jaipur
		82. Central Sheep and Wool Research Institute, Avikanagar, Malpura, Tonk
		83. College of Veterinary & Animal Science, Navania, Vallabhnagar, Udaipur
20	Tamil Nadu	84. Cotton Research Station (CRS), Srivilliputhur
		85. Tamil Nadu Agricultural University, Coimbatore
21	Telangana	86. ICAR - Central Research Institute for Dryland Agriculture, Hyderabad
		87. RARS, Warangal

S.No.	State	Name of AU/Research Station identified by States for NF Model Farm
		88. ARS, Kunaram
		89. RARS, Palem
		90. HRS, Mallial
		91. ARS, Karimnagar
22	Tripura	92. State Agriculture Research Station, Arundhatinagar, Agartala, West Tripura
23	Uttar Pradesh	93. Chandrashekhar Azad University of Agriculture and Technology, Kanpur
		94. Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut
		95. ICAR-Indian Institute of Farming Systems Research, Modipuram
		96. Acharya Narendra Dev University of Agriculture and Technology, Kumarganj, Ayodhya
		97. Banda University of Agriculture and Technology, Banda
24	Uttarakhand	98. GBPUAT, Pantnagar
		99. ICAR-Indian Institute of Soil & Water Conservation, Dehradun
25	West Bengal	100. Uttar Banga Krishi Vishwavidyalaya, Pundibari, Cooch Behar
		101. Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia

70°0'0"E

80°0'0"E

90°0'0"E



INDIA

Natural Farming Model Farms (Agro Climatic Zones)

30°0'0"N

20°0'0"N

10°0'0"N

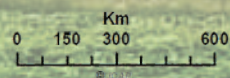
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Agro-climatic Zone

1. Western Himalayan Region
2. Eastern Himalayan Region
3. Lower Gangetic Plain
4. Middle Gangetic Plain
5. Upper Gangetic Plain
6. Trans Gangetic Plain
7. Eastern Plateau & Hills
8. Central Plateau & Hills
9. Western Plateau & Hills
10. Southern Plateau & Hills
11. East Coast Plains & Hills
12. West Coast Plains & Ghat Region
13. Gujarat Plains & Hills Region
14. Western Dry Region
15. Island Region

Legends

- Research Farm (in Progress)
(Names are provided in black in the map)
- Farmers Farm (in Progress)
- Research Farm (Proposed)
- Farmers farm (Proposed)



Map not to exact scale