# NATURAL FARMING

## Principles and Practices for the Master Trainers of Natural Farming

National Institute of Agricultural Extension Management (MANAGE)
(An Autonomous Organization under the Ministry of Agriculture and Farmers Welfare, Govt. of India)
Rajendranagar, Hyderabad 500 030, Telangana, India
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## About the Publication

The study material on Natural farming - Principles and Practices for the Master Trainers of Natural Farming was prepared with the help of contribution of different resource persons from NCNF, RRA-N and practitioners who shared their experience in the online training programme conducted for Master Trainers titled "Introduction to Natural Farming – Principles and Practices by MANAGE from 5 to 9 April, 2022.

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## Foreword
## Director General, MANAGE

Many high-yielding varieties (HYVs) and new technologies were introduced through Green Revolution to increase agricultural productivity. This increase in productivity helped the country to become self-sufficient in food production and to mitigate hunger and poverty. However, post green revolution has many challenges such as deterioration of soil health, depletion of water table, unsustainable food production, deterioration of ecology, environment, health, etc. In order to overcome the challenges, several initiatives were taken by the central and state governments in India. The Hon'ble Prime Minister of India Shri. Narendra Modi Ji has also highlighted "Need to take farming out of chemistry lab and connect it to nature's lab" in the National Conclave on Natural Farming at Gujarat on 16th December, 2021.

Government has also launched a special programme Bharatiya Prakritik Krishi Paddhati Programme (BPKP) as a centrally sponsored scheme – Paramparagat Krishi Vikas Yojana (PKVY) to promote natural farming. In this context, the National Institute of Agricultural Extension Management (MANAGE) was designated as the Nodal Organization and Knowledge Repository especially for promotion of Natural Farming.

As part of this, MANAGE has conducted an online training program for Master Trainers on Natural Farming during 5-9 April, 2022 with the help of National Coalition of Natural Farming (NCNF) and RRA - Network as partners. These Master trainers will be engaged in conducting 750 Online Workshops to create awareness to 30,000 Gram Pradhans on Natural Farming across the country from 1st April, 2022 to 15th August, 2022 as part of Azadi Ka Amrit Mahotsava.

As part of the Master Trainers Program, a study material titled "Natural Farming – Principles and Practices" was prepared for Master Trainers with the help of NCNF and RRA-N. The topics such as Natural Farming & Agro ecological Principles, Commonalities and differences in various practices, Regenerative Soil Management, Bio Stimulants, Water Use Efficiency, WAAPSA, Ecological Management of Pest and Diseases, Seed Management, Diverse Cropping System, Livestock Integration, Value Chain Development, Extension Approaches, etc., will be helpful for stakeholders, extension professionals of the line departments, scientists of KVKs and SAUs, ICAR institutes, officials of NGOs, FPOs, FPCs, entrepreneurs etc.

I congratulate the team at the Centre for Climate Change and Adaptation (CCA), MANAGE for successfully organising the Online Workshop and thank all the NCNF and RRA-Network partners for their contribution in bringing out a useful study material for the benefit of all the stakeholders of natural farming.

27.04.2022 Signature

## Content Page



### List of Cases

# Natural Farming - Principles and Practices

**Introduction :**
Across the Indian states, lakhs of farmers are now switching over to adopt agro-ecological practices to sustain their livelihoods. While some are driven by revived interest in moving back to traditional practices, majority are driven by the need to move away from high input use and reduce costs of cultivation.

The serious ecological and economic crisis in the farming community in India and other countries has led to evolution of new models of agriculture. The main objective of this ecological movement is based on principles of agroecology viz; a) local context (soil, weather, and available water) based cropping/farming systems and seed varieties/animal breeds, b) improving soil structure and fertility by organic means, c) preventive care to manage pests and diseases, d) effective use of locally available resources.

These sets of practices have evolved from reinterpreting the traditional farming practices with modern scientific learnings. As many believe this is continuation of the old traditional practices which are not relevant today but contemporary innovations with new science of ecological farming evolved at different nodes by farmers, civil society organisations and few agriculture scientists.

The initiatives are called variously as Sustainable ecological farming, Natural Farming, Organic Farming, Agroecology, Regenerative Agriculture, Sustainable Agriculture, Biodynamic Farming, Permaculture, SPNF, ZBNF etc. Various alternatives to the existing agriculture practices have emerged over the decades. At the core of it all, these have emerged out of a need for an efficient farming practice that is local, resilient and adaptable agro-ecological farming practice.

“Natural Farming is hence understood by us as the direction and process of transition towards a more local, resilient and adaptive agro-ecology based farming.”

Irrespective of the different farming models, at the core, all of these schools of thoughts have the following principles in common :

A. Using natural locally found products and inputs which the farmer can make on their own or buy from their local region
B. Increase cropping intensity through multiple cropping systems
C. Increasing soil organic matter
D. Increasing soil health particularly microbial population

Whereas the following are differences between them :

A. Degree of internalisation of input production within the farm
B. Usage of microbial preparation
C. Crop choices
D. Narratives

**What is essential to practice Natural Farming?**

1. Knowledge of the practices (in such a way that the farmers have the space and power to make their own decision based on their contexts)
2. Technology that is beneficial now and for the next 50 years minimum
3. Scientific understanding of the biological systems and the natural processes happening in nature
4. Creating values beyond yield, inputs and products; which embraces diversity, and supports the systemic transition process

**Core approaches to be looked into for practicing Natural Farming :**

1. Water and Moisture Management
    - Cropping pattern must be based on the local water resource and weather parameters
    - Rainwater harvesting practices such as grid block, trenches, ponds etc must be adopted
    - Harvest atmospheric moisture by increasing soil cover, designing cropping patterns for 365 days
    - Increasing soil water and moisture holding capacity by increasing soil organic matter
    - Improving water use efficiency through micro-irrigation systems, life saving irrigation plans, efficient cropping systems
    - Monitoring weather and soil moisture

2. Adaptive cropping systems
    - Cropping patterns based on soil types, water and weather parameters
    - Increasing cropping intensity (horizontal and vertical) through crop rotations and inter/multiple/poly crops
    - Designing farms taking an integrated farming systems approach
    - Managing living roots and green cover for 365 days
    - Staggered production system for fresh fruits and vegetables

3. Sustainable Soil Nutrient Management

Soil quality indexes such as the physical factors (soil structure, water holding capacity etc), chemical factors (EC, pH, Available nutrients etc) and Biological factors (Organic microbial diversity, soil fauna etc) are to be managed

- Prevent erosion
- Prevent compaction; minimising tilling, shift to animal drawn tools
- Manage soil salinity and pH; Organic amendments, cropping pattern changes, increasing soil organic matters
- Increasing soil organic matter; composting, mulching, manuring

- Biological nutrient management using homemade bio-fertilisers, Effective Microorganisms (EMOs)/Indigenous Microorganisms (IMOs)

4. Organic seed system
    - Identifying, conserving and documenting local diversity; mapping and characterisation
    - Participatory varietal selection to establish value for cultivation and use: Diversity blocks, generating data on local performance, user preferences, seed catalogues etc
    - No GMOs to be used due to biosafety issues
    - Organic seed hub; Manage parental lines, maintain breeding, training, capacity building on seed production, coordinating between conservators, breeders, seed producers and markets
    - Institutionalising production and distribution through community seed banks, community seed enterprises, farmer service centres for local production and distribution
    - Open source seed licensing; arrangements that facilitate and preserve freedom of access and use of plan genetic material, prohibit exclusive rights and apply to any subsequent derivatives of those materials
    - Creating value for diversity by developing processing and value addition in production to increase use

5. Integrating livestock to increase soil organic matters and for production of inputs

6. Non Pesticidal Management
    - Integrating management practices to prevent insects, diseases and weeds from reaching damaging stage or proportions
    - A natural ecological balance will ensure that pests do not reach a critical number in the field that engages the yield
    - Nature can restore ecological balance if it is not meddles with too much, hence no chemical pesticides at all
    - Understanding the insect biology and crop ecology is important to take up right management practices - botanicals or microbials, farm made or commercial
    - Pest surveillance : Farm level and village level surveillance to identify pests and disease using various traps to give alerts and advisories
    - Simple tools such as flip charts, apps, manuals etc for problem diagnosis
    - Building local entrepreneurship for production and sale of bio-fertilisers and inputs
    - Weekly advisories based on local surveillance

**Understanding different farming models**

**Natural Farming** : Largely relies on farm made products; i.e, the inputs used in farming are made on farm using the locally found resources

**Organic Farming** : Largely relies on farm made inputs however when local inputs are not available, commercially organically produced bio-inputs such as biofertilizers, biopesticides etc are adopted.

**Agroecology** : Farming that centers on food production which makes the best use of nature's goods and services while not damaging these resources.

**Permaculture** : Approaches farming from a design perspective which relies on the land characteristics. Farm efficiency is increased through optimised and efficient design principles.

**Sustainable Agriculture** : Farming practiced in sustainable ways, which means meeting society's present food and textile needs, without compromising the ability for current or future generations to meet their needs. It can be based on an understanding of ecosystem services.

**Agroforestry** : An intensive land management system that optimizes the benefits from the biological interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock.

**Biodynamic Farming** : Farming based on natural processes and stellar movements

**Climate Smart Agriculture** : A model that approaches farming from the perspective of building climate resilience through climate mitigation, adaptation and resilient practices. The focus here is on building climate resilience and not on the products used.

# Soils - Perspective in Natural farming

Soil is fundamental to crop production. Without soil, no food could be produced on a large scale, nor would livestock be fed. Because it is finite and fragile, soil is a precious resource that requires special care. Many of today's soil and crop management systems are unsustainable. At one extreme, overuse of fertilizer has led, in the European Union, to nitrogen (N) deposition that threatens the sustainability of an estimated 70 percent of nature[1]. At the other extreme, in most parts of sub-Saharan Africa, the under-use of fertilizer means that soil nutrients exported with crops are not being replenished, leading to soil degradation and declining yields. This means that **ESSENTIALLY SOILs ARE DYING**!!!!

## 1 HOW CAN WE BRING BACK 'LIFE' INTO THE SOIL?

*It has always been seen as a debatable topic on how is it possible?*

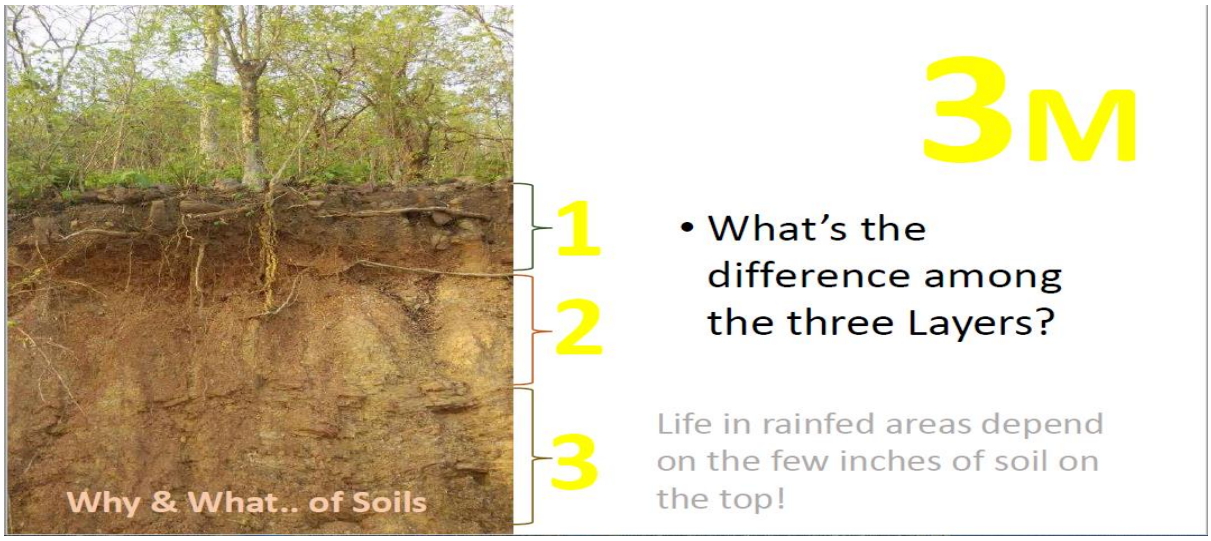
One of the possible solutions is using Compost applications like Farm Yard Manure (FYM), Vermicompost, NADEP compost, Industrial compost, Green Manure & using Soil conservation. However, all these solutions require Cow dung & with the decreasing use of livestock in comparison to the land where most of the degradation happens. The challenge is over adequacy & spread to limited areas & crops.

## 2 DOES THAT MEAN WITHOUT LIVESTOCK WE CAN'T ADDRESS THE SOIL ISSUE…?

*Nature has made it possible using the following rejuvenation method*

## 1. Understand the soil - the 'WHY' & 'WHAT' part

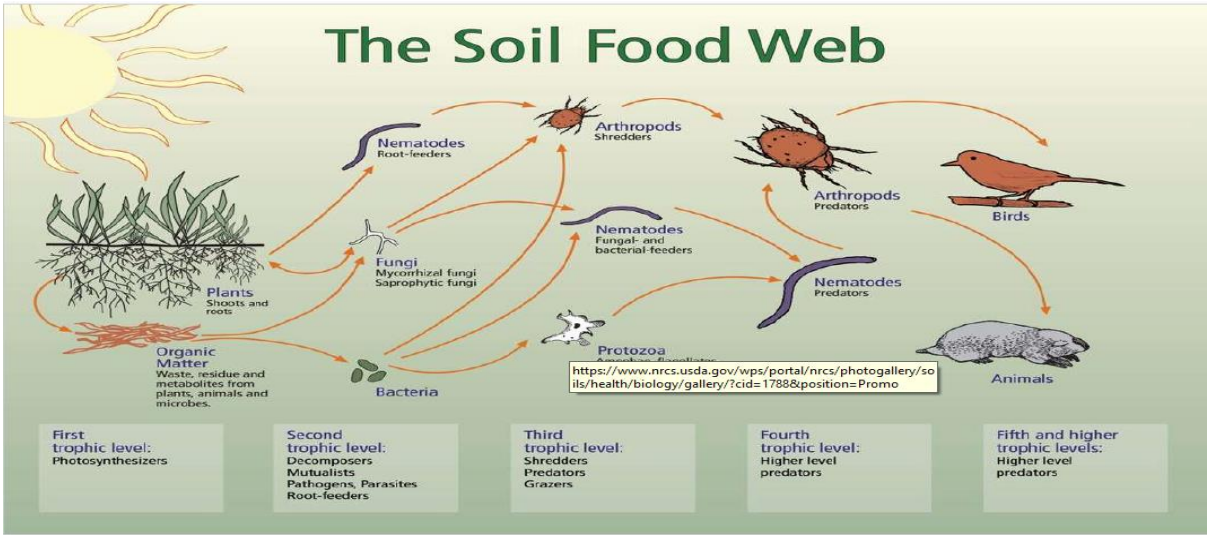
Trees needs moisture for the entire season whereas there is rain for only 35 days. Therefore, rainfall is captured by the topmost layer (1) where the max. microbial activity takes place. Through the organic matter, the water penetrates through the roots and ensures productivity & food security. It also helps to harvest & retain water for longer period.




Strategies to incorporate:

- Reduce the soil temperature by crop cover at the top for 365 days/long period.
- Reduce surface hardness for rainwater to infiltrate into the soil
- Increase more organic matter in the root zone which can help to harvest more water.
- Increase the root zone for penetration to take place.

## 2. Role of life in soil – The Living Roots

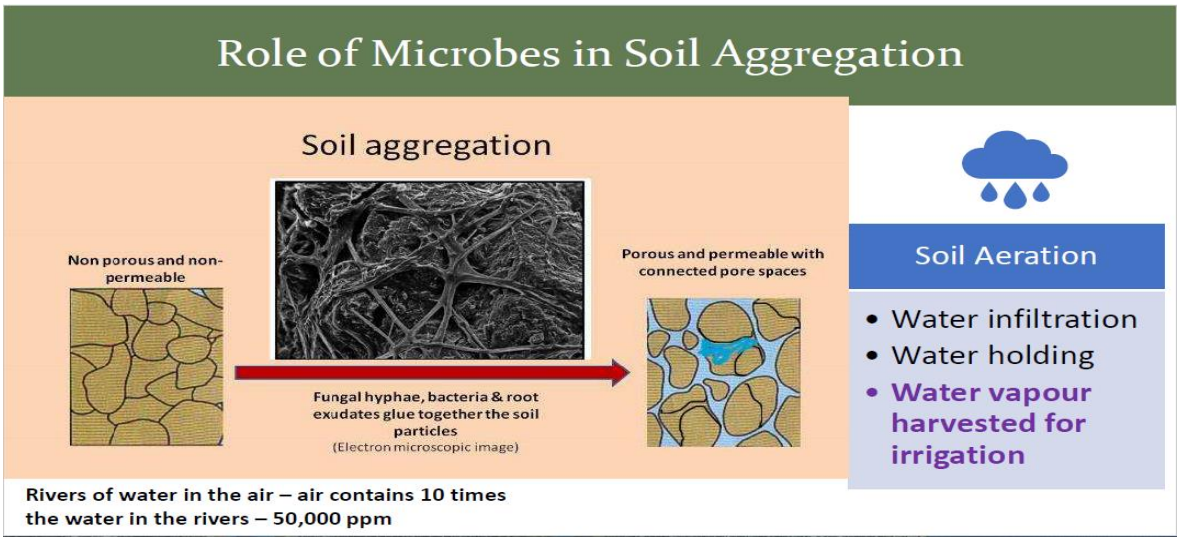



Here comes the food web above the ground & below the ground. The pictures show multiple micros & macro-organisms like earthworms, bacteria, fungi etc present in the Soil. The system of Soil biology is interlinked where one is dependent on the other for survival. Therefore, it is important to ensure such a food web for better health of the soil.

## 3. Role of Microbes in Soil aggregation

Normally, Soil without any organic matter is considered as dirt which are tightly packed to restrict the infiltration of water & are resembled as **Nonporous & Non-permeable.** Whereas the soil with organic matter like fungal hyphae or bacteria helps in the formation of porous spaces, thereby leading to increase in the absorption of water. Therefore, water adheres to the surface of particles or organic matters leading to water infiltration & increase in the holding capacity.

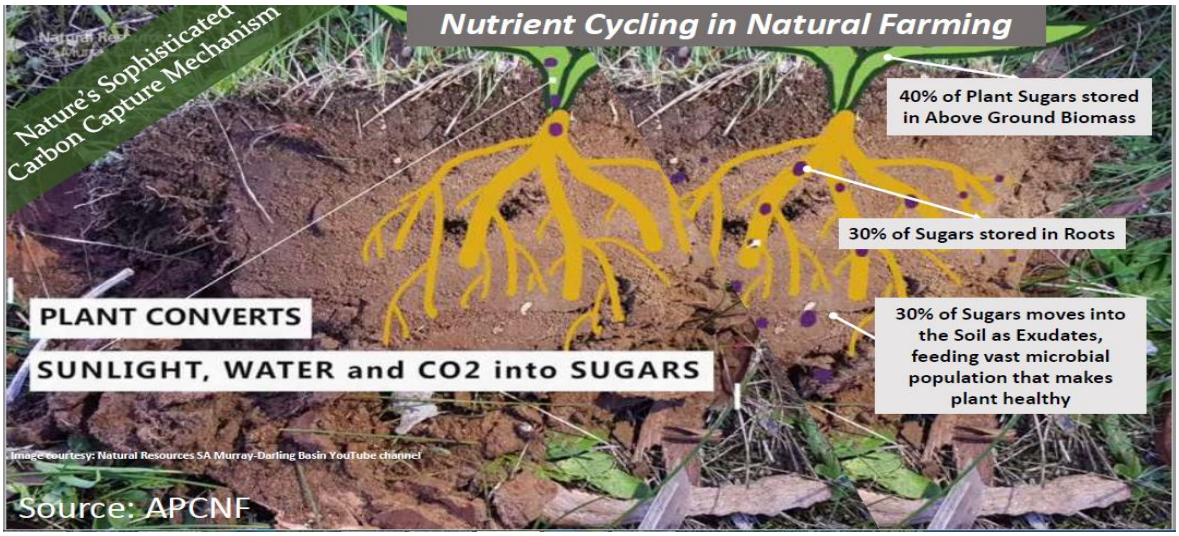
Surprisingly, these microbes also help to **retain moisture** from the air which is termed as **Whapasa by Subhas Palekar in ZBNF** (Zero Budget Natural Farming).




## 4. Nutrient cycling in Natural farming

This concept is associated with the **living roots.** The theory behind it is plant produce Sugar. Out of the total plant sugar produced, 40% of the plant sugar are stored at the ground biomass either in the form of grain or leaves. The remaining 30 % of the sugar are stored in roots. From that 30%, 1/3$^{rd}$ of the sugar is released into the soil as Exudates which feeds the vast microbial population that makes plant healthy. This leads to a system of **interface between the Root, Soil & Microbes**. Therefore, we can say that more diverse cropping system can contribute to better condition of the soil at a faster rate.

Even after harvesting, if the roots are alive in the soil, the bacterial association will happen making the soil fertile. Scientifically, 1gm of carbon can hold 8 gm of water. Hence, more of the carbon content, will lead to more holding capacity of water in the soil.




## 5. Crop variety- POLY CROPPING

Crop diversity is an integral part of Natural farming where Poly-cropping plays an important role. It emphasizes on growing 8-10 crops to generate *situ biomass* which helps in mulching at various stages & improves the soil health. It is easier to produce the same amount of biomass through Poly-cropping both above & below the soil without even using compost. That's why, natural farming focus is higher towards *situ biomass production*.

*Cowpea and field beans grown as intercrops in Mango orchard*

Some of the benefits of Polycropping includes:

- Resilience from vagaries of weather
- Reduces risks & generates surplus income
- Provides nutrition diversity
- Strengthens soil structure

### 6. Bio-stimulants as necessary catalysts

Use of bio-stimulants increases plants tolerance to and in the recovery from abiotic stress. Mostly, it improves the quality of the produce & helps in the management of pest & diseases.

## 3 KEY LEARNING

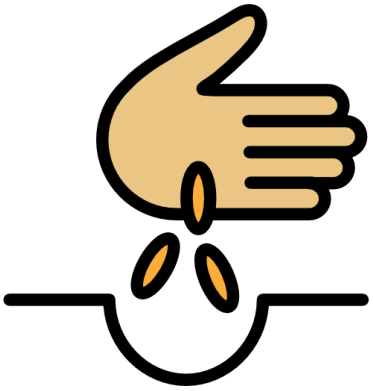
Natural farming Strategy - **In Soil Organic matters**

| Requirement | Strategy |
|---|---|
| ● Increase in soil organic matter (soil sponge) | ● In situ biomass generation through crop system |
| ● Reducing evaporation, hardening of soil surface | ● Soil cover, mulch, surface not exposed to direct sunlight |
| ● Reducing soil temperature and desiccation of organic matter | ● Soil cover 365 days |
| **Life in Soil & Microbes** | |
| ● Enhanced biological activity in soils | ● ***Living Roots****; Of Diverse crops, deep & shallow rooted* |
| ● Enhanced microbial activity | ● **Bio-Stimulants:** Beejamrutam<br>● **Jeevamrutam,** (Ghana /Liquid) – soil & foliar applications |
| ● Less disturbance to soil | ● Light/ no till |
| **Soil Conservation** | |
| ● Erosion through runoff | ● Soil conservation - measures |
| | ● Harvesting soils – stream terraces |
| | ● Earthen/ pebble – Bunds |
| | ● Lower velocity of runoff- safe discharge |

***Bibliography:*** *Dubey, A. (2019). Soil microbiome: a key player for conservation of soil health under changing climate. Springer Link, 2405-2429.*

# Seed System in Natural Farming

For streamlining landraces in our cropping system first of all we need seeds of landraces which are mostly at present distributed and multiplied by informal methods with no proper Standard Operating Procedures (SOPs) for checking the quality parameters and multiplication of seeds.

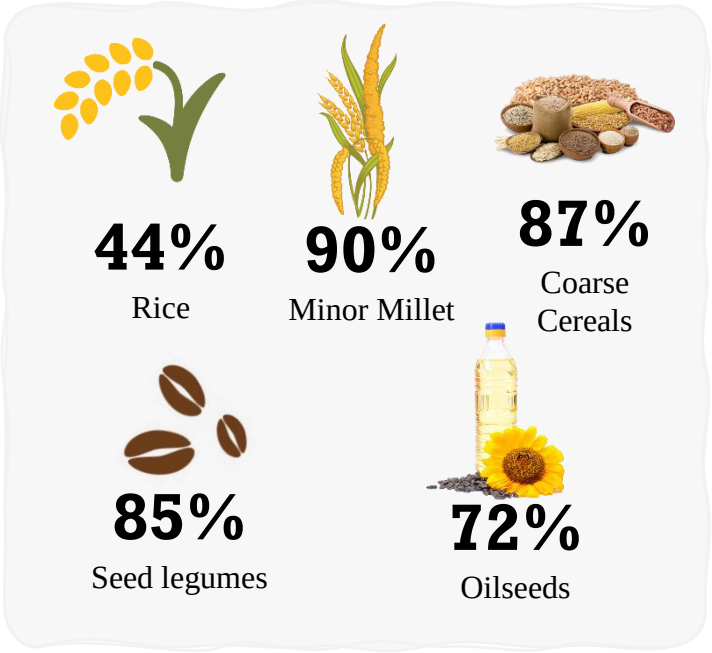


Cultivation of landraces and wild species are required for enhancing nutrient contents in our food and enhancing. We should give emphasis on landraces for the following reason.

- Enhancing nutritional and end use quality.
- Increasing resistance to insects, diseases and parasitic plants.
- Improving tolerance against adverse climatic conditions.

**40%**
Rainfed Area

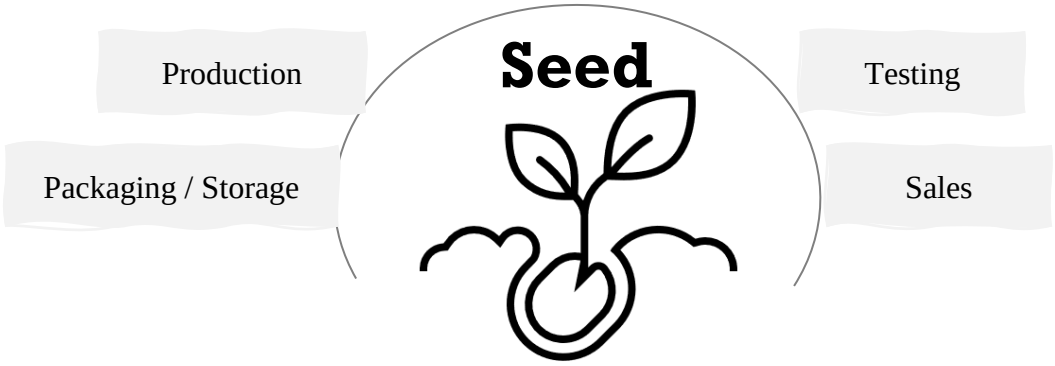
*Which comprises,*




Which do not have any quality parameters for seeds. Because mostly these landraces are not considered as new varieties.

## PROCESS FOR ESTABLISHING SEED SYSTEM OF LANDRACES

*The proper steps to provide quality seeds of landraces to farmers include*




There are **two types of system** for conservation of bio-resources

- ***In situ* conservation:** It is conservation of germplasm in original habitat. Here wild species, wild relatives, landraces and traditional varieties are conserved in biosphere reserve, National parks, Gene sanctuaries and on farm trials.
- ***Ex situ* conservation:** It is conservation of germplasm outside its natural habitat either in field gene bank such as crop gene bank, arboretum, herbal garden and botanical garden or *In vitro* gene bank such as seed gene bank, cryo- gene bank and DNA bank.

*The key processes for preparation of SOPs for seed system of landraces are,*

- Standardizing characters with minimal descriptors for landrace documentation.
- Evaluation of landraces for yield, pest resistance, nutritional value, climate resilience and no chemical inputs to release in those areas.
- Preparing guidelines for certification of seed standards of landraces.
- Preparing package and practices for seed production of landraces.
- Release of landraces by apex committee under Agriculture Production Commissioner (APC) cum Additional Chief Secretary (ACS)/secretary Department of Agriculture & Farmers' Empowerment (DAFE) which is facilitated by Central Variety Release Committee (CVRC) at national level.
- For seed production and certification, the exclusive rights should not be given to an individual.
- All the public infrastructure institute will be utilised for technical support on the production programs and maintenance breeding.
- Package of practices will be developed in association with experts NGOs (MSSRF, SAMBHAV, WASSAN, RRA network etc.) and FPOs that has traditional knowledge.
- All the data related to landraces and operations will be managed through an open-source digital platform.
- Landraces Seed Centres at block level by FPOs to get registered to enhance quality seed supply at community level.

- Paras Seed Certifiers at village level will be trained by different public institutions and universities to support certification of seed production of landraces at local level.
- We will popularise the landraces in a locality by developing Biodiversity Blocks and conducting field days of farmers and selection of landraces based on farmer's suggestions and also conducting seed mela.

# Roles, Types and Methods of Preparation of Bio-Stimulants

There are **Four wheels** of Natural Farming

**BEEJAMRUTHAM**

which means seed treatment. It eliminates soil born and seed borne diseases. Microbial seed coating through cow urine and dung-based formulations.

**ACHHADANA**

Ground to be kept covered with crops and crop residues as mulching.

**JEEVAMRUTHAM**

Enhance soil microbiome through an inoculum of cow dung cow urine and other ingredients.

**WAAPHASA**

Fast build-up of soil humus through ZBNF leading to soil aeration and water vapor harnessing. Sending carbon dioxide in the form of organic carbon.

## 2 RESULTS

- Higher yields, diverse crops and lower costs
- Enhanced soil fertility
- Soil carbon enhancement
- Reduce water requirement for crops, harnessing atmospheric water
- Resilience to climatic shocks

## 3 PLANT CONVERTS SUNLIGHT, WATER AND $CO_2$ INTO SUGARS

- Nature's Sophisticated Carbon Capture Mechanism
- 40% of Plant sugars stored in Above Ground Biomass – in stem, leaves, fruits.

- 30% of sugars stored in Roots
- 30% of sugars moves into the soil as Exudates, feeding vast microbial population that makes plant healthy – release into the soil.

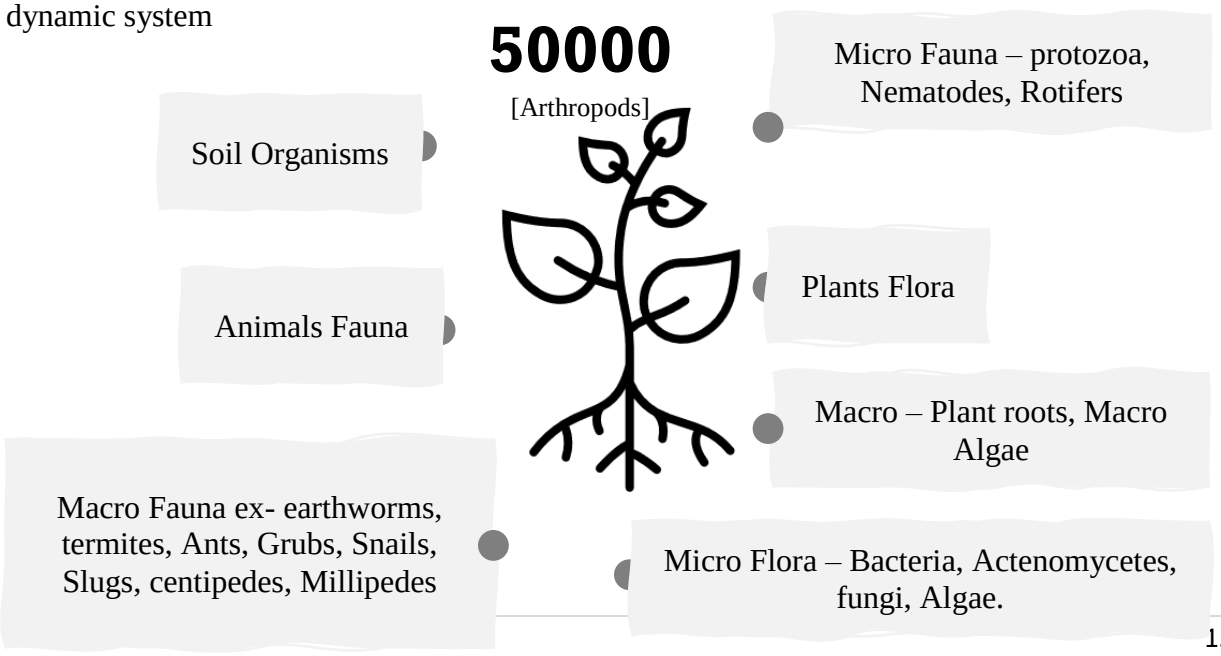
There are billions of microbial organisms that lives in the soil, by adopting chemical farming we are not giving them food. Through natural farming we can provide food and nutrients to the plants.

Humus is increasing every year. Organic carbon content can be increased by natural farming.

## 4 SOIL CONTAINS ENORMOUS NUMBERS OF LIVING ORGANISMS

One Mug of Undisturbed Native soil may contain,


The soil is teeming with millions of living organisms which make it a living and dynamic system

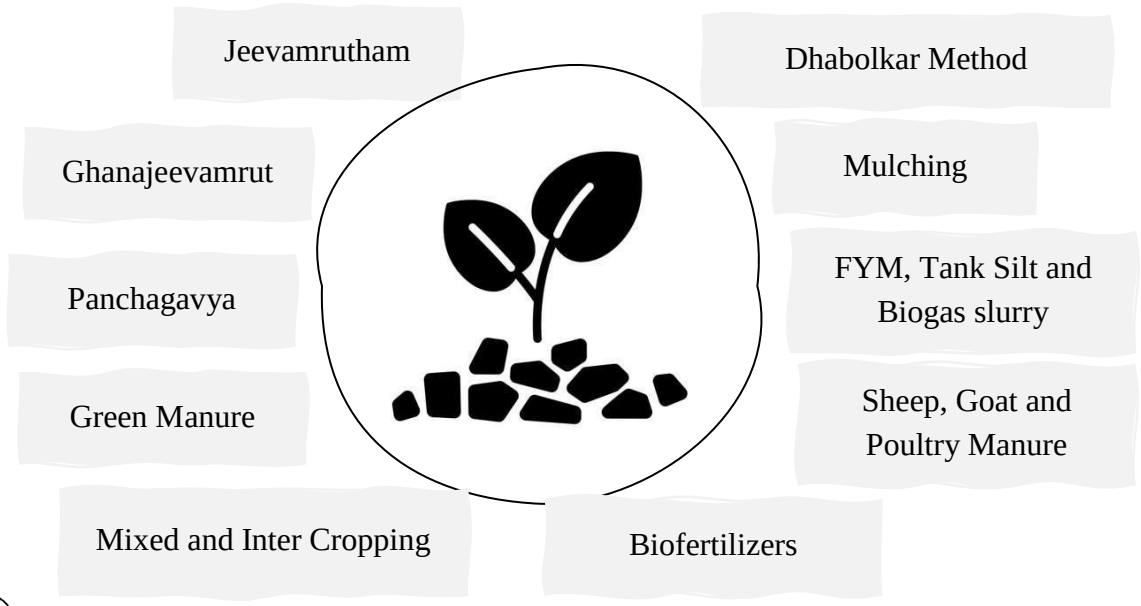


## 4 CONCEPT - SOIL FERTILITY MANAGEMENT THROUGH NATURAL MEANS

**Soil to be treated as** "LIVING MEDIA"

- Returning crop residues to soil through animal route / directly
- Dung to be viewed as source of microbial inoculum – need not be dump tons
- Enabling environment for returning of earthworms

**Soil Fertility Management Methods**




## 5 MIXED CROPPING

- Combination of deep rooted and shallow rooted crops (e.g. Groundnut + Pigeon Pea)
- crops of different duration (Pigeon Pea and maize)
- Hosting natural predators (Cotton + Black gram/ Green Gram, Cow Pea host Spiders and beetles)

## 6 MULCHING

- Mulching is nothing but keeping the soil always covered. It is covering the soil with some crop.
    - Farm waste can be used as mulch
    - Rainwater overflows on uncovered soil. Mulch prevents loss of rainwater
- Mulching also prevents evaporation of moisture from the soil and it allows water to percolate into the soil.

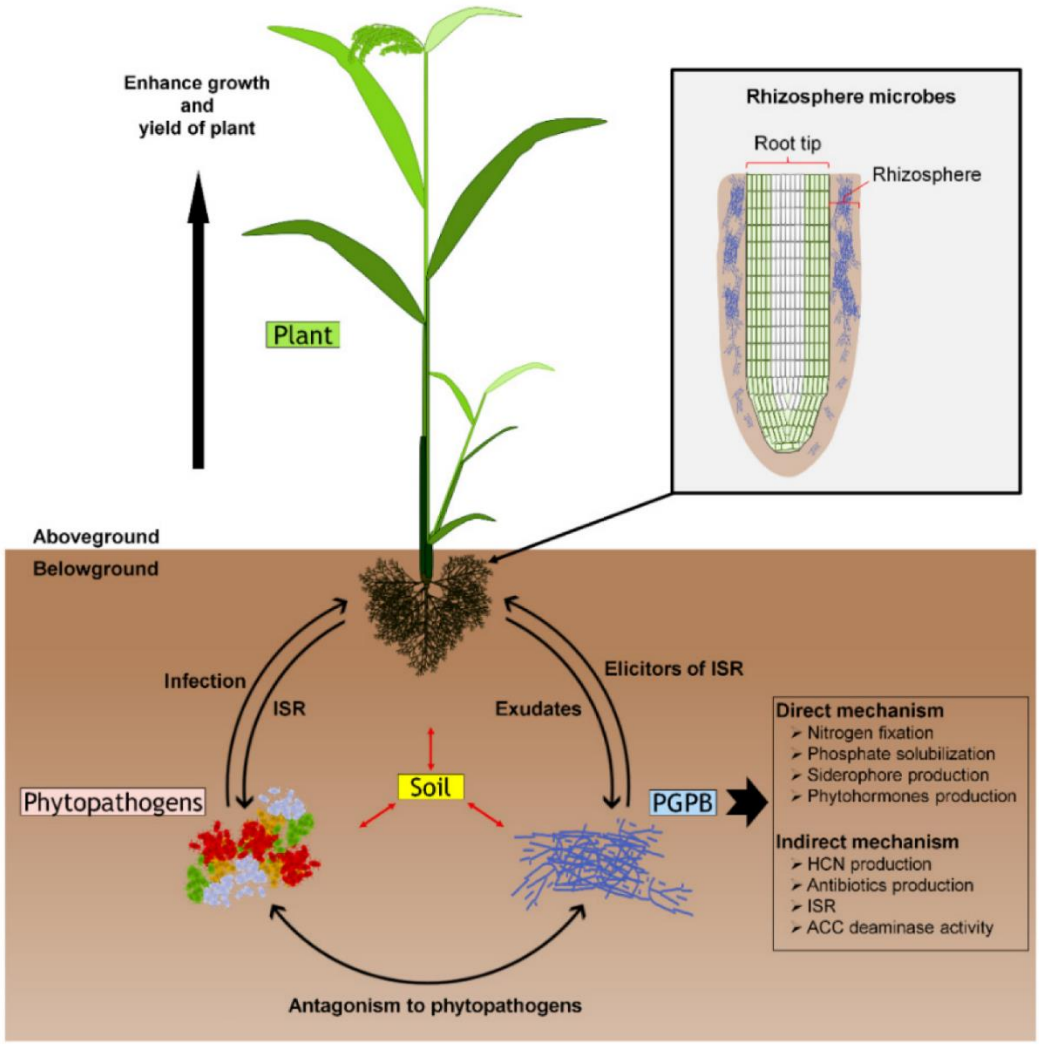
# Plant Protection Approaches in Natural Farming

## 1 AGROBIODIVERSITY

- Agrobiodiversity is the biodiversity related to cropping systems and/or farming systems which is further divided into above ground biodiversity and below ground biodiversity. Above ground biodiversity consists of crops, beneficial insects, pollinators, pests, birds and other vertebrate animals. Similarly, below ground biodiversity consists of bacterial, fungi, protozoa, nematodes, insects, rodents etc.
- There is linkage between Above Ground Biodiversity and Below Ground Biodiversity. Each strain and species of microorganism living in the rhizosphere have great affinity with particular species of plant. This has been coming since long time and part of evolution.
- Crops cultivated from desi (Land races or heirlooms) seeds have this type of association with bacteria. That is why the use of desi varieties is much relevant in the natural farming. Below Ground Biodiversity plays major role in soil fertility.
- Below Ground Biodiversity is 10 time more than that of Above Ground Biodiversity. Science has strong evidence that microbes such as Mycorrhizal fungi and Plant Growth Promoting Rhizobacteria (PGPR) help plants to deal with biotic and abiotic stress through plant growth promotion and induced resistance. Below ground microbes interact with above ground biodiversity such as plants (herbivore insects, their natural enemies and pollinators), in a bidirectional way.
- Beneficial soil organisms perform many beneficial functions which influence soil fertility and plant health. Beneficial bacteria release organic acids which are useful in solubilization of mineral elements of the soil. Bacteria also release complex polysaccharides that support in making of soil aggregates. Soil aggregates give soil to structure.
- Other beneficial soil microorganisms such as the Actinomyces release antibiotics into the soil. These antibiotics are taken up by the plant to protect it against pests.
- Fungi perform beneficial functions in soils. Mycorrhizal fungi supply trace elements and water to plant roots. Other fungi decompose crop residues and vegetative organic matter and release nutrients. Many of the organic compounds released by fungi help in the formation of humus and soil aggregates.
- Beneficial soil dwelling animals create tunnel like channels in the soil which are source for water percolation and air circulation. Soil dwelling animals also help in the formation of humus and balance the concentration of soil microorganisms within the food web. Thus, a living soil is a fertile and healthy soil.

## 2 PLANT IMMUNITY

- In natural farming, plant protection is done by natural phenomenon by plant immunity and push -pull effect of insects by crop diversity. The plant immunity is depending on the humus content and microbial diversity in the soil and plant (Rhizopsheric bacteria and Phyllospheric bacteria).
- Plants usually develop direct defence against insect herbivores and indirect defence to promote the effectiveness of natural enemies of insect herbivores. This is done by soil microbes. Many useful soil borne microbes (e.g. Root endophytic fungi, mycorrhizal fungi, plant growth promoting fungi, rhizobacteria and rhizobia) exert positive effects on plant growth and survival through direct and plant mediated mechanisms. These mechanisms promote plant growth and Induce Systemic Resistance (ISR) in plant. This is observed in case of natural ecosystems.
- Plant Growth Promoting Rhizobacteria (PGPR) favor plant growth notably by facilitating nutrient availability and modulating the host's hormonal balance but also display plant protective activity toward pathogen ingress. This biocontrol potential relies on several traits including the ability to efficiently compete for space and nutrients with pathogens, a strong direct antagonistic activity based on secretion of low-size antimicrobials or hydrolytic enzymes and the capacity to stimulate induced systemic resistance (ISR).
- ISR is a systemically expressed resistance state that renders the host less susceptible to subsequent infection, and it is of great interest from an agronomical perspective because effective against a broad spectrum of microbial pathogens, nematodes, and insects.
- Most of the well-characterized PGPR elicitors are soluble compounds, but some Volatile Organic Compounds (VOCs) were as well-reported to induce systemic resistance in the host plant, showing that these metabolites can also act as infochemicals involved in inter-kingdom communication.



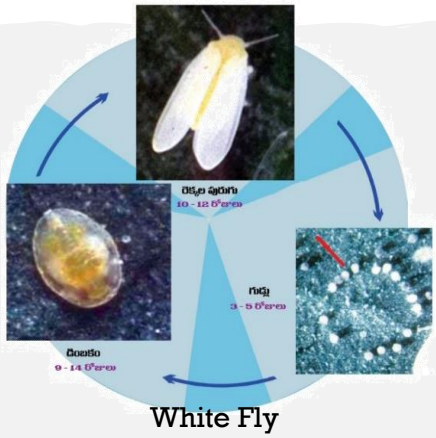

*Courtesy and Reference: Mohamad Syazwan Ngalimat et al. Microorganisms 2021, 9(4), 682*

***Example:*** Biological control interactions exerted by the plant growth-promoting bacteria (PGPB). This illustration depicts the interactions between PGPB, phytopathogens, and plants. PGPB promote plant growth either by direct and or indirect mechanisms. PGPB colonize plant's rhizosphere and produce antimicrobial metabolites. In the plant's rhizosphere, antibiosis and nutrient competition interaction suppresses the growth of phytopathogens. Elicitors of Induced Systemic Resistance (ISR) production by PGPB and in the simultaneous presence of phytopathogens enhanced the plant ISR.

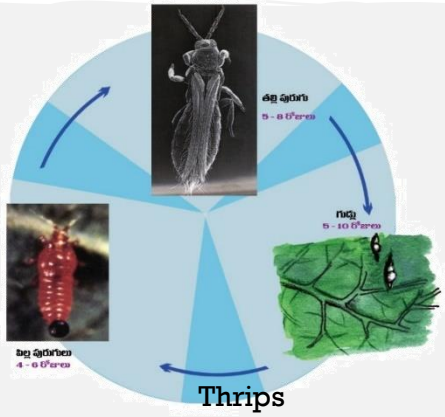
Thus, this mediated defense response of plants towards phytopathogens and consequently enhanced plant growth and health.

# 3 INSECT PESTS AND THEIR MANAGEMENT APPROACHES IN NF

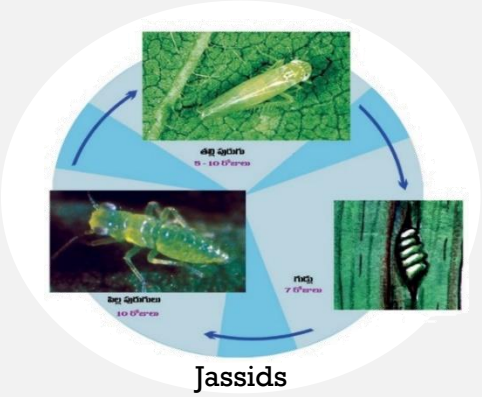
We need to understand the lifecycles of insects, critical stages of damage and their threshold levels, before going to control any pest. In natural farming, pests are naturally controlled /managed by natural enemies and pathogens. As discussed, the plant defence mechanism and immune system plays a critical role in plant protection, besides presence of natural enemies in the crop ecosystem.



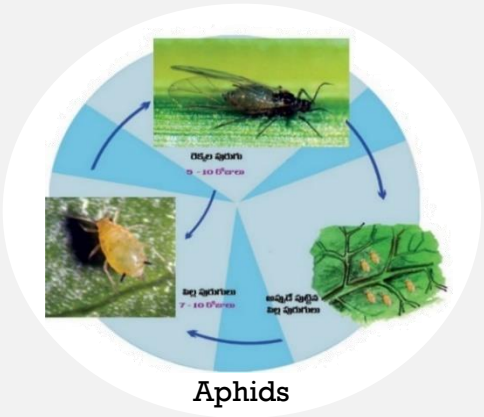
White Fly



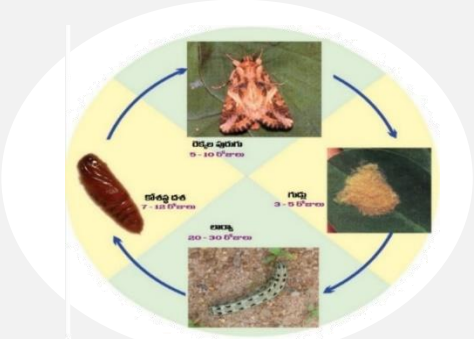
Thrips



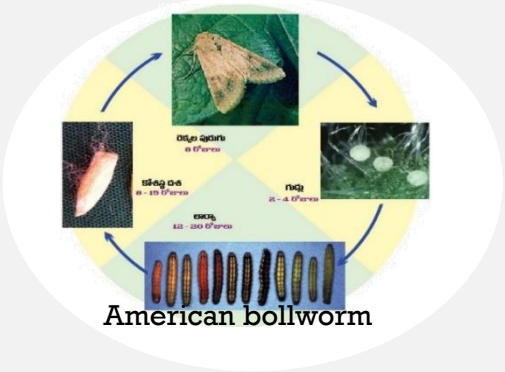
Jassids



Aphids



Tobacco cutworm



American bollworm

In natural farming, there are only preventive approaches followed to minimise the pest incidence and reduce the crop damage. In case the pest population crosses threshold level, there are few curative measures by timely application of botanical concoction or by natural solutions.

**The following are PREVENTIVE APPROACHES**

- Seed Treatment with Beejamruth.
- Spraying of Panchagavya (Both growth promoter and pest and disease resistant)
- Push-pull strategy by crop diversity
- Border crops
- Trap crops
- Yellow, white, Blue sticky plates
- Light traps
- Pheromone traps
- Bird perches

# [a] BEEJAMRUTH

Preparation of Beejamruth and seed treatment is important in Natural farming. The following ingredients, methodology and usage should be followed to control pest and diseases and also to promote uniform germination.

| | |
|---|---|
| **Ingredients** | ● Water – 20 ltrs<br>● Desi cow dung - 5kgs<br>● Desi cow urine - 5 ltrs<br>● Edible calcium - 50 grams<br>● Bund soil - 200 gram |
| **Methods** | Take a Plastic Drum/ Mud Pot/ Iron Drum/ Cement Drum: Mix all the above stated ingredients by stirring it with a wooden stick in clockwise direction. Soak the solution overnight. Next day morning filter it with a nylon cloth and it can be used for seed treatment. |
| **Shelf Line** | 48 Hours |
| **Benefits** | ● Kills all disease-causing spores of seed borne diseases<br>● Kills insect eggs associated with seeds<br>● Induce germination, terminates hibernation<br>● Uniform germination<br>● Healthy crop |

| | |
|---|---|
| **Usage** | ● For trees, remove the plastic cover and dip the sapling along with soil material or if the soil material is loose, pour the Beejamrutham into the soil material before removing the plastic cover and wait for 30 minutes before planting it in the field.<br>● Cereals, Millets, all seeds of Gramineae family, Dicot Pulses, Leguminous family seeds, All vegetable seeds, spread the seeds on a plastic sheet and delicately spray the Bheejamrutham on them and delicately rinse them with hands such that their outer layer doesn't get spoiled. Let them dry in the shade for 30 mins and then can be sown<br>● Saplings, seedlings: Dip the roots in Bheejamrutham, wait for 15 to 30 mins and then can be planted.<br>● Tubers, Cuttings: Dip them in Bhejamrutham, remove them and dry them in shade for 15 to 30 mins and then can be sown. |

# [b] NEEMASTRA

As a prophylactic measure, at every 15 days or 20 days interval, Neemstra may be sprayed on the crop, in anticipation of any pest incidence. This will prevent egg laying, prevent egg hatching and also act as antifeedant against all sucking pests and early larval stages of lepidopteran pests. This can be used as both preventive and curative measure.

| | |
|---|---|
| **Ingredients** | ● Water - 200 litres<br>● Desi cow urine - 10 litres<br>● Desi cow dung – 2 kg<br>● Neem leaves with tender stems – 10 kg |
| **Method** | ● Grind the leaves and tender stems. Take water into a drum and mix all the ingredients.<br>● Stir the solution with a stick in clockwise direction for 10 mins and cover the drum with a gunny bag/Lid.<br>● Allow it to ferment for 48 hours. Stir it at every 12 hours. Filter it with nylon/muslin cloth and store it in a clean vessel<br>● Don't expose it to Sun light. |

| | |
|---|---|
| **Shelf Life** | 6 Months |

# [c] DASHAPARNI

Dashaparni is best cocktail botanical which contains wide range of botanicals from 10-20 plant species. This act as antifeedant and insecticide against sucking pests and larval stages of all lepidopteran pest (except borers). Though it is difficult to collect various leaves, it is more superior to other botanical concoctions.

| | |
|---|---|
| **Ingredients** | ● Water - 200 litres<br>● Desi cow urine - 10 litres<br>● Desi cow dung – 2 kg<br><br><u>Take 10 Types of Leaves out of the following 22 types of Leaves.</u><br>*(Note: First five types of leaves are mandatory).*<br>● Neem leaves Azadirachta indica - 3 kgs<br>● Karanj Leaves of Pongamia pinnata - 2kgs<br>● Seethaphal Leaves Annona squamosa - 2kgs<br>● Castor leaves Ricinus communis - 2kgs<br>● Datura leaves Datura metal - 2kgs<br>● Leaves of Calotropis procera - 2kgs<br>● Leaves of Vitex negundo - 2kgs<br>● Leaves of Datura stramonium - 2kgs<br>● Leaves of Nerium indica - 2kgs<br>● Leaves of Hibiscus rosa sinesis - 2kgs<br>● Mango leaves, Mangifera indica - 2kgs<br>● Leaves Lantana camara - 2kgs<br>● Leaves of Cassia tora - 2kgs<br>● Leaves of Guava, Psidium guava - 2kgs<br>● Leaves of Pomegranate, Punica granatum - 2kgs<br>● Leaves of Drumstick, Moringa oleifera – 2kgs<br>● Leaves of Coffee, Coffea arabica - 2kgs |

| | |
|---|---|
| | ● Leaves of Mahua, Madhuca indica - 2kgs<br>● Coco leaves, Theobroma cacao - 2kgs<br>● Leaves of Acacia nilotica - 2kgs<br>● Leaves of Psoralea corylifolia - 2kgs<br>● Leaves of Bitter Gourd, Momordica charantia - 2kgs<br><br><u>Other Grounded Leaves, Powders & Pastes</u><br>● Tulasi Leaves plus stem plus Branches (Basil, Ocimum tenuiflorum ) - 2kgs<br>● Marigold whole plant - 2kg<br>● Turmeric powder - 200 grams<br>● Ginger powder - 200 grams<br>● Tobacco powder - 1 kg<br>● Green chilli paste - 1kg<br>● Garlic paste - 0.5kg |
| **Method** | First take the grounded leaves of ten types and mix them in water. Soak them over night. Next day morning mix grounded Basil leaves, Grounded Marigold leaves, Turmeric powder, Ginger powder, Tobacco powder, Green chilli paste, Garlic paste into that solution. Stir it well with a wooden stick and keep the lid. Keep the solution in shade for 40 days. Keep stirring every 12 hours for a minute. We can use it after 40 days. |
| **Shelf Life** | 6 Months |
| **Usage** | Spray 4% Dashaparni whenever necessary on all kinds of pests. |

# [d] BRAHMASTRA

This is another botanical cocktail concoction which contains mix of plant leaves with high antifeedant and insecticidal molecules. Brahmastra act against majority of pest including sucking and caterpillar.


| | |
|---|---|
| **Ingredients** | ● Desi Cow urine - 20 liters<br>● Neem Leaves – 2 kgs<br>● Pongamia leaves – 2 kgs |

| | |
|---|---|
| | ● Custard apple leaves - 2 kgs<br>● Castor leaves – 2 kgs<br>● Datura leaves – 2 kgs |
| **Method** | Hand grind all the leaves like chutney. Don't use grinders. Put all the ingredients into iron/steel vessel, stir it well and boil the solution till it foams out, then decrease the heat or stir it and in few seconds, it foams out again. Like that its repeated for four times totally. Let it cool down and keep in a cool dry place for 48 hours without opening the lid (only lid, no gunny bags). Stir it every 12 hours without opening the lid for a minute. After that filter it and store it in a clean vessel preferably in an earthen pot. |
| **Shelf Life** | 6 Months |
| **Usage** | 4-5% of Brahmastra on all sucking pests, caterpillars (but not borers). |

# [e] AGNIASTRA

This botanical contains most powerful chemicals /natural molecules which act as antifeedant, insecticidal and growth regulator against wide range of pests. This is used as curative measure. This is considered as most powerful botanical concoction due to presence of potent chemicals in the neem, tobacco, chilli and garlic. This is recommended when all other options are failed. Farmers should prepare carefully and use it carefully. Sometimes this concoction is not recommended in the fields where farmer opt for organic certification because certification agencies do not approve tobacco use.

| | |
|---|---|
| **Ingredients** | ● Desi Cow Urine - 20 litres<br>● Neem Leaves (Ground thoroughly) – 2 kg<br>● Tobacco Powder - 0.5 kg<br>● Red Chilli powder - 0.5 kg<br>● Garlic paste - 0.25 kg |
| **Method** | Put all the ingredients into iron/steel vessel, stir it well and boil the solution till it foams out, then decrease the heat or stir it and in few seconds, it foams out again. Like that it's repeated for four times totally. Let it cool down and keep in a cool dry place for 48 hours without opening the lid (only lid, no gunny bags). Stir it every 12 |

| | |
|---|---|
| | hours without opening the lid for a minute. After that filter it and store it in a clean vessel. |
| **Shelf Life** | 3 Months |
| **Usage** | 4-5% Agniastra useful to control on Borers, Bollworms, medium to large sized Caterpillars and Sucking Pests. |

## 4 CROP DISEASES AND MANAGEMENT OPTIONS IN NF

We need to understand the lifecycles of insects, critical stages of damage and their threshold levels, before going to control any pest. In natural farming, pests are naturally controlled /managed by natural enemies and pathogens. As discussed, plant defence mechanism and immune system plays critical role in plant protection, besides presence of natural enemies in the crop ecosystem.

| | | |
|---|---|---|
| **FUNGAL DISEASES** |  |  |
| | *Alternaria leaf spot* | *Tikka leaf spot* |
| |  |  |
| | *Powdery mildew* | *Rust* |

| | | |
|---|---|---|
| **VIRAL DISEASES** |  |  |
| | *Yellow Mosaic in Bhendi* | |
| |  |  |
| | *Leaf Curl in Brinjal* | |
| |  |  |
| | *Little Leaf in Brinjal* | |

| | |
|---|---|
| **BACTERIAL DISEASES** |  |
| | *Speck in Tomato* |

| | |
|---|---|
| |  |
| | *Anthracnose in Guava* |
| |  |
| | *BLB in Paddy* |

In Natural farming the outbreak of disease and spread of disease is controlled by periodical application of mulching and Drava jeevamrutham. Maintaining crop diversity with border crops and intercrops also important practice to prevent plant diseases.

<u>The following are preventive measures</u>

- Selection of healthy seeds
- Selection of disease resistant varieties
- Seed treatment with Beejamruth
- Adjust sowing time
- Crop diversity with border crops and Inter crops
- Mulching
- Frequent sprinkling of Drava Jeevamruth on mulch material, as to increase diversity and numbers of useful bacteria in soil (Useful bacteria prevent spread of diseases and induce immunity in plants).

| | |
|---|---|
| **Curative Measures** |    In case farmer find the disease, spreading is more and causing economical loss to crop, he should take curative measures by spraying any of following solutions.<br>1. Spraying of sour butter milk and<br>2. Dry Ginger + Milk solution. |

# SOUR BUTTERMILK

| | |
|---|---|
| **Ingredients** | ● Water - 200 liters<br>● Fermented sour buttermilk - 6 liters |
| **Method** | Take 6 litres of milk and make curds with it. Remove the Creamy layer on it. Let it remain for 3 to 5 days, so there will be a grey layer of fungus formed. Churn it well and mix in water, filter and spray on infected trees. |
| **Shelf Life** | 3 Days |
| **Usage** | Works against all diseases. No dilution required. |

# DRY GINGER AND COW MILK SOLUTION

| | |
|---|---|
| **Ingredients** | ● Water - 2 liters<br>● Ginger Powder - 200 grams<br>● Desi (native) cow milk - 2 liters |
| **Method** | Take ginger powder and mix it in water. Boil the solution till it becomes half by volume and let it cool. Take Desi cowmilk in a bowl and boil it and remove the cream. Let it cool. Mix both solutions and stir it well with a wooden pole. After 2 hours you can use it. |

| | |
|---|---|
| **Shelf Life** | 48 Hours |
| **Usage** | It works against diseases. Spray 5% solution on infected parts of crop/ trees. |

# Diverse Cropping Systems in Natural Farming

## 1 WHY DIVERSE CROPPING SYSTEM


- Sowing of different types of crop with different duration, which matures at different times. It starts from September-October and continues up to February.
- The soil is covered with crop till February, so it is not exposed to sun for 9 to 10 months and heavy leaf litter addition to soil, which improves the quality of soil over time by retaining moisture as well as maintaining the soil temperature.
- Crops are designed in a multi-tiered canopy to harvest the maximum sunshine for each crop.
- Monsoon rainfall is not used in single rain fed crops but in multiple crops.
- As there is no chemical spray in natural farming, which encourages more population of birds and insects visiting the farms, which facilitate more pollination due to give and take relationship of nature.
- Multiple cropping system adopted in natural farming takes care of physical, chemical and biological properties of soil.
- Diverse cropping system helps in maintaining bulk density, porosity, infiltration rate, moisture holding capacity, aeration, erosion, and surface runoff, which improves the physical property of soil.
- Diverse multi-tier cropping system harness the nutrients from different depth of the soil. It helps in efficient use of nutrients available in soil. In natural farming many Phosphorus and Potassium solubilising bacteria get activated and they convert the non-available form of different nutrient into available form.
- Natural farming is microbe intensive which sustains the nutrients. Each crop in natural farming has different association of microbes in rhizosphere which develop crop based microbial diversity which help in improving fungal: bacteria ratio for nutrient fixation. Many micro pest antagonists such as *Pseudomonas*, *Bacillus*, *Trichoderma* and other entomopathogenic

microbes and earthworm, beneficial insects, and bees will be available in plenty in natural farming.

- As the soil in natural farming is covered with crops for more than 9 months, the water requirement of crops is reduced. Hence, it will reduce the energy requirement by less use of bore well. In diverse cropping system, maximum foliage cover is ensured in soil, it will capture maximum amount of soil moisture and reduces the temperature of soil.

## 2 NAVADHANYA CROPPING SYSTEM – A DESIGN

Illustrated by Sreekanth (WASSAN)

- Main crop: groundnut/ millets/ sunflower etc. harvested in <100 days (3 months).
- 1st Intercrop Row harvested in 4 months.
- 2nd Intercrop Row: harvested in 6 months.
- Border crop: Millets on border rows.
- Limited crops: mixed within the rows along with the first 3 -- small proportions – a diverse array of crops for self-consumption or sale.
- Additional crops: leafy vegetables, vegetables and others – very small niches mainly for household consumption.

**What is Navadhanya Cropping System?**

It is an intercropping system in dryland agriculture. It has evolved to sustain crops in erratic rainfall, trapping erratic rainfall and utilising 100% to crops. The farmers used the system as the net of erratic rainfall in drought prone areas for protecting at least 2/3rd of the crops in their fields.

Source:http://www.ecosecretz.com/2017/09/navadhanya-cropping-system.html

## 3 CONCLUSION

- In India 40 million Ha of rice is grown in 11 agro-ecological zone. Out of which, 30 percent of rice is grown in non-irrigated area and around 12 million ha of cultivating rice has the potential to convert into multi cropping system without affecting food and nutritional security.
- 52 percent of cultivable are in India is rainfed. It has the large potential for natural farming which will improve the health of soil, human and environment.
- For diverse cropping system, there is a need for location specific plans.

Illustrated by Sreekanth (WASSAN)

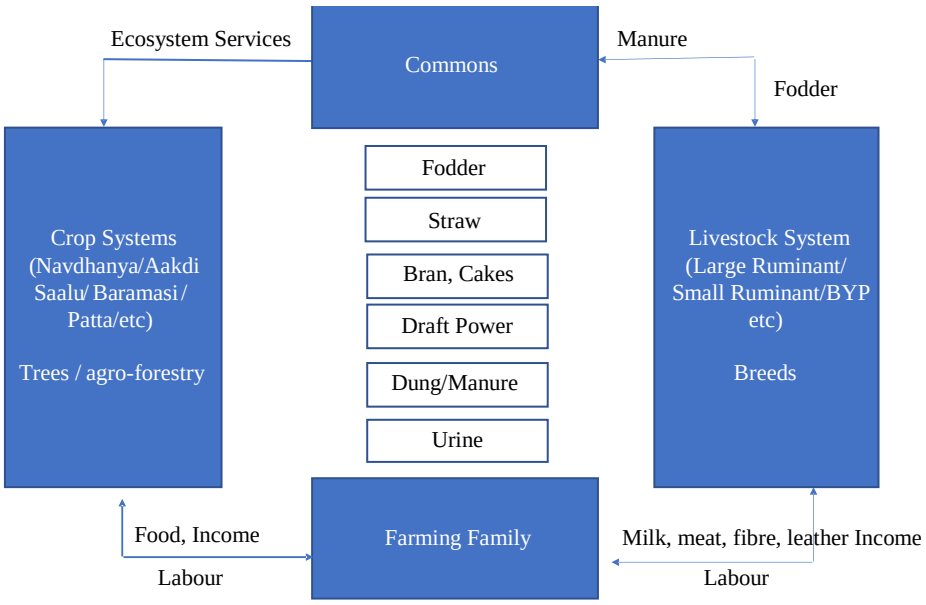
- There is a need for increasing the awareness, collecting scientific evidence, Capacity building, Resource access (for example seed of diverse crops and knowledge about multi-cropping system should be available to farmers), Farmer led On-Farm research has to be done in collaboration public, Private, NGOs, Farmers Organizations, etc., in the farmers' fields.

# Integration of Livestock in Natural Farming - Perspective, Principles and Practices

> “Livestock is the lifeline of millions of rural households in the country. It plays very significant role in securing livelihoods. It is an integral part of the natural farming system too. However, narrow sectoral approach has broken the interlinkages between crop husbandry and livestock production system.”

There are certain types of livestock productions system like extensive grazing -based system, pastoral production system which produces foods like milk, meat, and also wool, fibre and manure, can also be considered as natural ways of farming. Beside this, for successful transition to natural farming integration crop and livestock is very critical. Following figure shows the interlinkages between Crop and Livestock production system.

**Crop - Livestock - Landscape: A Framework for Natural Farming**



In this training session of **Livestock Integration in Natural Farming**, we should know the following aspects as these are being debated a lot during the discourse of natural farming:

- Do we need only Desi Cow for Natural Farming? Do other species of livestock contribute to Natural Farming?
- Does Bullock play role in Natural Farming?
- Is it only the crop husbandry in farm that constitute NF? Is NF restricted to farm?
- What type of livestock production system produce chemical free livestock products?
- What is the role of AH department in Natural Farming?

Livestock provides manure in different forms to the soil for increasing microbial activities in the soil. Dung and urine acts as bio-stimulant and helps several micro-organism to grow which helps in nutrition availability to the plant through its roots. Cow urine is main ingredient of preparation of herbal concoctions / bio-pesticide which are used for controlling pests and diseases in the crops.

In Indian condition, dung and urine of desi / indigenous cow perform best as bio-stimulant. However, due to several years of cross-breeding program, indigenous cattle breeds are being diluted. National Bureau of Animal Genetic Resources has identified, characterised and registered 50 cattle breeds in the country from different agro-climatic zones. In-situ participatory conservation of these breeds will strengthen / facilitate adoption of natural farming in the country. Awareness building, organizing promotional events on indigenous breeds, marketing of value-added products like Ghee, paneer, and other milk products of indigenous breeds will contribute to the agenda of natural farming.

Dung and urine of other livestock are also useful for soil health improvement. In the absence of indigenous cow, buffalo and other animal can also be used for natural farming. In several places, particularly in drylands penning of animals on agricultural field is a traditional practice followed by farmers. Penning of with migratory herds of sheep, cow, camel is practiced which is the low-cost method of improving soil health. Penning reduces lots of labour of farmers family and high labour intensity is one of the bottlenecks for the transformation towards natural farming. A study carried out by CRIDA highlighted those farmers adopted penning achieved higher yield than those

are not following penning. Similarly, a recent study carried out by Centre for Pastoralism (CFP), Watershed Support Services and Activities Network (WASSAN) and Centre for Peoples Collective (CPC) found that in deccan plateau farmers who invites pastoralist to pen his animals for 7 -10 days have drastically reduced the use of chemical fertilizers. Therefore, other species of animals not only desi cow contributes to promotion of natural farming.

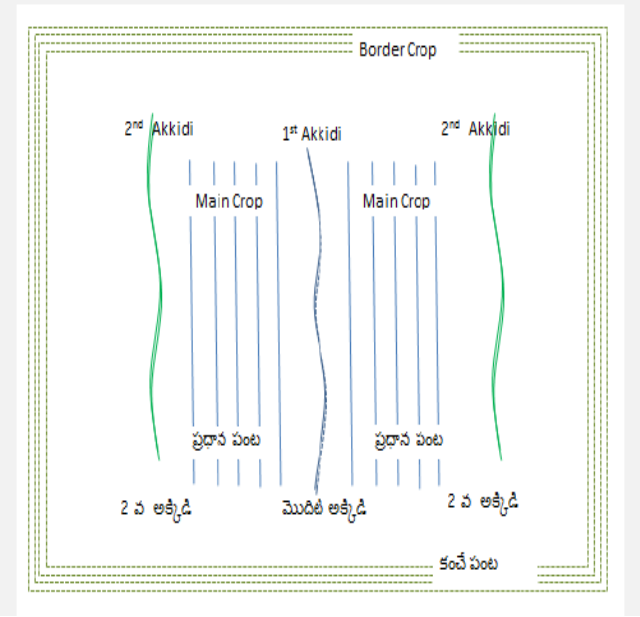
## BULLOCK PLAYS IMPORTANT ROLE IN NATURAL FARMING

Due to increasing use of heavy farm machineries in a mono cropping system, use of bullock has been reduced in Indian agriculture. However, still more than 40 % of energy used in agriculture done by draught animal power. Beside, providing raw materials like dung and urine for the preparation of *Jeevamrita, Beejamrita* and other concoctions for natural, Bullocks helps in promoting diverse mix-cropping / multi-cropping system which is one of the important principles of agro-ecology and natural farming.


Case studies documented by RRA Network and WASSAN under the TIGR$^2$ESS (Transforming India's Green Revolution by Research and Empowerment for Sustainable Food Supply) carried out in 14 agro-ecology zone in 10 states found that traditional mix-cropping followed by the

farmers with the use of Bullock. Some of them are called *Aakdi Saalu* in Karnataka, *Navadhanya* in Andhra Pradesh, *Sangdi Kheti* in Tribal region of Rajasthan or *Patta Padhhati* in Vidarbha Region of Maharashtra.

## A NAVADHANYA FIELD IN ANDHRA PRADESH AND ITS MIX-CROPPING DESIGN




Bullock also helps in providing mobile hybrid energy solutions for effective and efficient use of water. Some of these technologies are Mobile Solar Pump which helps providing critical irrigation to multiple farms.

- **Regeneration of Commons & Fallows for Fodder Security:** Since Livestock is integral part of natural farming, it is important to sustain livestock in the village in order to transform a village into natural farming village. Though commons are shrinking, it is high time to protect, conserve and regenerate commons. There are several examples in the country led by organizations like Foundation for Ecological Security (FES) who have extensively worked on community led regeneration of commons (several examples are available at www.fes.org.in).

Beside commons, current fallows can also contribute towards fodder security for the animals in the village. In Anantapur district of Andhra Pradesh, WASSAN worked with communities in Ayyavaripally village, a dairy dependent village – became fodder surplus in 2 years reviving all the fallow lands in the village; moving from Rs.17 lakhs deficit to meeting all its requirements.

*WASSAN carried out the following in the village*

- Fallow lands are mapped
- Fodder deficits estimated (fodder budgets)
- Tie-up between Dairy farmers with fodder deficits with fallow land owners
- Cultivated multi-sps fodder in fallow lands

| CROP COMBINATION | | | |
|---|---|---|---|
| **Sl.No** | **Type of seed** | **Units** | **Seed per 1 Acre** |
| 1 | Jowar | Kgs | 3 |
| 2 | Bajra | Kgs | 3 |
| 3 | Horsegram | Kgs | 4 |
| 4 | Cowpea | Kgs | 2 |
| 5 | Field beans | Kgs | 2 |
| 6 | Maize | Kgs | 4 |

| | | | |
|---|---|---|---|
| 7 | Ragi | Kgs | 1 |
| 8 | Stylow hameta | Kgs | 1 |
| | **Total** | | **20** |

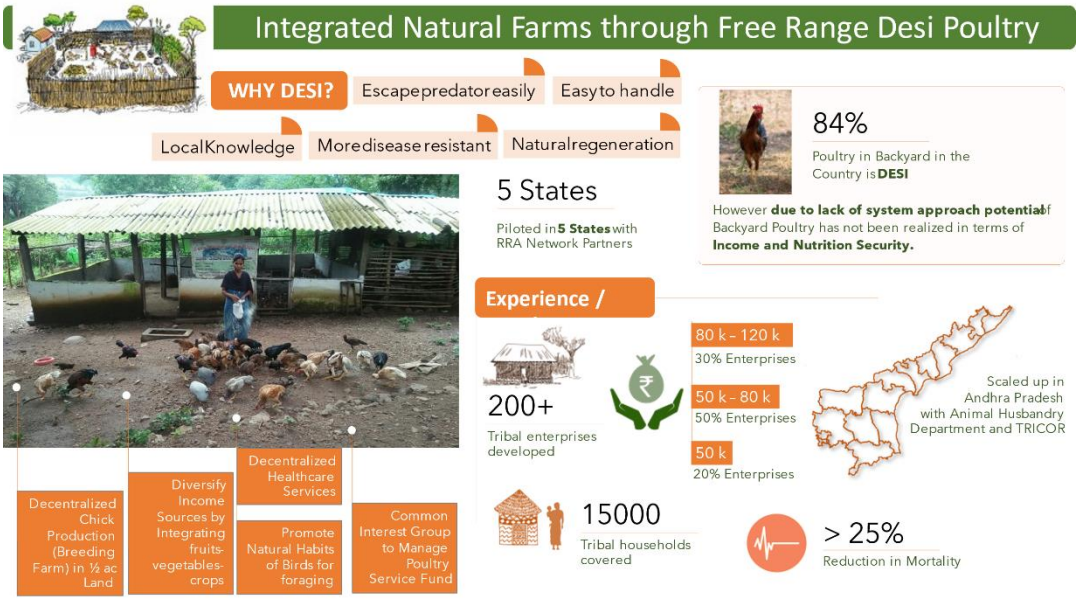
## CHEMICAL FREE LIVESTOCK PRODUCTION SYSTEM

- **Pastoral Production System (PPS):** Various Pastoral Production Systems are found in the country. Several traditional pastoral communities in many states still produce milk, meat, eggs, wool and bullock power through the grazing system and without providing external feed. Camel herders in Kutch district of Gujarat and in several districts in Rajasthan produce Camel milk which has several medicinal therapeutic values.

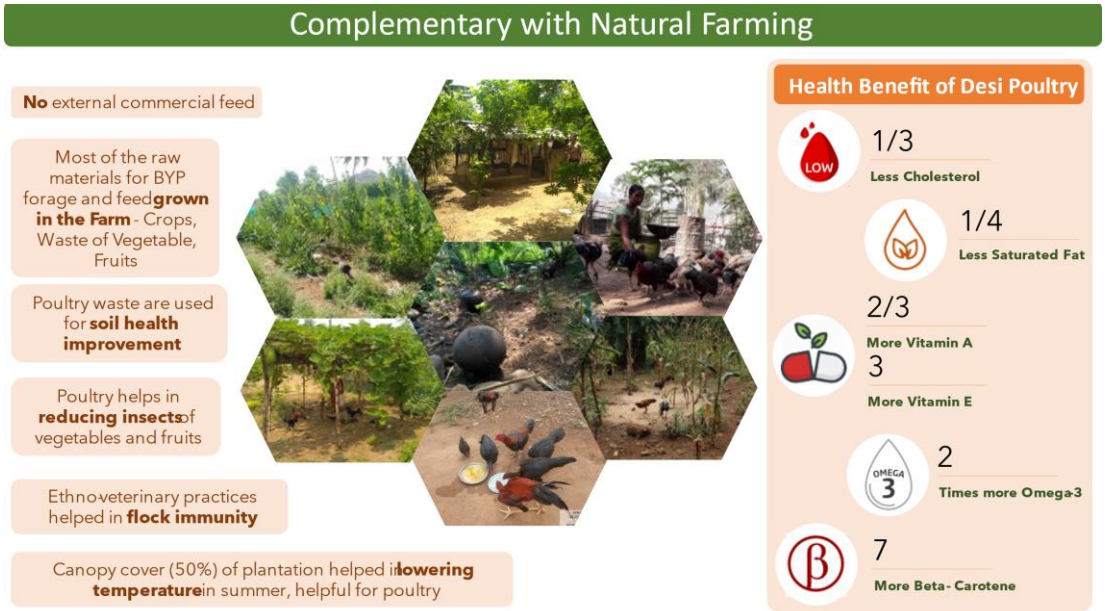
  Similarly, Pastoral production system in Banni Grassland produce more than 1 lakh litres of milk every day by grazing in Banni Grassland. In Uttarakhand, Van Gujjar communities produce milk mostly by grazing their animals in and around Rajaji National Park. All these production systems are natural system and should be considered as other forms of Natural Farming.

- **Intensive Ecological Farm with Desi Poultry**

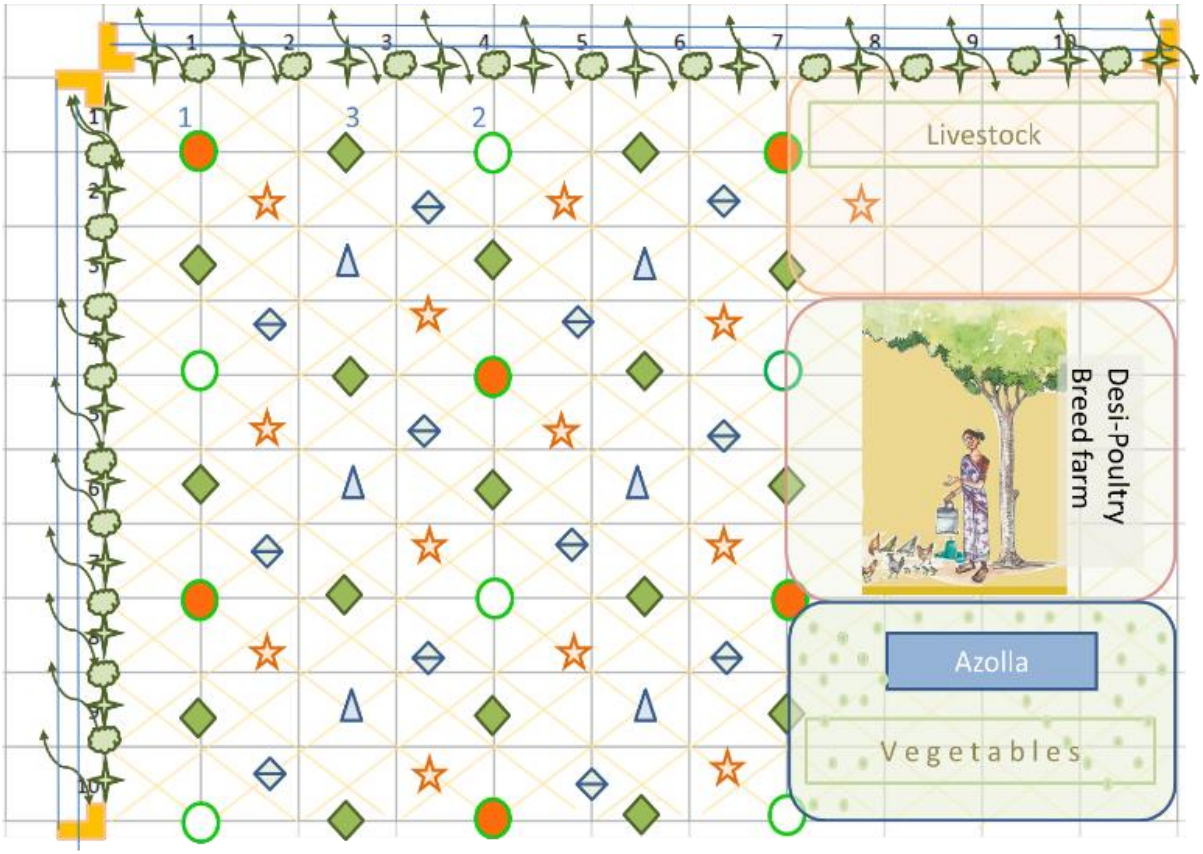
  This is another model where desi poultry are being reared through foraging system without having industrial feed. This was first piloted by RRA Network in 7 states which was influenced from the learning of Namakkal KVK in Tamil Nadu. This model then scaled up by the Department of Animal Husbandry, Govt of Andhra Pradesh in the tribal areas, where 0.5 ac of back yard land was dedicated for production of desi / indigenous poultry as an enterprise.




This 0.5 ac of land have a particular design of multi-layer farming with Desi Poultry where grains, vegetables and fruits are grown without chemical pesticide and fertilizers and by using poultry litter as well birds as a natural predator for the insects that attack crops.




Several Health benefits are also drawn upon from this model. The design of the 0.5 acre of intensive ecological farm is given bellow:




## KEY FEATURES OF THE INTENSIVE ECOLOGICAL FARMS ARE AS FOLLOWS

- Half acre (0.5 Acre) farm
- Fenced
- With a night shelter for poultry
- 5-layer intensive fruit and other trees, and grass
- About 50 hen units- foraging
- 3 to 4 ram lambs (grazing)
- 2 Dairy animals
- Vegetable crops
- Low irrigation through drips
- Investment of about Rs.2.00 lakhs over period
- Returns start from 6 months
- Reach about Rs.0.75 toRs.1.00 lakh by 2nd year
- Pays back in 4 years-time

# ROLE OF ANIMAL HUSBANDRY DEPARTMENT IN NATURAL FARMING

*The Department of Animal Husbandry both at Government of India as well as at the state level, can plan important role in promoting Natural Farming:*

- Support and acknowledge some of the pastoral production system as another form of natural farming
- Revise National Livestock Policy and incorporate livestock centric natural farming models
- Prepare road map of animal husbandry department on taking up support services like (healthcare) for pastoral system, creating enabling policies and investment that helps in NF transition
- Under NLM (National Livestock Mission), Intensive Ecological farming with Desi / Indigenous poultry
- Active convergence with agriculture department for promoting integrated farming system which has a potential to be incorporated with Natural Farming.

# Value Chain Infrastructure & Market Management for Natural Farming Produce

## Journey to New Business Models and Success Stories

**Restore** – A group of volunteers who work with farmers and help them move to organic farming as well as facilitate market linkages. Created markets and awareness in urban areas. The group of people first dug deep into how things relating to farmers, food, environment, nutrition and the amount of chemicals that were being used. Food and health have become two disparate arenas without being looked at together.

Today organic market has grown in comparison to the last 10 years yet is at 1%, which still is respectable and demands discussions. Retail market in India is 1 lakh crores which is only 10% of GDP, but it is still very important since it involves a large part (50%) of the rural market. 80% of this agriculture which employs 70% of the rural people. The world average of farmer's earnings per unit of money spent is 14-28% (14 in the USA and 26-28 in India). But with OFM, the percentage has been increased to 74, which mainly started to increase a farmer's earnings. Although in the mainstream market it won't be possible due to other activities in between farmer and consumer, still the idea should be for a major part of the earnings to reach back to the farmers. Some of the questions to ponder upon while thinking of markets are – "Can a market have a heart", "Can it be local and bolster local economy by having local production, aggregation all linked to local consumption?" "Can the market be ethical?" "Can the market have values?" "Can it be eco-friendly?"

OFM started working with the urban markets trying to correct the workings of it and bringing solutions to questions. But simply replacing chemical food with organic food in markets for consumer to buy wasn't enough for OFM and it was seeking a deeper change. It wanted organic food to become a part of the lifestyle of both farmers and consumers. They wanted it to be fair for both ends, should bring awareness and understanding on both ends. Some people thus came together to start Re-Store on a voluntary basis in Chennai in 2007-2008. This FPO helped farmers transition into organic with help of experts. The idea was to bring collective action for sustainable change working on a cooperative mode and with small efforts scaling that change without centralized ownership. Thus OFM (Organic Farmer's Market) was established too along with small shops across the city. Similarly, Tula, an enterprise for sale of organic cotton clothes made

by artisans who hand spun, hand woven, naturally dyed garments using organic cotton, was born. The whole value chains were kept ethical.

**Re-store**: An urban citizen's collective, started by people of Chennai. Most disturbing aspect for organic food chain was the markets and hence Re-Store was established to bridge the gap. The team at Re-Store started engaging with urban dwellers and hosting farm visits for them where they do interact with the farmers, work on the farms and get to know their food and also the process behind food production. This brought connectivity between farmers and consumers and built a network. Regular meetings and discussions were held where experts were invited to explain the different links between food and health, nutrition, ecology, pollution, etc. Re-Store started in a garage but the response was tremendous. In the $4^{th}$ or $5^{th}$ year, there was growth and Re-Store was visiting parks, IT companies, schools etc for awareness through movies, presentations etc and creating an aware market. Gradually there were 300 organic stores by different brands in Chennai in the $4^{th}$ year of Restore. For restore itself, in $4^{th}$ year they crossed 1Cr in turnover and thus moved to a bigger store from the garage. But there were complaints and enquiries since the consumers were not sure about the traceability, fair pricing for farmers, and quality check for authenticity of organic. There was no regulation at the time. But Re-Store was determined to take organic to the masses and penetrate the markets and not just the elites.

When there were youngsters who were coming in, they were being asked to collectivize and move products in bulk which would be easier to manage. Thus collective action in cooperative mode. The stores were kept simple and small without swanky interiors and wasteful expenditure, because the main idea was to have more and more stores across neighborhoods and also have a fair price for farmers while enabling the middle class and lower middle class to buy the products. Traceability and transparency were at the heart of the operations. The model of operation was such that there were 15 stores run by 15 young persons and a central aggregation unit. This model minimized the intermediary costs by not adding any extra margins for the central repository. This central repository had its own store and survived on basis of the profits made from the store and also did all the cleaning and sorting for the other 15 stores to supply the produce to them. This way the costs were kept low. None of these stores or businesses have owners and no personal profits. The business is run by taking small loans from friends which have always been returned. A member needs to visit at least 2 farms per month, volunteer at the central store once a week.

OFM does not sell any branded products other than those sold by women's or farmers' collectives. The products are never wrapped in plastic or any packaging. Consumers generally get their own containers and covers. Procurement for OFMs are also very stringent where at least two people from the team visit the farm to approve. The OFM stores use metal boxes, containers and glass jars to dispense food items and provide paper packets to consumers avoiding all plastic usage. Vegetables come twice or thrice a week and consumers are very loyal to the OFM stores since they now understand the quality difference and trust the system.

OFM also works on some value-added products, working on nostalgia. The waste from the products is also reprocessed and sold to consumers, conducting composting workshops, cooking workshops and ecological lifestyle workshops. The OFM outlets were upcycled places with donated products. Worked with 150 farmers at the end of 5 years with a yearly increase in both consumers and farmers. They conducted regular melas and farmer markets which touch a lot of consumers where importance of local, indigenous and desi practices and food is discussed.

Re-store also decided to only sell indigenous varieties of rice and bring back an array of millets. The stores were never run for the convenience of consumers, the most important was ecology and environment and second was farm livelihood with consumer needs being third but all of it always abiding by fair trade, fair price and fair practices followed. The stores also followed band pricing for vegetables throughout the year to avoid the sudden rise and drop of price and consequently fluctuating farmer earnings. The farmers are involved in deciding the pricing of their produce. Farmers from different regions and different agro-climatic conditions are paid differently based on their cost of inputs, local situations, irrigation conditions and water availability, etc. The work at OFM follows the vision of J C Kumarappa where local artisanal products were supported, local economy was bolstered and rural livelihoods were empowered and started creating local markets. OFM started working with women farmers, kitchen gardeners. Creating awareness and change through civil involvement has been an important part of OFM's journey where they have undertaken many non-violent activities with their members and consumers and also gathers media attention which has brought about a positive outlook for OFM.

OFM and Re-Store is not merely a trader or a vendor of agro-produce, but has also helped the society during many crises. In collaboration with many other organizations like the Safe Food Alliance, Sevai Karangal, Vettiver, Arappor, Greenpeace etc they have volunteered to help people in distress during the migration crisis. There is a social consciousness as a central value.

Some of the problems today are big players, big money and big margins. There are local linkages missing which is a loss-making situation for producer, seller and the consumer. The long value chains are detrimental in many ways especially elongating transport, increasing middle men and pushing prices away. The trust factor in organic needs to be improved and better regulations need to be brought in. Better compliance measures need to be devised which do not make life hard for farmers. Organic farmers also lack proper infrastructure for drying and storing. There needs to be systemic help from government which will be the only way for scaling, monitoring, regulation and market expansion.

**Some non-negotiables for markets** should be a fair price for farmers, traceability and transparency, production and consumption to be as close as possible, environmentally sound

packaging. Beyond regular business, organic markets should be fair, cooperative, collectivized operation at both ends, decentralized, distributed economy from start to end of value chain.

While organic encompasses a lot of practices, natural is not much different. Organic has been established for a long time and has regulations for exports and markets and thus will be preferred and so it is important that the nomenclature doesn't shift much. There could be two different regulations but they should be very different and very far apart but should be more inclusive so it is easy for people on both side of the standards which makes it easy for farmers as well as consumers. Too many differences could make it difficult for consumers to choose and farmers to sell. There also need to be easier norms for farmers selling with certifications but is following practices.

# Participatory Guarantee System (PGS)

Participatory Guarantee Systems (PGS), as defined by IFOAM (International Federation of Agriculture Movements), are "locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange."

PGS-India (Participatory Guarantee System of India) is a quality assurance initiative that is locally relevant, emphasize the participation of stakeholders, including producers and consumers and operate outside the frame of third party certification.

Guiding Principles:
PGS India system based on participatory approach, a shared vision, transparency and trust. In addition it gives PGS movement a National recognition and institutional structure.

Participation:
Participation is an essential and dynamic part of PGS. Participation embodies the principle of collective responsibility for ensuring the organic integrity of the PGS. This collective responsibility is reflected through

- Shared ownership of the PGS
- Stakeholder engagement in the development and operation process
- Understanding of how the system works
- Direct communication between producers and consumers and other stakeholders

Shared Vision:
Collective responsibility for implementation and decision making is driven by common shared vision. All the key stakeholders (producers, facilitating agencies, NGOs, social organizations, State Governments and state agencies) support the guiding principles and goals, PGS is striving to achieve and this is achieved initially through their participation and support in the design and then by joining it. This may include commitment in writing through signing an application and pledge that includes the vision.

Transparency:
Transparency is created by having all stakeholders, including producers and consumers, aware of exactly how the guarantee system works to include the standards, the organic guarantee process (norms) with clearly defined and documented systems and how decisions are made.

Trust:
The integrity base upon which PGS-India programme is built, is rooted in the idea that producers can be trusted and that the organic guarantee system can be an expression and verification of this

trust. The foundation of this trust is built from the idea that the key stakeholders collectively develop their shared vision and then collectively continue to shape and reinforce their vision through the PGS. The idea of 'trust' assumes that the individual producer has a commitment to protecting nature and consumers' health through organic production.

Horizontality:
PGS India is intended to be non-hierarchical at group level. This will reflect in the overall democratic structure and through the collective responsibility of the PGS group with sharing and rotating responsibility, by engaging producers directly in the peer review of each other's farms; and by transparency in decision making process.

National Networking:
PGS India while keeping the spirit of PGS intact aims to give the entire movement an institutional structure. This is achieved by networking the groups under common umbrella through various facilitating agencies, Regional Councils and Zonal Councils. National Centre of Organic Farming shall be the custodian of data, define policies and guidelines and undertake surveillance through field monitoring and product testing for residues. Regional councils and facilitating agencies facilitate the groups in capacity building, training, knowledge/ technology dissemination and data uploading on the PGS website.

PGS India Standards:
PGS-India standards have been defined in tune with National Standards for Organic Production (NSOP) prescribed under National Program for Organic Production (NPOP) to maintain uniformity in organic production process and quality of organic products in the country. For ease of functioning and understanding standards are presented here in easy to understand and simplified form. For further clarification and correct interpretation readers may refer to National Programme for Organic Production available at http://apeda.gov.in/apedawebsite/organic/ORGANIC_CONTENTS/National_Programme_for_Organic_Production.htm as amended from time to time.

Organic Crop Production

1. Scope

Crop production standards prescribed here refer to cultivation of any agricultural and non-agricultural crops/ plants for the production of food and fiber and their derivatives or by-products and collection of non-timber wild harvest produce from natural forests.

2. Habitat Management and General Requirements
    a. Maintain sufficient diversity on farm through maintenance of diversity plantations, biological nitrogen fixation bushes and trees on farm boundary or as hedge rows.

Integration of randomly located multipurpose trees on farm bunds and in utility spaces help in creation of habitat for maintenance and survival of different beneficial life forms.

b. Integration of agro-forestry, if feasible should be considered
c. Adequate measures should be adopted to conserve and harvest rain water
d. Preferably the entire land holding with livestock should be converted to organic according to these standards.
e. If it is not possible to convert the entire farm (split production) then the measures must be in place to ensure that organic and non-organic parts are clearly and continuously separate.
f. Simultaneous production of same crop (parallel production) in organic and non- organic needs to be avoided.

3. Diversity Management
   a. Organic farming systems should avoid mono-cropping and ensure continuously changing farm diversity. Diversity is also a key to maintain soil fertility and to effectively manage the pressure from insects, diseases and weeds. Diversity should also help in maintaining or increasing soil organic matter, soil fertility, microbial activity and general soil health.

   b. Diversity can be achieved by adopting mixed cropping, intercropping and crop rotations. Cover crops, trap crops and multi-layered farming practices are also effective tools for diversity management. Soil fertility can be maintained by integration of legumes or deep rooted plants in cropping systems, frequent use of green manures, planned rotations and fertilization with organic inputs.

4. Integration of livestock

   As organic farming systems largely depend upon farming system approach, therefore it is important to integrate livestock along with crop production. This will not only help in overall farm diversity but will also ensure continuous availability of dung and urine for manuring and soil fertility management.

5. Soil and Water Conservation
   a. Soil and water resources to be managed in sustainable manner and measures to be taken to prevent erosion and salination of soil, excessive and improper use of water and the pollution of ground and surface water.
   b. Clearing or destruction of forest is prohibited, burning of straw or biomass shall be restricted to minimum

c. Measures to be in place to prevent land degradation and pollution of ground and surface water.

6. Contamination Control
    a. Adequate measures to be taken to prevent contamination through water, air drift, mixing or comingling through:
    b. Raised bunds and escape channels to prevent rain water runoff from non- organic fields
    c. Buffer zones between organic and non-organic farms
    d. Separate storage in time and space both for inputs and farm produce
    e. Cleaning of machines and tools while using in organic farm
    f. Any other measure suggested by the group/ certification programme

7. Conversion requirements
    a. For a farm and its crop production products to be certified organic, it is mandatory that the farm and entire farming operations of organic production unit has under gone a period of conversion, complying with all the standard requirements for following period:
        i. 36 months for perennial plants
        ii. 24 months for plants/ crops other than perennials
    b. In cases where de-facto requirements under these standards have been met for several years and the same can be verified from available documents, conversion period can be reduced to 12 months at the discretion of Regional Council.
    c. In default organic areas where there is no history of prohibited substances use and administration has imposed the ban on use of such substances and adequate measures are in place to prevent entry of such prohibited substances, the requirement of conversion period can be dispensed with. But such exception can be granted only by the PGS Secretariat on recommendations of RC after physical verification.

8. Seeds and planting material
    a. All seeds and planting material shall be certified organic. When certified organic seed and planting materials are not available (Local group need to ensure non-availability), chemically untreated conventional seed and planting material can be used.
    b. Use of Genetically modified seed/ planting material/ transgenic plants, microorganisms (GMO) or their products, directly or indirectly are strictly prohibited

9. Soil fertility and nutrient management
    a. Green manuring, legume cover crop/ intercropping, multi cropping, effective crop rotations and recycling of organic farm generated plant biomass through composting or mulching should form the basis of nutrient management
    b. Sufficient quantities of biodegradable material of plant or animal origin should be used

c. Biodegradable material of plant/animal origin must be composted through aerobic composting method where pile temperature has been maintained between $131^0$ and $170^0$ F for minimum 5 days.

d. Raw dung-urine products should be used only after controlled fermentation

e. Mined mineral fertilizers in their natural composition can be used. In case of micronutrient deficiency, micronutrients can be used mixed with compost.

f. Off-farm/ purchased inputs should be evaluated before use by the group to ensure that no prohibited substances have been used in their making and method of production is physical, mechanical or biological.

g. Off-farm/industry produced inputs approved by NPOP accredited certification body as approved input for use in organic farming can be used without further approval of the group.

h. Microbial preparations such as bio fertilizers, biodynamic preparations, EM solutions etc can be used.

i. Use of mineral nitrogen and all synthetic fertilizers, chemical hormones, synthetic growth promoters, directly or indirectly are prohibited.

j. Use of sewage, sludge, human excreta or their products are prohibited

10. Insect pest, disease and weed management

a. Insect pest and disease management should rely primarily on best management practices such as balanced soil fertility management, use of crops and varieties resistant to pests and adapted to local situations, diversity management, effective crop rotations, multi-cropping/ intercropping, green manures, manipulation of planting and sowing time and habitat manipulation through diversified plants, hedge rows, insectary plants, trap crops etc.

b. Pest problems may also be controlled through physical, mechanical and biological approaches such as (but not limited to):

    i. Removal of infested plants/ parts, ii. Collection and destruction of egg masses iii. Use of light traps, yellow and blue sticky traps, pheromone traps iv. Mechanical such as tilling, scrapping, hoeing v. Biological such release of pest predators, parasites, pathogens, installation of bird perches,

c. In cases where cultural and preventive approaches are not sufficient and there is imminent threat to the crop then plant protection products derived from plant or animal origin and prepared by using physical, mechanical or biological methods can be used. Products approved for use in organic farming by certification bodies accredited under National Programme for Organic Production (NPOP) can also be used.

d. Natural mined products and biological products such as microbial bio pesticides can be used

e. On-farm produced plant extracts, oils or fermented products can be used provided no synthetic ingredients is used in such preparations,

f. Weed management can be done through mulching with biodegradable material, mowing, livestock grazing, hand or mechanical weeding, flame, heat or electrical means or by using plastic or other synthetic mulches, provided that such mulches are removed from the field after harvest.

g. Use of synthetic herbicides, fungicides, insecticides and other chemical preparations including synthetic plant growth regulators and synthetic dyes are strictly prohibited. Use of genetically engineered organisms or products are also prohibited.

11. Collection of non-cultivated products of plant origin from wild habitats and forests

a. The collection of wild plants and parts thereof and products including Tusser cocoon, Honey, Lac, Medicinal Plants and Herbs, Roots and tuber, grown naturally, and in forest shall be certified as organic provided:

i. It is derived from a designated area for collection, clearly depicted in the map and is permitted by the forest department or state department, which is subject to inspection,

ii. The collection areas have not received any treatment with products other than those authorized for use in organic production,

iii. The collection area shall be at appropriate distance from conventional farming and sources of pollution and contamination,

iv. The products are derived from a stable and sustainable environment and total collection shall not exceed the sustainable yield of the ecosystem or threaten the existence of plant and species.

Organic Certification

- Certification is required & mandatory for sales in National and International markets as per (Food Safety and Standards Authority) FSSAI guidelines
- National Organic Program (NOP) Standards: Sales in International Markets third party certification is required
- National Programme for Organic Production(NPOP) Standards: Sales In national markets can do with this certification
- PGS Standards: Sales in National Markets can sell their produce as organic produce “locally focused on quality assurance systems” depends on farmer groups mutual authentication


What is an organic product?

- The categorization of a product as organic implies two main things:
- First, it is free from toxic persistent chemical pesticides, synthetic fertilizers, growth hormones and antibiotics or Genetically Modified Organisms (GMOs)
- Second, stringent organic cultivation standards are followed, with respect to impact on soil, water and air
- The production plots, collection centres, processing and packing facilities and processing need to be organic

Why Certification?

- Growth of the organic sector with more volumes in the market place
- Assurance from producer to consumer separated by distance
- A guarantee on the nature of products becomes more and more important
- For uniform label
- Consumers concern for healthy food is assured
- Image, credibility and transparency
- For premium price
- Its a marketing tool

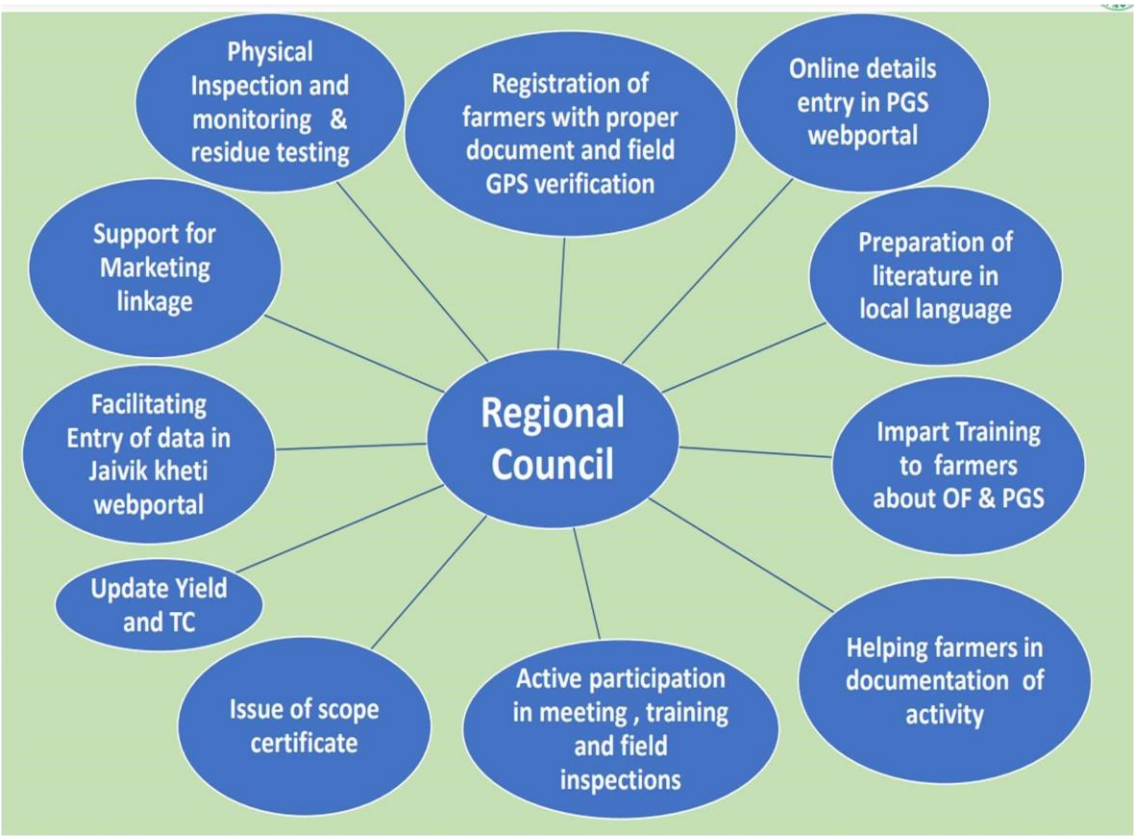
PGS available for

- Crops and orchards
- Bee keeping
- Livestock
- Wild harvest

- Processing and handling

About Regional Council

Regional Council (RC), authorized by National Advisory Committee (NAC) under PGS- India program of National Project on Promotion of Organic Farming (NPOF) including registration of local groups, endorsement of Local Groups, Capacity Building of local groups, surveillance, peer appraisal and summary sheet appraisal and certification decision endorsement process within the frame work of PGS India program.




Role of Regional Council

- Registration of farmers with proper document and field GPS Verification
- RC will provide copies of all the instruction manuals, standards and formats in hard copies in local language to the local groups.
- Monitoring and surveillance of Local Group, including participation in some peer appraisals  sample collection for pesticide residue testing
- Issue the TC to the consumer/bulk buyer
- Active participation in meeting, training and field inspections
- Verification and approval of peer summary decision
- Issuance of scope certificate

Role of Local Groups:

- Making sure that all members follow the rules
- All the group members should have responsibility
- Giving them the support they need , helping to write all the records
- Crop situation during the Farmer Field School visit, discussing the procedures of the members and recording them Inspection of members' crop fields and writing report
- Ensure that Peer appraisals need to be submitted on time (Seasonally)
- Books of records updation
- Meeting register
- Training Register
- Farmer Diary
- Coordinating the inspection carried out by the regional council

Registration of local group

Registration of PGS Local Group subject to verification of necessary documents like

- Farm History Sheet (3 years)
- Farmers Registration with local group
- Farmers Pledge
- Endorsements etc

Sampling and Residue testing

RC randomly select farms/products and draw soil samples/products for testing of pesticide residue.

Certification process by local group (LG)

- Form a group comprising of minimum 5-20 farmers (Preferably belongs to same village) Collect registration and farm history sheet (last 3 years) from all the members.
- Explain about PGS Standards and PGS operational documents.
- Convene the meeting of all the members and ask all the members to sign the pledge.

Conversion

- Regional Council will verify that whole farm is brought under organic before grant of certification.
- RC will not allow any part or parallel conversion but allow gradual conversion of whole farm within 24 months time.
- Registered farmers will get the Green certificate for 1$^{st}$ two years means they are under conversion period, after completions of two years farmers will get PGS India Organic certificate means fully organic.

For Local Group registration below details need to be collected from farmers:

- Farmer personal details
- Farmer name
- Address
- ID proof
- Aadhar and Voter ID
- Family details and relation etc
- Farmer phone no.
- Farmer farm details
- Total Area in HA and offered area for organic farming in HA • Survey no.
- No.of Plots
- Land own/lease/rent
- Longitude and latitude details
- Livestock (available or not if yes have to mention names and no.)
- Irrigation facility
- Storage facility
- Farmer used bio inputs
- During the season farmers used bio fertilizer/ kashayalu etc.,
- Plant protection – sticky trapes, light trapes, pheromone trapes etc..,
- Crop details
- Crop name, area , expected yield
- Cost of cultivation
- Register the group on-line on PGS Website fill all the forms and submit to RC for uploading the information on PGS website.
- Enter into agreement with the RC for services to be availed on payment basis (as per mutual agreement).
- Request RC to grant registration, user ID and password. Necessary recommendations. Alternatively apply to the RC and request RC to undertake verification. RCOFs can also be requested for endorsement of Local Groups.

Surveillance Inspection

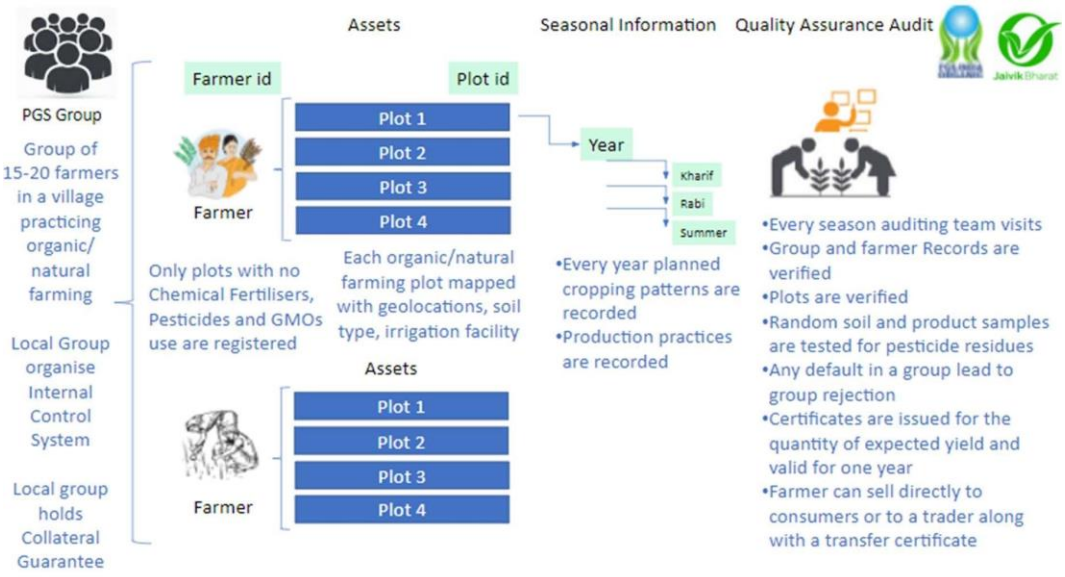
Surveillance visits are takes place twice/thrice in a year. The surveillance inspector verifies the fields and checks if all fields have been correctly registered and if new fields have been added.

He verifies the cultivation measures and whether the seeds, insect pest control and weed control, and fertilization correspond to the ICS/PGS-India standard. Verifies whether all measures against erosion have been taken and checks if there is any risk of drift from neighboring fields.

- Farmer Group Level
  - Weekly verification during FFS
  - Monthly Reviews
  - Cluster level compilation
  - Data entry
- RC level

- Once in a season
- Interaction with farmers
- Verifies all documents and random fields
- Takes samples for testing

Traceability System




Certification Process by Regional Council

Step 1

* Receive registration applications (on-line or off-line or in hard copy) of Local Groups (LG). Check details of individual farmer including geo-tagging of farms and mobile nos. Check for other group recommendation or endorsement by Central/State Govt. authorities.
* On being found adequate approve registration on-line.
* If data and application have been provided on-line then approve register on-line and provide user ID and password on PGS-India website.
* If application is in hard copy or off-line then upload the information on website and grant registration with user ID and password.
* Provide copy of PGS standards and LG operational manual guidelines in local language.

Step 2

a. Time to time keep interacting the group and help them in understanding the certification process. If possible participate in some of the group meetings or key field trainings of group.
b. Encourage and build the capacity of the group for on-line data management (may be through internet café)
c. Undertake random supervision on groups for assessment of standards implementation and capacity of the Local Group
d. At least 50% of the groups registered under it, must be verified suitably every year. Every group must be physically verified at least once in two years

e. Receipt and redressal of complaints against the LGs and their functioning

Step 3

a. On receipt of entire data set and Local Group Peer Appraisal Summary Sheet, screen the details for completeness, ensure that PGS standards and processes has been complied.

b. Compare the peer appraisal summary findings with RCs own physical evaluation report, take into consideration previous non-compliances, complaints and investigation findings if any;

c. On being found compliant to PGS standards and norms, approve grant of certification and issue certificate.

d. RC needs to endorse the certification decision of the LG, if requirements have been met and there are no adverse findings into RCs physical verification, complaints, adverse residue testing report or adverse supervision report etc.

Following check points suggested for decision endorsement: i. Required LG meetings done and members present

ii. Key trainings organized and members present

iii. Summary sheet is complete and gives full reflection of certification process

iv. Complaints, if any received during the period

v. Physical verification report of RC

vi. Past record of non-compliances and advisory implementation and

vii. Result of residue testing (if any)

e. In case of Non-approval, reasons must be communicated in writing or electronically with justification.

f. RCs cannot pick and choose individual farmers. They can approve or not approve or reject the decision of the group.

g. RC at its discretion can also return the decision of the LG for reconsideration in case of procedural non-compliance and ask the LG to resubmit the summary sheet after addressing and closing the non-compliances.

h. The RC needs to decide on certification request within 30 days from the date of uploading the LG-summary sheet or submitting the hard copy of the group decision to RC. If RC fails to endorse the decision of the LG or otherwise within 30 days then groups decision will be auto approved on PGS India website and a non-compliance is credited against RC.

i. Scope certificate is issued to the group with crop name and area details of the peer appraised season for each farmer separately in annexure. Scope certificates are issued season-wise with details of crops and area for that particular season.

j. After the harvest Local group uploads the actual yields. RC can verify the uploaded actual yields on-line and if satisfied approve the yields minus self-consume on with lot no and packaging/ bulk etc. for sale and issue of TCs.

k. On yield approval by RC, TCs can be generated on-line for each and every farmer member separately. TCs can be issued in one go for entire produce of the individual member or in small lots on number of occasions.

l. RCs need to ensure that certified organic products are sold with UID code provided on the Transaction Certificate.

m. In case if sales are happening between two PGS-India registered operators then there is no need for paper TC, online TC will facilitate transfer of stock from seller operator to buyer operator

Time Lines, Complaints and Appeals

Time lines For Local Group

a. Four group meetings, at least two in each season.
b. One training, any time during the year. First training within 6 months of registration
c. Peer appraisal to be done during crop growth period starting from 15 days of sowing till 15 days before harvest.
d. In case of plantation crops also two peer appraisals to be done one during flowering season and another after six months.
e. Uploading of peer appraisal summary sheet till 7 days before harvest date
f. Uploading of actual yields within 60 days of harvest
g. Time limits for holding stocks – Within the validity period of scope certificate
h. If no TCs are issued and stock remains unsold the PGS-India website will delete the stock in auto mode after 12 months from the date of harvest
i. Perishable commodities such as livestock products, vegetables and fruits etc can be traded on daily or weekly basis as per the discretion of the group and yields uploaded on PGS-India website on weekly or fortnightly basis and TCs are also issued in batch mode on weekly or fortnightly basis.

For Regional Councils

a. Acceptance of LG/ individual farmer/ processor application by Regional Council within 30 days of date of submission
b. If LG request for endorsement then complete first inspection and endorsement within 60 days and grant registration
c. Approval of certification decision, within 30 days of submission of peer appraisal summary sheet or within 15 days on resubmission of certification decision after return by RC
d. Grant of certification in case of individual farmers/ processor and handler within 30 days of physical inspection
e. Approval of actual yields – within 15 days of uploading actual yields by LG
f. Physical inspection of LGs – Within 12 months for the first time and subsequently at least once in 24 months.
g. Physical inspection of individual farmers/ processors and handling units – At least once a year
h. Approval of annual system plan in case of processors and handlers – within 15 days of submission

# Natural Farming Practices in India
# from the Book of Natural farming in millets- A Revolution in Indian Agriculture

published by ICAR-IIMR, Hyderabad

# Natural farming practices in millets

**For short duration millets crops:**

| Duration | Natural farming practices |
|---|---|
| At the time of sowing | Seed treatment with Bijamrut |
| At the time of intercultivations | Application of 100kg of Ghanajeevamrutam |
| At 30 DAS | Spraying of 5 litres of Dravajeevamrutam in 100 litres of water |
| At 51 DAS | Spraying of 10 litres of Dravajeevamrutam in 150 litres of water |
| At 72 DAS | Spraying of 20 litres of Dravajeevamrutam in 200 litres of water |
| At 93 DAS | Spraying of 5 litres of well fermented butter milk or dry ginger milk solution in 200 litres of water |

**For long duration millet crops:**

| Duration | Natural farming practices |
|---|---|
| At the time of sowing | Seed treatment with Bijamrutam |
| At the time of intercultivations | Application of 100kg of Ghanajeevamrutam |
| At 30 DAS | Spraying of 5 litres of Dravajeevamrutam in 100 litres of water |
| At 51 DAS | Spraying of 10 litres of Dravajeevamrutam in 150 litres of water |
| At 72 DAS | Spraying of 5-6 litres of Neemasthram in 200 litres of water |
| At 93 DAS | Spraying of 20 litres of Dravajeevamrutam in 200 litres of water |
| At 114 DAS | Spraying of 5 litres of well fermented butter milk or dry ginger milk (fermented for three days) kashaya in 200 litres of water |

## Finger Millet

**Soils :** Finger millet can be cultivated in light red soils to heavy soils with good drainage facility. Soils with water logging conditions are not suitable.

**Time of Sowing :** Finger millet is in *kharif* sown during the months of July - August and for *Rabi*, during November-December and January-February for the summer crops.

**Varieties suitable for cultivation:**

| Variety | Season | Crop duration (days) | Yield (Q/acre) |
|---|---|---|---|
| Champavathi | All Seasons | 80-85 | 10-12 |
| Bharathi | All Seasons | 105-110 | 14-16 |
| Sri Chaitanya | Kharif | 110-115 | 12-16 |
| Vakula | Kharif, Rabi | 105-110 | 13-15 |
| Hima | Rabi | 105-110 | 10-12 |
| Suvarnamukhi | Kharif, Rabi | 105 | 14-15 |
| Veghavathi | Kharif, Rabi | 115-120 | 15-16 |
| Indravathi | Kharif, Rabi | 115-120 | 15-16 |

**Intercropping :**

Intercropping of Ragi + Pigeon pea in 8:2 proportions is highly profitable with a spacing of 30cm × 10cm in finger millet and 60 cm x 20 cm in Pigeon pea. Ragi + field bean in 8:1 proportion can also be followed with spacing of 30cm between the rows and plant to plant distance of 10cm in case of ragi and 20cm in case of field bean is recommended. Ragi + soybean in the proportion of 1:1 can also be cultivated.

## SRI method of Ragi cultivation:

### *Sub treatment with Bheejamrutha:

Bheejamrutha protects from pests and diseases in eco-friendly manner. Take 5kg of local cow dung in a cloth and bound it by the tape and hang this in the 20 lit water upto 12 hours. Take one litre water and add 50gm lime in it and leave it stable for a night. Then next morning, squeeze this bundle of cow dung in a bucket of water and collect this cow dung solutions. Add a handful of soil in this cow dung water solution and stir it well. Finally add 5 litre desi cow urine in that solution and add the lime water and stir it well. This prepared Bheejamrutha is used for seed treatment of finger millet before sowing in nursery. Add 5gm of *Tricoderma harzianum* and 5gm of *pseudomonas fluorescens* to 1kg of seed for seed treated.

## Preparation of Nursery:

**Sowing :** Seed treatment with Bheejamrutha, sand/soil and compost in the ratio of 1:1:1 proportion is to be done before sowing.

**Nursery :** Nursery of 40sq.m is required for 1 acre of main field.

- First lines have to be drawn with the help of wooden marker at a spacing of 10 inches X 10 inches for transplanting the seedlings from nursery.
- Rows or ridges are to be made by using the bicycle wheeler.

## System of Finger Millet Intensification (SMI) – An agro ecological innovation:

- Spray 3% panchagavya solution or Jeevamrutha before 4-5days of transplanting the seedlings.
- 15-25 days old seedlings should be planted in the main field.

## Before Sowing:

- Water/irrigate the seedlings 2 hours before transplanting, which makes the soil loose so that seedlings can be pulled easily.
- Seedlings should be carefully pulled to prevent the soil around the roots from being disturbed. If possible, lift the soil with a shovel so the roots come along with the soil.
- The seedlings should be transported to the main field within half an hour after they seedlings are pulled before drying of soil around the roots. Seedlings are transplanted at a spacing of 10 inches × 10 inches by using cord or marker.
- Seedlings should be planted at a shallow depth, when the seedlings are planted at the junction of lines, care should be taken to prevent the roots from damaging.

## Management of Nursery :

- **Time of Sowing in Nursery:** Sown during the 1st to 3rd week of july month.
- **Sowing of Seeds:** Sow seeds at a depth of 1/2cm in the soil. Spacing of 3-4 cm between the seeds is recommended.
- **Protection of seeds:** Seeds are to be covered with vermicompost and Jeevamrutha has to be applied at regular intervals.

## Preparation of Jeevamrutha:

To 10 lit of water in a barrel, add 5 kg cow dung, 5 lit of cow urine and stir it well. Later add 250gm of jaggery, 250 gm of pulse flour and a handful of soil from the bund of the farm and stir the solution well. Allow this solution to be stable for 1 hour in shade. Finally, this prepared

jeevamrutha should be diluted with water in the ratio of 1: 20 lit dilution and around 200 lit of jeevamrutha is sufficient for 1 acre of land.

**Field Preparation:**

- Plough the field thrice at an interval of 8–10 days and Jeevamrutha has to be sprayed in the field before last plough in order to maintain sufficient moisture in soil and also to conserve organic compounds.
- Level the field with leveller after ploughing.

**Planting seedlings in main field**

**Weeding, pulling of vertical round logs over the plants:**

- Manual weeding should be done thrice at an interval of 10-15 days with a hand weeder between the rows. This helps to not only remove the weeds but also improves the aeration in the vicinity of the root zone and enhance the plant growth.
- Spray 1 lit Jeevamrutha mixed in 10 lit of water immediately after the removal of weeds.
- After removing the weeds, hollowed out wooden log has to be pulled over the plants in order to bend the plants. This helps in increase the unable of more tillers and roots.

## Differences between Chemical method & SRI method of Cultivation

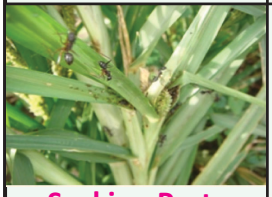
| | Chemical Method | SRI Method |
|---|---|---|
| Seed rate | 5kg | 500 gm |
| Seed treatment Vermicompost | Not followed | Jaggery, Cow urine, Hot water, |
| Method of sowing | Broadcasting | Transplanting 20-25 days old nursery is transplanted in square method |
| Spacing method | No spacing | 10 cmX10 cm in square |
| Weeding, Pulling of log | Not followed or | practiced Followed / Practiced after 15,25 and 40 days |
| Irrigation (Rabi) | 2 times | 4 times |
| Stems per plant | 1 | 8-10 |
| No.of tillers per hill | 3-4 | 7-8 |
| Stem | thin | thick |
| Roots | Shallow | Penetrates deep upto 1 cm |
| Yield per acre | 0.4 tonnes | 1-1.5 ton nes |
| Yield per ha | 1 tonne | 2.5 to 3.75 tonnes |

## Manures:

**FYM (or) Vermicompost :** 2 tonnes of FYM or 800 kg of vermicompost or 2.5 tonnes of NADEP compost per acre has to be incorporated prior to 1 5-20 days of sowing. Apply 125kg Ghanajeevamrutha per acre just before sowing, another 125 kg at 30 DAS and liquid Jeevamarutha at 45 DAS and 60 DAS. Foliar spray of 3% panchagavya should be done at flowering stage.

## Crop Protection :

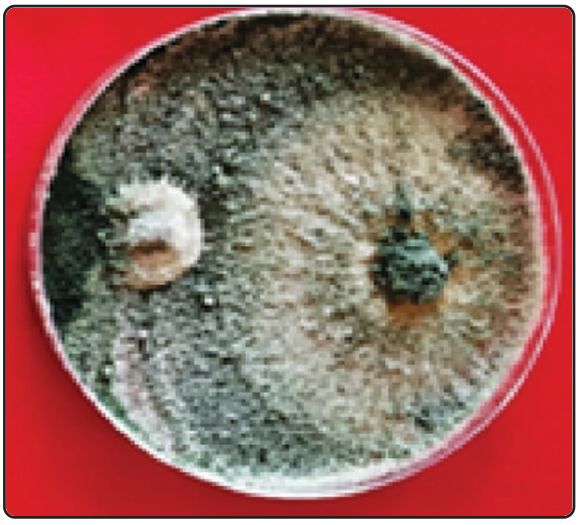
### Pests

| Name of the pest | Symptom | Control |
|---|---|---|
|  Pinkbollworm | Matured and developed larvae are pinkish in colour which tunnels into the stem and thereby kills the stem. If crop is infested at earhead or panicle stage white ear heads are formed. These larvae move from one plant to other and damages the crop. | ✦ Install 5 pheromone traps per acre.<br>✦ Spray 5 % neem seed kernel extract or neemasthra<br>✦ After 10 days spray Bhramastra<br>✦ If infestation is severe, apply Agniasthra. |
|  Aphids | Aphids infect during the ear head stage and feed on the inflorescence, grains and damages the crop | ✦ When aphids infest, remove them either by using hands or by shaking the ear heads.<br>✦ Install 5 pheromone traps per acre.<br>✦ Use marigold or castor as trap crops.<br>✦ If infestation is severe spray green chilli- Garlic extract.<br>✦ Install 15 bird perches per acre. |
|  Sucking Pests | Mealy bugs, Green leaf hopper, white leaf hopper suck the sap from plants and damages the crops. | ✦ Install 15-20 bird perches per acre.<br>✦ Plant 3 rows of maize crop around the field. |
|  Termites | Termites infests the ragi plants generally and cause more damage. when grown under light soils and under rainfed conditions termites infestation will be heavy. | ✦ Destroy the hills of termites.<br>✦ Spray cow dung +cow urine+ Asafoetida. |

## Diseases:

| Name of the Disease | Disease Symptom | Control |
|---|---|---|
| **Blast** | It occurs both in the nursery and main field. Showers of rains with high humidity in air and night temperatures of 20°C intensifies the blast disease. Spindle shaped spots are seen on leave, nodes and fingers. | ✦ Maintain field without any weeds.<br>✦ Selections of blast resistant varieties such as Ratnagiri, Sri Chaitanya, Bharathi.<br>✦ Cow dung+ cow urine+ Asafoetida is sprayed twice within a interval of 10 days. |

***Pseudomonas fluorescens* and *Trichoderma asperellum* against *Rhizoctonia solani***
**(Dual culture techniques)**



## Diseases of Finger millet (Blast)



Neck blast



Finger blast

Leaf blast



Healthy

Banded blight

## Extracts used for the control of pests in finger millet :

### Neem extract: (for control of sucking pests, Mealy bugs):

Pour 100 lit of water in a large earthen pot or barrel and add 5 lit of cow urine, 5 kg cow dung. Extracts from 5 kg neem leaf is mixed in this barrel. Stir/ mix the solution well and keep it for 24 hours. It is to be stirred twice a day with stick and later filtered through a cloth and 100 ml of this filtered solution is mixed with 5 litres of water and sprayed.

### Multiple use extract (for the control of sucking pests, stem borers):

Pour 10 lit cow urine in an earthen pot or barrel and 3 kg neem leaves are crushed and the extract is mixed with the cow urine in the pot. Later crush 2 kg custard apple leaves, 2kg papaya leaves, 2 kg pomegranate leaves, 2kg Guava leaves and extract is added to the pot. This mixture is boiled until reduced to 1/5$^{th}$ of its concentration. After cooling, leave it undisturbed for 24 hours and after that bound/ tie it inside a cloth and filter. This filtered 100 ml solution is mixed with 5 lit of water and sprayed.

### Firey Solution (for control of leaf folders, stem borers):

Pour 10 lit of cow urine in an earthen pot and mix it with the extract obtained by crushing 1 kg tobacco leaf and later add extracts 500 g of green chilli, 500 g of garlic to it. Finally add the extract obtained by crushing 5 kg of neem leaves to it and boil this mixture until it reduces to 1/ 5$^{th}$ of its concentration. After cooling allow it be stable for 24 hours and then tie in a cloth and filter. This filtered 100 ml of solution is mixed with 5 lit of water and this sprayed.

**Kunda solution (for control of stem borer, fungi, leaf hoppers):**

Required ingredients:

- Cow dung 1kg
- Cow urine 2 lit
- Neem Leaves 1kg
- Calotropis leaves 1kg
- Pongamia leaves 1kg
- Jaggery/ Molasses 50 gm
- Hand full of soil from termite hill.

**Process of preparation:**

- Above mentioned contents are mixed in an earthen pot and cover the pot with gunny bag and keep it in dark for 7 days.
- After 7 days, filter this solution and dilute it by adding water.
- Apply 15 ml of this solution mixed with 1 lit of water over matured plants and 25ml of solution mixed with 1 lit of water over tender plants.
- Later on every 7$^{th}$ day 2 lit of cow urine is mixed with the remaining contents in the pot and can be used for a period of 6 months.
- This solution can be effectively and against stem borers, leaf hoppers and fungi.

**Control of Diseases:**

Seed treatment with *Tricoderma harzianum* @ 5 gm/kg of seed and spraying of 0.5% *Pseudomonas fluorescens* solution twice in the field at an interval of 10 days.

# Barnyard Millet

This crop is grown in Asia majorly in the countries of India, Nepal, Malaysia, Pakistan, Japan and China. In India, it is being cultivated in the states of Madhya Pradesh, Andhra Pradesh, U.P, Tamil Nadu, Karnataka, Maharashtra and Bihar. In Tamil Nâdu, it is grown in the areas of Selam, Dharmapuri, Krishnagiri, Coimbatore, Thiruchanapalli,Madurai, Dhindigal, Thirunalveri, Ramachandrapuram, Kerur, Perambadur and Namakhal districts. In Andhra Pradesh, it is cultivated sparsely in less area.

Under irrigated conditions Co-1, Co-(KV)-2 can be cultivated and sown during June-July.

## Soils:

Light red soils and well drained black soils are suitable for barnyard cultivation. Low fertile, medium drained soils are also quite suitable for cultivation.

## Climate:

This crop can be grown under any climatic conditions.

## Crop Duration:

*Kharif* crops sown during the months of June-July when monsoon occurs. It is a short duration crop which comes to maturity within 6 weeks.

## Seeds & Sowing:

Generally sown when rain conditions prevail during the first week of july by broadcasting or by placing the seed at the depth of 3-4cm in soil.

## Seed Rate:

Seed rate of 3.2 to 4 kg/acre is required. In some of the areas of Maharashtra, they are sown by transplanting seedlings but a spacing of 25x10 cm would be preferable.

## Fertilizers & Manures:

Apply 2-4 tonnes of FYM per ha before sowing. 15 lit of 3 % Panchagavya, Bheejamurutha, mixed in 200 liters spray fluid is to be sprayed after sowing.

## Water Management:

Generally, banyard millet is cultivated under rainfed conditions, but if dry conditions prevail for longer durations, one irrigation has to be given during panicle formation stage. It is susceptible to waterlogged condition and hence during heavy rains, excess water has to be drained.

## Weed management:

The field has to be maintained without any weeds during the first 25-30 days of sowing.

## Crop Protection – Diseases

| Name of the Pest | Control |
|---|---|
| **Stem borer** | Agni-astra can be sprayed for its efficient management |
| **Downy Mildew** | Seeds are to be procured from disease free plants. Infected plants in the field are to be removed and destroyed. Seed treatment with 5gm *Tricoderma harzianum* per kg seed is recommended. 0.5 % (0.5 gm in 1 lit water) spray solution is to be sprayed under field conditions. |
| **Rust** | 5 gm of *Tricoderma harzianum* mixed with 1 kg of seed for seed treatment. To spraying 0.5 % spray solution is required |

## Diseases of Barnyard millet

### Barnyard millet

**Banded blight**

## Harvesting & Threshing:

When the grains turn yellow and the leaves turn greenish yellow, the crop can be harvested by cutting it just above the soil, then drying and threshing it after a week.

It is possible to obtain 160-240 kg grain and 480 kg fodder yield per acre. Around 4-4.8 quintals of yield can be gained if improved management procedures are implemented.

## Proso Millet

Proso millet is widely cultivated in the countries like India, Japan, China, Egypt, Arabia & West - Europe. In our country it is being cultivated in Madhya pradesh, Uttar Pradesh, Bihar, Tamilnadu, Maharastra and Andhra Pradesh. In Tamilnadu it is grown in the districts of Vellore, Thiruvananallai, Selam, Namakkol, Dharmapuri, Krishmagiri, Madurai, Dhindigal, Thirunalveli and Jhuthukudi. In Andhra Pradesh it is cultivated in the North coastal areas and high-altitude tribal areas as a rainfed crop.

**Crop duration:** 60-90 days(kharif)

**Land Preparation:** The main field should be ploughed thrice with a country plough and nursery must be established.

**Seed Treatment:** Seed has to be treated with Bheejamrutham @ ml/kg.

**Seed Rate & Sowing:** A seed rate of 3.2 to 4 kg per acre is necessary. Seeds are spread either by broadcasting or by line sowing 25x10 cm spacing.

**Sowing Time:** It should be sown as a *kharif* crop from the first week of June to the last week of July. Around 842 germplasm samples were collected from around 30 Nations in the ICRISAT gene banks and research is underway to produce new types.

**Water Management:**

Generally, irrigation is not required during the kharif season. When the weather remains dry for prolonged periods of time during the tillering stage, however, only one irrigation is required at critical stage to increase the yields. The first irrigation should be done after 25-30 days at sowing and the second irrigation should be done after 40-45 days. More number of irrigations must be avoided because the root system is at shallow depths.

**Weed Management:**

Up to 35 days after sowing, the crop had to be kept weed-free. Within a gap of 15-20 days two manual weedings are performed.

**Pest / Disease management :**

| Name of the Pest / disease | Control |
|---|---|
| Rust | Seed treatment with 4 gm of *Trichoderma viridae/kg* seed is recommended. 1 kg Pseudomonas fluorescens, 15 kg vermicompost or 10 kg soil should be applied during the final ploughing. Seed treatment with Bheejamrutha and then with 8gm *Trichoderma viridae* can be utilised for effective management. |
| Shoot fly | Proso millet infested with shoot fly should be completely burnt & destroyed. |

## Diseases of Proso millet

### Healthy

### Banded blight

### Harvesting & Threshing:

Within 60-75 days, the crop matures. When the grains and leaves turn yellow, it's time to harvest. It can be threshed by hand or with the help of animals.

### Yield:

Around 8-9.2 quintals seed and 20-24 quintals fodder can be obtained if efficient management procedures are followed.

## Foxtail millet

One of the earliest millet crops used for food and grazing is foxtail millet. It is known for being a short-season, drought-resistant crop. It is high in protein, iron, beta-carotene and other vitamins and minerals. Foxtail millet grain has a lower glycemic index and is utilised as a food for diabetics and those with cardiovascular problems. Andhra Pradesh, Karnataka, Tamil Nadu, Rajasthan, Uttar Pradesh, UttaraKhand and Bihar are the leading producers of the crop in India.

Foxtail millet crop

Ear heads

Seed

**Soil type:** The crop can be grown in a variety of soil types. It may be grown in locations with little to moderate rainfall. It thrives on well-drained soils, but not so well in waterlogged soil.

**Time of sowing:** June to July 15th

**Varieties:** A number of high yielding varieties has been released for different states

| S.No. | State | Varieties |
|---|---|---|
| 1. | Andhra Pradesh | SiA 3088, SiA 3156, SiA 3085, Lepakshi, SiA 326, Narasimharaya, Krishnadevaraya, PS-4 |
| 2. | Karnataka | SiA 326, HMT 100-1 and PS-4, Narasimharaya, SiA 3088, SiA 3156, SiA 3085, DHFt-109-3 |
| 3. | Tamil Nadu | TNAU 43, TNAU-186, TNAU 196, CO 1, CO 2, CO 4, CO 5, K2, K3, SiA 3088, SiA 3156, SiA 3085, PS-4 |
| 4. | Rajasthan | PrathapKangani (SR-1), SR 51, SR 11, SR 16, SiA 3085, SiA 3088, SiA 3156, PS-4 |
| 5. | Uttar Pradesh | PRK 1, PS 4, SiA 3088, SiA 3085, Sreelaxmi, Narasimharaya, S-114, SiA 326, PS 4 |
| 6. | Uttarakhand | PS 4, PRK 1, Sreelaxmi, SiA 326, SiA 3088, SiA 3156, SiA 3085, PS 4 |
| 7. | Bihar | RAU-1, SiA 3088, SiA 3156, SiA 3085, PS-4 |

**Seed rate:**

Line sowing: 8-10 kg/ha, Seed drill: 12 kg/ha, Broadcasting: 15kg/ha

**Seed treatment:** Seed treatment with Beejamrutham followed by *Trichoderma harzianum* @ 5g/kg seed and *Pseudomonas fluorescens* @ 5g/kg seed

**Spacing:** 22.5 cm between rows and 10 cm between plants within a row

**Land preparation:** Field has to be prepared thoroughly with the help of country plough or Iron plough for 2-3 times before sowing.

## Manures:

- Soil application of FYM @ 4 tones per acre and spray application of 3% Panchagavya and 5% of Jeevaamrutham
- Application of NADEP compost @ 2500 kg/acre
- Application of Ghanajeevaamrutham @ 125 kg/acre at the time of sowing and 125kg/acre near root zone 30 DAS

## Intercultural Operations:

- Thinning has to be carried 20 DAS to maintain optimum plant population
- Two inter cultivations and one hand weeding is effective for weed control and good crop growth

## Plant protection:

- Selection of resistant varieties
- Seed treatment with Trichoderma viride @ 5g/kg seed
- Spraying of medicinal plant extract to control Pink warm, Termite, Grasshopper, Stem borer and Army worm
- Spraying 5% of Neem seed kernal extract, Agni asthram and 3% of Panchagavya at the time of flowering to control Pink worm
- Spraying of cow dung+ urine+Asafoetida (Inguva) extract near root zone to control Termites
- Spraying of Gobanam (Fungicide) to control Rust, Blast and Downy mildew diseases (or)
- Spraying 6 liters of fermented butter milk by adding in 100 liters of water against all the diseases (or)
- Spraying of wild ocimum leaf extract or Sontipaalukasaya against all the diseases

## Harvesting:

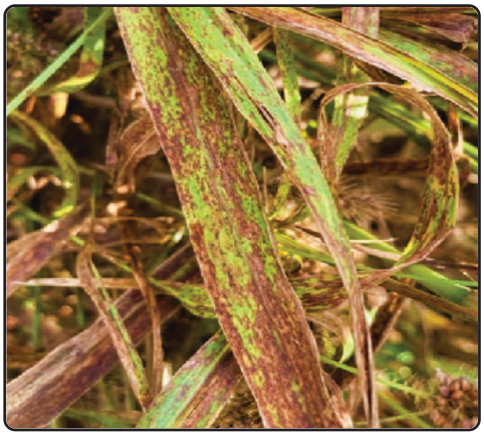
*Kharif*: September-October

*Rabi*: January- February

## Major diseases of foxtail millet

### Healthy

### Brownspot



### Rust

## Kodo millet

Kodo millet is a popular minor millet crop that is drought resistant and suited for growing in low-rainfall areas. It is a high-fiber, high-protein crop with a higher oxidant potential than other millets and cereals, including 8.3 % protein, 1.4 % fat, 65.6 % carbohydrates and 2.9 % ash. Kodo millet diet is nutrient-dense and is advised for persons with diabetes and heart disease.

Kodo millet is mainly grown in India, Indonesia, Thailand, Philippines and South Africa. In India, the major kodo millet growing states are Andhra Pradesh, Rajasthan, Tamil Nadu, West Bengal, Madhya Pradesh and Uttar Pradesh

**Kodo millet crop**

**Ear heads**

**Seed**

**Soil Type:** It is grown in different types of soils: Gravelly, stony, poor loamy soils, fertile soils, soils with rich organic matter

**Time of sowing:** June to July 15th

**Varieties:** A number of high yielding varieties has been released for different sates

| S.No. | State | Varieties |
|---|---|---|
| 1. | Madhya Pradesh | JK 439, RBK 155, JK 13, JK 65, JK 48, JK 137, RK 390-25, JK 106, GPUK 3, JK 98, DSP 9-1, TNAU 86 |
| 2. | Tamil Nadu | KMV 20 (Bamban), CO 3, TNAU 86, GPUK 3, RK 390-25 |
| 3. | Gujarat | GK 1, GK 2, GPUK 3, JK 13, RK 390-25 |
| 4. | Chhattisgarh | RBK 155, JK 439, Indira Kodo 1, Indira Kodo 48, GPUK 3, JK 65, JK 98, Chhattisgarh 2, RK 390-25, TNAU 86 |
| 5. | Karnataka | GPUK 3, RBK 155, RK 390-25, TNAU 86 |

**Seed rate:**

Line sowing: 10 kg/ha

Seed drill: 12 kg/ha

Broadcasting: 15 kg/ha

**Seed treatment:**

- Seed treatment with Beejamrutham followed by *Trichoderma viride*@4g/kg seed
- Seed treatment with *Azospirillum brasilense* and *Aspergillus awamouri*@ 25g/kg is beneficial

**Spacing:** 22.5 cm between rows and 10 cm between plants within a row

**Land preparation:** Field has to be prepared thoroughly with the help of country plough or Iron plough for 2-3 times before sowing

**Manures and Fertilizers:**

- Soil application of compost or FYM@ 2000 kg/acre is recommended. Additionally, 4 packets of phosphobacteria mixed with compost/biogas slurry is good for crop growth and yield.

- Before sowing, mix 5 kg seeds in three packets of azophos @ 200g each and mix thoroughly with rice starch and shade dry

**Intercultural operations:**

- Thinning has to be carried 20 DAS to maintain optimum plant population
- Two inter cultivations and one hand weeding is effective for weed control and good crop growth

**Plant protection:**

- Selection of resistant varieties
- Seed treatment with *Trichoderma viride*@ 4g/kg seed followed by Beejamrutham
- Soil application of *Pseudomonas fluorescens* mixed thoroughly in 15 kg of cow dung is recommended

**Banded blight of Kodo millet**



**Harvesting:**

*Kharif*: September-October

*Rabi*: January- February

## Little millet

Little millet is a hardy minor grain crop that belongs to the Poaceae family (Gramineae). The name of the species comes from a specimen found in Sumatra (Indonesia). Little millet is a South Asian grain that is grown in India, Indonesia, Burma, Malaysia, China, Pakistan and Sri Lanka. Andhra Pradesh, Madhya Pradesh, Odisha, Jharkhand, Uttar Pradesh, Haryana, Karnataka, Chattisgarh, Gujarath and Rajasthan are among the states in India where it is expanding. It can resist both drought and standing water. It may be grown up to 2000 metres above sea level. Tribal and poor farmers grow the crop in poor soils with little or no cash input for food and feed. In comparison to other cereal crops, it has a high renewing capacity.

It's a beautiful millet that's appropriate for folks of all ages. It aids in the prevention of constipation and the treatment of all stomach ailments. Its high fibre content aids in the reduction of fat deposits in the body. Per 100 gm of small millet, there is 8.7 gm of protein, 75.7 gm of carbohydrates, 5.3 gm of fat and 1.7 gm of minerals. Little millet is high in complex carbs, antioxidantsand phenolic compounds, all of which aid in the prevention of metabolic illnesses such as diabetes, cancerand obesity. The crop is drought resistant and nutritionally and medicinally superior to or comparable to other farmed cereals. Grains are recommended for diabeties and heart problems. Little millet grain has exceptional storage qualities and is referred to as a famine reserve since it can be held for several years without danger of stored grain pests in normal storage circumstances. The crop is suitable for fragile and vulnerable agro-ecosystems because it is environmentally benign.

**Little millet crop**

Ear heads

Seed

**Soil type:** It is grown in different types of soils: Gravelly, poor loamy soils, fertile soils, soils with rich organic matter. However, red loamy soil is preferable

**Time of sowing:** June to July 15th

**Varieties:** A number of high yielding varieties have been released for different states

| S.No. | State | Varieties |
|---|---|---|
| 1. | Andhra Pradesh | OLM 203, JK 8, BL 6, DHLM 36-3 |
| 2. | Odisha | OLM 203, OLM 208, OLM 217, BL 6, DHLM 36-3, DHLM 14 1 |
| 3. | Madhya Pradesh | JK 4, JK 8, JK 36, JK 137, BL 6, DHLM 36-3 |
| 4. | Tamil Nadu | Paiyur 2, TNAU 63, CO 3, CO 4, OLM 203, OLM 20, BL 6, DHLM 36-3, DHLM 14-1 |
| 5. | Chattisgarh | JK 8, BL 6, BL 4, JK 36, JK 137, DHLM 36-3 |
| 6. | Karnataka | OLM 203, JK 8, BL 6, DHLM 36-3, DHLM 14-1 |
| 7. | Gujarath | GV 2, GV 1, OLM 203, JK 8, BL 6, DHLM 36-3, DHLM 14-1 |
| 8. | Maharashtra | Phule Ekadashi, JK 8, OLM 203, BL 6, DHLM 36-3, DHLM 14-1 |

**Seed rate:**

Line sowing: 10kg/ha

Seed drill: 12kg/ha

Broadcasting: 15kg/ha

**Seed treatment:**

- Seed treatment with Beejamrutham followed by *Trichoderma viride*@4g/kg seed
- Seed treatment with *Agrobacterium radiobacter* and *Aspergillus awamouri*@ 25g/kg improves crop growth and seed yield

**Spacing:** 22.5 cm between rows and 10 cm between plants within a row

**Land preparation:** Field has to be prepared thoroughly with the help of country plough or Iron plough for 2-3 times before sowing

**Manures and Fertilizers:**

Soil application of compost or FYM@ 2 tones/acre, 2 weeks before sowing and application of NADEP compost@ 2500kg/acre. Additionally, application of Ghanajeevamrutham@125 kg at the time of sowing and 125 kg at 30 DAS improves crop growth and yield

**Intercultural operations:**

- Thinning has to be carried 20 DAS to maintain optimum plant population
- Two inter cultivations and two hand weeding at 15 DAS and 40 DAS is effective for weed control and good crop growth

**Plant protection:**

- Selection of resistant varieties
- Seed treatment with *Trichoderma harzianum* @ 4g/kg seed followed by Beejamrutham
- Spraying of Neemasthra, Brahmasthra, Agniasthra and Gobanam for pest and disease control

## Little millet

### Banded blight

### Alternaria leaf blight

**Harvesting:**

*Kharif*: September-October

*Rabi*: January- February

# Sorghum

Sorghum is planted as a *kharif* crop in telugu states with little rainfall, as well as in Chalka soils such as Mahaboobnagar and Kurnool districts. Sorghum is grown in 82.5 thousand acres in Andhra Pradesh and Telangana states during the kharif season and 2.15 lakh acres during the rabi season. In kharif, an average yield of 699 kg is acquired and in rabi, an average yield of 975 kg is obtained.

Sorghum crop

Ear head

Seed

**Growing areas:** As kharif crop, it is cultivated in low rainfall areas of red chalka soils in Kurnool district include the Nandyal hills of Kurnool and Kadapa districts. It is late sown as rabi crop in Prakasam district.

**Sowing time:** *Kharif* -June, Maghii-September, *Rabi*- October, Late rabi- November, Summer-january.

**Seed treatment:**

- Soak the sorghum seeds in a 75-100g Asafoetida + 1 lit water solution and then dry them in the shade. This aids in the treatment of ergotism.
- Aswagandha and Datura plant extracts should be used to treat seeds. 250 gm Aswagandha and 50 gm Datura leaves are crushed, then mixed with 1 kg of seed and dried in the shade. This aids in the production of disease-free nursery seedlings.
- Seed treatment of 1 kg sorghum seed with 100 gm cow dung powder + 250 ml cow urine enhances germination % by breaking seed dormancy.
- Before sowing, the seeds should be soaked overnight in the supernatant lime solution (1 kg lime in 10 lit of water, kept at room temperature for 10 days) and then air dried.

**Seed treatment with Bhjeemruth**

**Soils:** Black Soils, light red soils.

**Seed rate:** 3-4 kg

**Spacing:** Plant population of 58000-72000 plants per acre should be maintained when sown at a spacing of 40 x 12.15 cm

**Manures:**

- Apply 5 tonnes of FYM, 2500 kg of NADEP compost in the last ploughing. At the time of sowing, apply 100 kg FYM, 125 kg Ghanajeevamrutha and again after 65 days 200 lit of liquid Jeevamrutha is to be given through irrigation.
- Apply 0.8 tonnes of vermicompost to increase the carbon content in soil.
- Care to be taken to apply 2 kg Azosporillum and 80-100 kg organic manure per acre below the seed 2 kg Phosphobacteria mixed with 200 kg of FYM during ploughing.
- Atleast 5 kg Mycorhize (VAM) per acre has to be applied.
- Once in a month spray 5% Jeevamrutha (5 ml Jeevamrutha in 1 lt of water)
- Spray 10% cow dung and 3 % panchagavya at 30, 45 days of sowing in order to correct the Nitrogen deficiency.

**Usage of Jeevamrutha:**

Application to field: Jeevamrutha can be applied along with the irrigation water by draining the jeevamrutha from drum into the irrigation channels so that it mixes well with water and reaches roots effectively otherwise fill the jeevamrutha in a large bucket and mix it in the irrigation channel with a plastic mug gradually.

**Foliar spraying :**

- If Jeevamrutha applied as foliar spray along with field application, excellent results can be obtained.
- After 15 days of sowing spray 5 lit of Jeevamrutha mixed with 100 lit of water per acre.
- Again spray it after 30 days of sowing by mixing 5 lit of it in 150 lit of water per acre.
- After 60 days of sowing, fourth spraying should be done by mixing 20 lit of Jeevamrutha in 200 lit water per acre.

- Spray it after 75 days of sowing (20 lit Jeevamrutha + 200 lit water)
- Spray it after 90 days of sowing (20 lit Jeevamrutha + 200 lit water)
- Spray it after 100 days of sowing (25 lit Jeevamrutha + 200 lit water)

**Ghanajeevamrutha Powder:**

The micro organisms in Ghana jeevamrutha powder are generally in dormant stage but once applied in field they multiply and get activated. During sowing add 100 kg FYM, 10-100 kg ghanajeevamrutha powder with the seed. This helps in increasing yields when compared with chemical fertilizers.

**Water Management:** During the kharif season, sorghum does not require irrigation. When necessary, irrigation is provided during the flowering and grain production stages in the black soil regions. Irrigation is to be given once in a week for light soils once in 15 days for black soil crops.

**Inter cultivation:** During kharif season, jowar and pigeon pea is grown in 1:1 proportion.

**Weeding & intercultivation:**

Intercultural operation with implements such as Guntaka and danti 30 days after sowing helps to preserve moisture in the soil, which aids plant growth.

**Mulching:**

The covering of the fields with the waste materials of Jowar, Ragi, Wheat, Paddy, soya, banana, green gram and black gram crops is known as mulching with crop wastages. This helps in building up of earthworms and Microbial environment for microorganisms in the field. This makes the earthworms living in the soil make burrows to come up from deeper soil to surface thereby bringing the nutrients to the surface layers of the roots and helps in nutrient absorption. This process makes a similar view of ploughing.

Growing of small crops such as greengram and cowpea in the fields of large crops which helps in conserving the soil moisture by not allowing the sun rays to fall directly on soil is termed as natural covering or mulching and such crops called as cover crops.

**Straw: Organic mulching material**

## Crop Protection:

- Plant 3 rows of maize around the main field as a border crop.
- Arrange 15 - 20 yellow and white plastic boxes painted with grease.
- Plant marigold and castor crops as trap crops.

## Natural pesticides for control of pests and diseases:

Different types of extracts can be prepared from locally available medicinal trees for the control of pests & diseases.

## Pest Killers

**Neemasthra: (for control of sucking pests and other minor pests)**

Five kg of fresh dried neem leaves are to be powdered and mixed in 100 lit of neem seeds. Take 5 lit of desi cow urine and 1 kg desi cow dung and mix in this drum containing neem powder solutions and stir it well in clockwise direction. Cover this with gunny bag for 24 hours and later filter it through transparent cloth and sprayed in the fields.

## Brahmastra (For control of major pests)

Leaves of 2 kg Neem, Custard apple and Datura are crushed and mixed in 10 lit of cow urine in a drum and stir it well by using a stick. Later boil this solution and allow it to cool for 48 hours and filter this solution through a cloth and spray this filtered solution by mixing 2-2.5 lit in 100 lit of water per acre. This can be stored for 6 months and used.

## Agniasthra (For controlling stem borers)

Take 1 kg fresh tobacco leaves, 5 kg fresh Neem leaves, 1-2 kg of green chilli, 0.5 kg garlic and crush them and take this mixture in a pot and finally add 10 lit of cow urine to it and allow it in boil for certain period and cool it for 48 hours. After 48 hours filter this solution through a cloth and then stored. When needed mix 2 to 2.5 lit of this solution with 100 lit of water and spray it per acre.

## Disease Killers

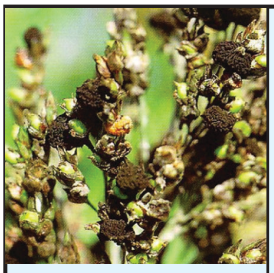
**Gobanam:** 6 lit of fermented butter milk is mixed with 100 lit of water and sprayed per acre. This helps in control of diseases.

**Cultivation of Sorghum in rabi:** Instead of sowing sorghum alone, it is advised to sow 2-3 crops as mixed cropping with 4 kg local sorghum varieties seeds + 2kg desi groundnut seeds + 1 kg Coriander seeds are treated with Bheejamrutha and seeds are sown after application of 100 kg FYM which is mixed with 10-100 kg Ghanajeevamurutham.

## Pest and Disease management

| Name of the pest / Disease | Symptom | Control |
|---|---|---|
|  Sorghum Shoot fly | The infected shoots shrivel up and die. If the shoots are removed, a foul odour is released. During the first 30 days after sowing, more tillers are developed and the infestation is severe. As a result, the kharif crop is planted before July 15. This shoot fly assaults the crop until it reaches the fifth week of growth. | ✦ Apply 200 kg Neem powder during the last ploughing.<br>✦ Maintain bunds weed free and spray Agniasthra. |

| | | |
|---|---|---|
|  **Sorghum stem borer** | After 30 DAS this pest attacks the crop. The leaves develop circular holes and the inflorescence dies, resulting in white ear heads and dead heart symptoms. Red colour discolorations can be visible when the stem is split open. | ✦ Install 4-5 pheromone traps for pink bollworms.<br>✦ Spray cow dung+cow urine solution once in a week. This repels the pests hence eggs cannot be laid.<br>✦ Spray 5% Neem seed kernel extract.<br>✦ If the pest attack is more, spray Agniasthra. |
|  **Sorgham ear head bug** | Nymphs and adults suck sap from tender grains in milky stage resulting in shrivelled, unfilled, chaffy grains which initially show red spots on feeding sites and later turn black. | ✦ Identify the pest early and spray cow dung + cow urine solution or 5 % NSKE extract. |
|  **Sorghum + aphids** | Aphids suck sap from the plants. | ✦ Spray datura leaf extract for its control.<br>✦ Spray 5 % NSKE (Neem Seed Kernel Extract) or Neemasthra.<br>✦ Spray of 2gm of *Verticillium lecanii* per lit of water for controlling aphids |
|  **Grain smut disease** | Symptoms are more prevalent during the wet season. Rainfall during the blossoming and grain filling stages causes the most damage. Pink in black smut can be noticed depending on the type of fungal or smut spores on grains. | ✦ Spray 6 lit of fermented buttermilk mixed with 100 lit of water. |

| | | |
|---|---|---|
|  **Ergot or sugary disease** | A period of high rainfall and high humidity during flowering season favours this disease. Cloudy weather during anthesis encourages the disease spread. Pinkish / whitish honey dew secretions are observed from the infected earheads. | ✦ Spray cow dung + cow urine+ Asafoetida twice within a period of 10 days. |

**Intercrops:**

Sunflower can be planted as intercrop in jowar in the proportion of 6:3 ratio

Apply 200 lit of Jeeamurutha once in a month along with irrigation or 10-20 lit of Jeevamurutha can be mixed with 200 lit of water and sprayed.

**Harvesting:**

Sorghum is harvested when the grains in the ear heads turns from green colour to white and milky earheads turns to powdered form and also harvest after the black spot appears on the grain.

## Pearl millet

In general, the most widely grown millet is pearl millet, also known as Bajra. Since prehistoric times, it has been grown throughout Africa and Indian subcontinent. It thrives in drought-prone environments with low soil fertility and high temperatures. It thrives in soils that are highly saline or have a low pH. Because of its resilience to a variety of growing circumstances, it can be cultivated in regions where other millet or cereal crops would fail

India is the largest producer of pearl millet and among the Indian states, Rajasthan is the highest producing state. Pearl millet is a rich source of various nutrients and minerals, which contains 11.65% protein, 68.85% carbohydrates, 2.63% crude fiber, 11.65% fat and 2.75% ash.

**Pearl millet crop**

**Soil type :** Bajra may be grown in a variety of soil types. It does, however, grow best in black cotton soil and sandy loam soil with good drainage. This crop does not grow well in acidic and water logged soil.

Ear heads

Seed

**Time of sowing:**

*Kharif:* June -July

*Rabi:* January

**Varieties:** A number of high yielding varieties has been released for cultivation under different conditions

**Seed rate :** 3-4 kg/ha

- Seed treatment: Soak the seeds in salt solution (20 g salt in 1 litre of water) for 10 minutes to remove the ergot infected seeds followed by treatment with Beejamrutham
- Soak the seeds in Panchagavya solution (3-5 ml of panchagavya in 1 litre of water) for 7-8 hours to get disease free seedlings
- Soak 1kg seeds in Ashwagandha and Datura extract solution (Mixture; Ashwagandha root extract 250g+Datura leaf extract 50g+1 litre water) for healthy and disease-free seedlings

**Spacing :** 45 cm between rows and 15 cm between plants within a row

**Transplanting :** Seedlings should be 15 days old and spaced 45 cm between rows and 15 cm between plants within a row. In one acre, a total of 58,000 - 72,000 seedlings must be planted.

**Manures and Fertilizers:**

- Soil application of FYM@ 4 tonnes per acre
- Soil application of vermicompost@ 0.8 tones/acre to increase carbon source in soil
- Application of FYM@ 100 kg along with Ghanajeevamrutham 10-100 kg/acre
- Spray Geevamrutham for every 15 days interval

**Water management:**

- Soil mulching with groundnut husk 30 DAS to prevent moisture loss.
- Irrigation at the time of flowering, milky stage, seed formation and seed setting stage is advisable

**Inter cropping :** Bajra+ Redgram @ 2:1 ratio

**Intercultural operations :** Thinning has to be carried 15-20 DAS for maintaining optimum crop population

**Plant protection:**

- Spray cow dung+urine+Asafoetida (Inguva) solution to control Termites
- Spray wild ocimum leaf extract (or) Sontipaalukasaya to control green year/downy mildew disease
- Two sprays of cowdung+urine+asfoetida (Inguva) solution at 10 days interval controls ergot disease

## Major diseases of pearl millet

Leaf spot

Rust

Downy mildew

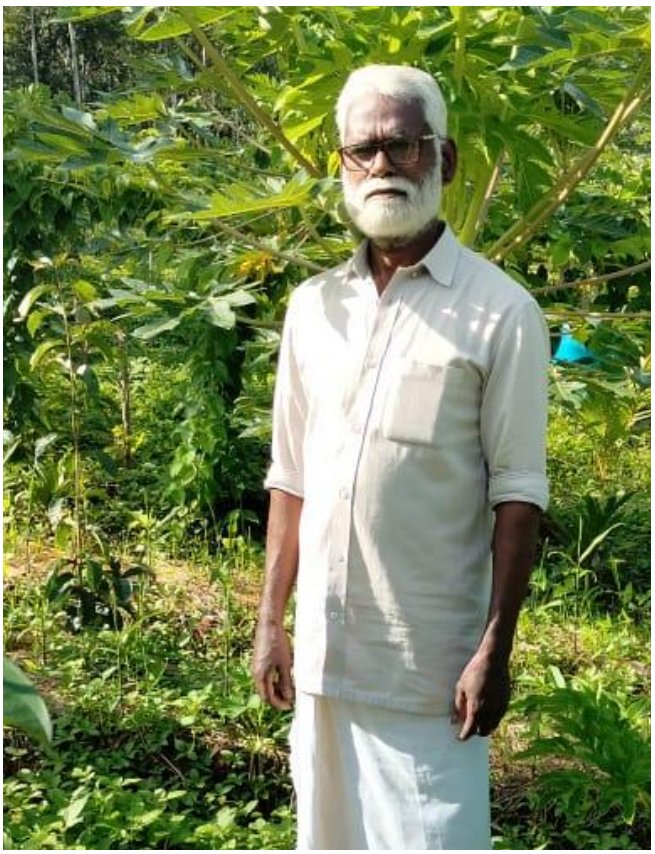
Ergot

**Harvesting:**

*Kharif:* October-November

*Rabi:* February-March

# List of Cases
# by NCNF



## Gopalakrishnan

**Wayanad, Kerala**
**Natural Farmer since 2011**

I actively started practicing natural farming in 2011 with paddy cultivation. Even though the yield was less in the first year, from the second year onwards I saw a drastic increase in the yield. **From one single plant I could harvest 72 Kgs of paddy.** Over the course of the next 2-3 years I observed that the weight of the harvest kept increasing and this I realised was because of the increase in the nutrient concentration of the plant. When I compare it with my earlier days of practicing chemical agriculture, I noticed a considerable decrease in pest attacks while doing natural farming. Also, earlier there hardly used to be any living beings in the soil but now I have an increasing number of creatures like earthworms that live in soil. Naturally pest attacks had to be higher in the earlier times since their predators weren't there.
Unfortunately though due to rampant pig attacks and incessant rainfall, since the last few years I haven't been able to continue with my paddy cultivation. **But the experience that I had with paddy clearly proved it to me that natural farming is the way forward and it is a successful model.**

My first exposure to organic and natural farming was back in 1987 when I was part of multiple nature clubs associated with the local Gandhian adivasi association. I clearly remember, once when we had visited the tribal regions of the *Kuruma* tribe, in their *deva pera* (God's room) I noticed very low quality rice husks being used. Out of curiosity, when I asked the tribe's leader of why such low quality rice husk is used he said, ***"...the farmers around have started using chemicals in their paddy field a few years ago. Since then the rice husk's quality has reduced, to the extent that we have to plant new sapplings every two years now. ... If by using chemicals this is what is happening with the husk then I can only wonder what will happen to the people eating this rice..."***

Even though this statement from the *Kuruma* tribe's leader hit me hard, I did not take it seriously enough to stop my chemical intensive farming practices. However, in 1994 when I was working with the organic association I got to interact with the doctors of Regional Cancer Centre (RCC) in Trivandrum who were researching the reason behind the increasing number of cancer patients in the adivasi regions. And to my shock, the research showed that **the adivasi communities who still practiced their traditional ways of cultivation had a much lower number of cancer patients in comparison to those that converted to the green revolution prescribed chemical intensive agriculture practices. Seeing this, I decided to stay away from chemicals and pesticides.**
And fast forward to 2009, I got to attend Subash Palekhar ji's camp on natural farming which gave me a deeper understanding on the practice of natural farming encouraging me to fully convert to natural farming.

Today I cultivate vegetables like tomato, gourds, chillies, beans etc; tubers like yam, tapioca, purple yam etc; fruits like papaya, coconut, mango, guava, etc and spices like pepper, ginger, turmeric, arecanut and even coffee. All these are naturally grown across a total land area of 1.5 acres. Most of these are used for my own consumption of people in and around me. By selling the surplus in the local market, I receive around INR 25000/- annually. **In the coming years I plan to initiate an agroforestry model of farming with the 5 stage farming practice. Meanwhile this year I am working on restarting paddy cultivation.**

# *Celebrating Champion Farmer*

# Kalpana Khanra,

**Ramganga village, Patharpratima Block, South 24 Parganas, West Bengal**

**Kalpana Khanra shares how despite the changing climate in the Sundarbans, she is able to give her family nutritious food all round the year**

*A story interviewed and written by;*
*Anirban Banerjee from DRCSC,*
*West Bengal*

NATIONAL COALITION FOR NATURAL FARMING

*"…My husband has not migrated to far-off States in search of work since the past 4-5 years, instead seeing the benefits of doing natural farming, he has joined us farming on our own land, is giving more time to our children's education and looking after the family…"*

Our ancestors have been living here in Ramganga village, South 24 Parganas (Sundarbans regions) since more than 100 years and there was rarely a time when they had to depend on the market for their food. However, **until a few years ago we could hardly grow one or two vegetable crops and paddy once an year despite using chemical inputs which were meant to be for quick and increased production.** Our 1 acre farmland and 0.165 acre of homestead land was no longer sufficient for the family. For almost all our daily needs we became solely dependent on the local market. **The changing climate, frequent natural hazards and occasional water logging issues made farming further difficult. Migrating to far-off states like Maharashtra, Karnataka etc in search of better income opportunity was the only way to meet our ends meet.**

Then in 2012, I became a member of the *Nadi Mahila Samity* (a mutual cooperation group) an initiative started by Development Research Communication and Services Centre (DRCSC). I got to attend series of training sessions on sustainable and nature friendly farming practices. Like preparation of organic manures, pest repellent and growth promoters, seed saving preservation & conservation etc.
These training sessions gradually changed my perception about farming because all the while until now the farming I practiced used lots of chemicals. **So growing food without chemicals was something new and insightful for me.** In fact the most striking learning for me was that locally available low cost materials could be used to make good manures and pest repellents. **Thus with regular interactions with the local field staff and support from the DRCSC team for manure, seeds, bio-pests repellents, neem oil etc; I first designed and began natural farming at my garden.**

*And then, there was no looking back!*

**Later in 2018, we revamped 0.66 acres of our farmland.** Raised land & embankments for vegetable cultivation, prepared low land for paddy and made pond and drain system for fish cultivation. This way we were able to grow all kinds of leafy and fruit vegetables, creepers etc all around the year - bitter gourd, chilli, brinjal, radish, okra, bottle gourd, Amarantha, tomato, sponge gourd, ridge gourd and so on. **In the paddy field of 0.33 acres** we cultivated desi *Dudheswar* paddy in monsoon and green gram in winter. And we have 5 cows; milk is consumed at home and if excess sold in the local market; the cow dung is used to make biogas. Whose slurry is then used for composting and used as manure in the farm. We also had chickens, goats and ducks but they had to be sold off as they were affected during the *Amphan* cyclone.

Integrated farming has been extremely beneficial for us. **Not only has it increased our vegetable production, but we can also harvest the produce throughout 9 months of the year and sell it in the local market.** Most effective selling happened in the time of lockdown last year, when there was high demand for chemical-free organic food. We also consume the fish everyday at home and rest is sold to the trader. Our average income from farming was Rs. 20,000 in 2018, but last year it increased to INR 45,000 - 50,000/-.

Over the years what we have learned is that apart from reduction in cost of production and increase in income, we now have nutritious and safe food for our family all around the years. **The best part is that natural hazards and changing climate has not affected drastically. And even if one farm patch suffers, production from the other patches are found to be sufficient.**
Farming this way has solved many of our challenges. To the extend that my husband has not migrated since last 4-5 years, instead farms on our land and spends more time with us.

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*Celebrating Women Champion Farmers*

# Damor Kamla Ben Shankar Bhai,

**Nawaghara village, Meghraj Block, Aravalli District, Gujarat**

**Now an active advocate for women land rights, Kamla ben is a relentless warrior motivating others to adopt sustainable agriculture. Zeal, courage and perseverance makes Kamla ben a true leader, who inspires others to dream, learn, do and become more…**

*Interviewed and written by Sharifa Khan from WGWLO, Gujarat*

NATIONAL COALITION FOR NATURAL FARMING

*A true leader is one whose actions inspire others to dream more, learn more, do more and become more…*

An apt quote to describe Damor Kamla Ben Shankar Bhai, a 42-year-old women farmer, from village Nawaghara of Meghraj Block, Aravali District, Gujarat. Mother of two sons, Kamla ben comes from a farming family. Since childhood, she has seen her parents work in the fields and even joined them sometime.

Kamla ben's life began to change when she started working on Women and Land Ownership with WGWLO where she became a Mahila Kisan Sakhi. Part of which she got trained on aspects of land rights and sustainable agriculture; Kamla ben's job was to educate women farmers about their land rights and sustainable agriculture.

At the beginning, Kamla ben started interacting with women farmers from 15 villages. During her interactions, she realised that even though she was trying her best to convince them to practice sustainable agriculture, something was restricting these women from adopting it. Upon introspecting, Kamla ben understood that their unwillingness was because they did not have any role model, someone with whom they could relate to.

*So just as a leader shows the way, Kamla ben decided to step up and decided that if she had to convince others then she had to lead by example.*

Kamla ben is married to Shankar bhai, a farmer who farmed in about 4.5 bighas of land along with his two brothers. She discussed with them about the benefits of sustainable agriculture and shared how it is beneficial in the long run. But the men of the family were not convinced. Even though her husband was supportive of Kamla ben, due to the family's pressure he could do very little. This incident helped Kamla Ben realise how important land rights is for a woman. Despite both men and women doing equal amounts of work, women have very little say in the decision making.

Kamla ben did not lose hope and continued to pursue her dream to start sustainable agriculture in her land. And after lots of efforts she finally convinced them to start sustainable agriculture in a small portion of their land. Kamla ben was given 0.5 bigha of land to experiment.

Kamla ben started farming through the SRI method and at first sowed wheat in the 0.5 bigha land. She used cow dung as manure and Amrit Pani as bio-pesticide. In the first year (2017), the production was less, which she knew was normally the case when we shift from synthetic chemical farming to natural farming. But the yield tasted really good.

*Perseverance of Kamla ben and the taste of the produce compelled Shankar Bhai to openly support her. Kamla ben then demanded to include her name in the land records of her family and she was successful.*

Couple of years down the line, they purchased 7 bighas of land and started doing sustainable agriculture cultivating watermelon using drip irrigation, indigenous varieties of Millets, and green vegetables for household use. Kamla ben was always particular of using only the local varieties of seeds which she conserved from her crops.

*Seeing Kamla ben practice sustainable agriculture and get good yield, the other women farmers also started to listen to her. For them, Kamla ben presented a successful model of how sustainable agriculture could benefit.*

Kamla Ben has until now motivated over 132 women farmers from the 15 villages and has helped them adapt to sustainable agriculture. She also initiated seed banks of local crop varieties in these villages.

Kamla Ben says, *"Owning a land in her name made her more confident, and gave her a say in the decisions. Despite both men and women doing equal amounts of work, women have very little say in the decision making, which is very unfair."*

# Mahesh Anna

**Village: Ammanaghatta**
**Taluk: Gubbi**
**District: Tumkur**
**State: Karnataka**
**Location: 13.3426061,76.9130633**

My encounter with natural farming dates back to 15 years ago when I was frequently facing a lot of health issues especially related to the Digestive system. I had tried all sorts of medicines but they all provided only temporary relief. That was when I decided to pay a visit to the local doctor in my village who practiced Naturopathy.

"**We are Nature. Nature is Us."** His words echo in my ears to date! He has his unique way of treatment where he used strictly natural remedies, during my treatment I learned a lot about how the body and nature are synonymous. I saw how just a few days of eating clean and organic food made me feel active and energetic throughout the day.

I thought to myself that if the grains from the conventional chemical practices have destroyed our body so much then what impact they'd have had on the soil and water!
That was when I gave Natural farming a shot! I started investing myself in learning much about the techniques by attending various workshops and seminars including the one that was conducted by Subhash Palekar and also reading books like One Straw Revolution by Fukuoka.
I had made up my mind to switch completely to natural farming!

The initial period was a struggle because there were no set ground rules for it and everything mostly seemed like a hit & trial method. I wouldn't lie when I say I felt like a mad scientist while experimenting on my crops.

The yield was low initially and a lot of people in my village started mocking me and questioning my practices. This had a great impact on my family and even though they tried being supportive somewhere in the corner of their heart, they also feared for the loss. However, I refused to give up.

When you initially start with agro-ecological-based methods you do not see the results overnight, but there are certain signs to show that you're heading in the right direction.

For me it was when I saw squirrels and worms making their homes on my farm or when I heard the birds chirping around, I mean this may sound silly to you but trust me when I say that I hadn't seen such a sight before.

A year later I noticed how the water consumption was a lot lesser when compared to the times before. Soon I started growing a variety of crops like Ragi, Finger millet, Papaya, and Chikkoos.

A lot of people advised me to at least spray weedicides, I however refused to heed their advice and let them grow as the boundaries around my farm. This not just helped in nitrogen fixation in the soil but also helped the plants hold water while maintaining the temperature of the land.

The foliage, twigs, and other plant wastes are recycled as manure to the crops. They also act as fodder to my livestock. This was another interesting observation; when my cows were fed with the produce from my organic farm, the quality of milk and manure they produced was many folds better than before. Not just that, their health also improved significantly.

Today my farm is spread across 10 acres of land and houses crops like – **Ragi, Tomato., Mango, Papaya, finger Millet, Ginger, Turmeric, Lemon, Chillies, and a wide variety of green leafy vegetables**. All of these are sold in the market as well as used by us at home. It makes me delighted to see that the same people who questioned me years ago, prefer my crops over others. I have heard them praising the taste of the fruits from my farm sometimes! **"Natural farming is not simply a practice, it has been more like a Spiritual Journey for me that has taught me so much about nature, as well as my own body"**

Desi seed bank

Low carbon agriculture demo plot

*Celebrating Champion Farmers*

# Paani and Narayan Sonagara,

**Haripar Village, Kalyanpur block, Devbhumi, Dwarka Dist., Gujarat**

**Narayan Sonagara shares how with his wife Paani being the backbone of his farm and family, they have been able to successfully fulfil his dream of converting their land into a natural farm.**

*Interviewed and written by*

*Kartik Joshi from AKRSP-I, Gujarat*

NATIONAL COALITION FOR NATURAL FARMING

My name is Narayan Sonagara. Growing up in a family of farmers, I started farming since I was 12 years old. While applying synthetic chemicals, especially pesticides, I had always faced skin and eyes irritation. And at each of those times I remembered the stories told by my dada about their traditional natural farming methods. So I always wondered how these synthetic chemicals would react inside my body. The thought scares me every time.

*As a young 16 years old boy I decided for myself that I will only do natural farming.*

However my journey from conventional to organic farming was not easy. Initially, when I tried to convince my family to practice natural farming, at least in a small portion of land to begin with, they would dismiss me saying, "*tum toh chotte ho, tumhe kuch nahi pata kheti baddi ka*". I couldn't go against my elder brother and family, hence couldn't do anything much. So after many years, when our lands got divided between us siblings, is when I could finally start.

*"…When you drink tea every morning and one day when you do not get to drink tea, your entire day gets spoiled, the same way my land was addicted to the fertilisers…"*

In the first season of going fully natural, my wife Paani and I decided to start with wheat. As we had expected, not applying any synthetic fertiliser resulted in a weaker crop. And Paani was a bit sceptical of our decision from the start so when the crop was one month old and showed very little promise, Paani immediately suggested to act swiftly before we loose the crop. But my conviction to do natural farming reminded me of the many stories my *dada ji* used to tell me. Instantly I went to the nearby *gaushala* and brought a trolley full of cow dug. Paani and I started working in our field, hoping everything will be alright. Eventually we gave 6 more trollies full of fresh cow dung with irrigation. Despite her scepticism, Pani used to work on the farm the entire day and go home in the evening. She used to wait util midnight for me to come home to have dinner. **And after a few days, our crop started showing growth. We subsequently produced 20 quintals wheat per acre that season, which was equivalent to what the nearby farmers who used synthetic chemicals produced.**

*"... Since then, Paani became my backbone in converting all our 12 biga's of land (~ 4 acres) into fully natural…"*

Today we grow wheat, maize, groundnut, turmeric and have a small vegetable garden for our household needs. I used YouTube videos and WhatsApp groups to learn about the different farming practices and discussed them with Paani. Both of us together make all the decisions even on what crops to grow. Few years ago Paani started creating a small seed bank to store *desi* seeds to diversify our farm.

Because Paani has taken the lead at our farm and she being the backbone at home, I have been able to teach and support other farmers. **With the support of AKRSP-I, we have been able to motivate and help 18 farmers to start organic farming.** And since my farm got organic certification from Gujarat Organic Products Certifications Agency (GOPCA), I am now also part of a group that has assisted 33 farmers with the certification process.

Along with the team from AKRSP-I we are trying out demonstration plots of low carbon agriculture. Where many varieties of crops and new methods of farming are being experimented. **I am slowly getting into agroforestry and my dream is to grow different species of trees across my land.**

I still remember how many years ago, my friends used to taunt me that I am behaving recklessly and I will put my family on the streets. *But little did they know that Paani and I are a strong team together, and this teamwork can make any dream a reality.*

NATIONAL COALITION FOR NATURAL FARMING

*Celebrating Women Champion Farmers*

# Padmavati Mandi,

**Village Chingri, GP Jhunjhka, Chhatna, District Bankura, West Bengal**

With a sigh of relief, Padmavati shares her gratitude for having adopted natural farming, for it ensures her children and family nutritious food.

*Interviewed and written by*

*Annyatama Basu from DRCSC, West Bengal*

NATIONAL COALITION FOR NATURAL FARMING

A spirited lady from Chingri village of Jhunjhka Gram Panchayat in West Bengal, Padmabati Mandi bears all the household expenses by cultivating her land. She used to live in extreme poverty with her son and daughter, and worked as a daily wage labourer. Earlier Padmabati used to practice chemical farming and cultivated upto 2-3 types of vegetables in one season. She used to find it difficult to cultivate her land due to water scarcity. They were unable to get sufficient amounts of nutritious food from her land due to less yield. There was no certainty of getting work every day and even when they got work, payment of wages was uncertain. Sometimes they couldn't afford even three meals a day.

It was in this situation that DRCSC (Development Research and Community Centre) was introduced to her in the year 2012. In the presence of DRCSC, she went through several agriculture related training programmes such as Livestock rearing, different techniques of preparing organic manure, etc. Padmabati was identified as a willed woman by implementers of the training programmes. Her homestead had a small space in the backyard, and as per the suggestion of DRCSC, they decided to turn it into a productive space. She started growing some nutritious vegetables and fruits by recycling household waste, grey water etc., and cultivated indigenous poultry in a symbiotic method. Poultry eats wastages of leafy & fruit vegetables and poultry litter is used for growing vegetables.

> *After harvesting the produce, Padmabati was convinced that there was scope of providing nutrition to her children through this. Soon she also started using natural manure in the fallow land behind their hut which remained unproductive for years.*

Now, Padmabati grows a mix of seasonal vegetables cultivated on raised land and broadened embankments throughout the year. Crops grown include tomato, ladies finger, beetroot, carrot, chili, cowpea, ivy gourd, beans, spinach, radish, fenugreek, turnip, elephant foot yam, taro, amaranth, bitter gourd, coriander, brinjal, ash gourd, bottle gourd, pumpkin, ipomoea, ceylon spinach, cucumber, ridged gourd and snake gourd. Paddy is cultivated in the low-land during the rainy season and green gram, potato and onion during winter.

Padmabati is now empowered enough that she can take household decisions such as buying things or taking decisions in her children's education. She and her family consume at least 450 grams of green vegetables or fresh fruits every day round the year.

Padmabati says,

> *"This garden has become our guardian. It not only gives us nutritious food, but also gives us some income. I spent my maximum time gardening which gives me mental peace and happiness."*

*Celebrating Women Champion Farmer*

# Pemalbai Radhe Shyam

## Bilood village, Khandwa dist., Madhya Pradesh

**… despite my husbands' skepticism for natural farming, I stood firm in my conviction and convinced him to just start with 0.5 acres … initially he resisted my decision but today he is my strongest support system …**

*A story interviewed and written by Deepika Shelar from AKRSP-I, Madhya Pradesh*

NATIONAL COALITION FOR NATURAL FARMING

My name is Pemalbai Radhe Shyam, a 50-years-old woman and I live with my husband, two sons, daughter in law and three grandchildren in Bilood village, Pandhana block, Khandwa district, Madhya Pradesh.

We have been growing soyabean, maize, cotton, wheat and gram through synthetic chemical based agriculture practices in our 5 acres of land. Synthetic chemicals such as Urea, DAP, Potash, Monocrotophos, Coragen, Canfidor, Biojontan and Ulala were used.

> *Farming has been my family's main source of income since generations, but the high cost of Agri-inputs and the associated health issues have always been a worry, but then we were left with no other option but to continue using these inputs.*

In 2017, I participated in an exposure visit to Kailash Bihari ji's farm, a natural farmer from Baroda Ahir village, Pandhana; conducted by AKRSP-I. The visit showed me possibilities of cultivating without using the synthetic chemical inputs. And seeing the successful model, I made up my mind to go back home and practice natural farming. Upon sharing my learnings and plans with my husband, he immediately dismissed the natural farming practices saying that all crops will go into waste if we won't put fertilisers and pesticides in it.

> *Despite my husband's skepticism, I stood firm in my decision and convinced him to at least start by applying organic fertilisers in just 0.5 acres of land. And that's how my journey of practicing natural farming started.*

Currently we are practicing natural farming in all of our 5 acres of land. We are using Bijamrit, Amrit pani, panch patti kadha, soyabean tonic, GGOC (ginger garlic onion chili chutney). Thanks to using these homemade inputs, we have been able to save Rs. 45,000/- in past three years. Subsequently, I also started making some of these inputs such as amrit pani, panchpatti kadha, soyabean tonic, etc at home itself in bulk quantities. And selling these to people around, gave another source of income for me.

Seeing my success with natural farming over these years, I am grateful to have got the opportunity to train the other SHG members and encourage the other women of my village.

> *Over the years, as a family we have seen the quality of the crops we produce. And have particularly noticed how since we started practicing natural farming, we hardly fall sick.*

With my husbands support and encouragement, this year I started intercropping in our farm. In fact, my husband helps me in making all the non-pesticide inputs and organic materials. *Even though, initially my husband resisted the idea of natural farming, today he has become my strongest support system.*

A case of Mr. Krisastam Pradhan, Odisha

Age-55

Address -Pangananju, Block-Raikia,

Kandhamal, Odisha, 762101

Contact-8763697203.

I started farming since I was an adult and I have never used chemical fertilisers in my field. Although I did not know the methods of ZBNF, I used cow dung-based manure to maintain soil fertility in my plot. Farmers in our area have always been using natural methods of farming to be in harmony with the nature. In 2017, I was introduced to better methods of natural farming by SWATI organisation. Since, then I have noticed more outputs, cost reduction and better plant health. I now grow Turmeric, Rice and Millets in my land using local seed variants, I make Bijamrita and Jivamrita from the cattle litter and sell the produce in the local market of Raikia and to the KASAM organisation. I also have a livestock of 10 goats and 15 cows (a few Jerseys variant and others are local breed).

An average cropping cycle in my field starts in the month of April. I grow local variant Turmeric in about an acre of my land, traditional rice and millets in half an acre each. I also grow ginger and a local variant of potatoes in patches. The climate in our area supports up to 3 cropping cycles a year, barring one dry month. The agriculture is rainfed since we don't have any irrigation project or canals in our area. For the turmeric, I treat the field with *handi khata* (Jivamrita). After planting the shoots (pua) in April, the field is left at its own for a month. Following that, I cover the field with branches and leaves of Sal (*Shorea robusta*) as an *achadana* (Mulch). The layer prevents the growth of unwanted weeds, maintains soil fertility

and deters soil erosion because of runoff rains. After sometime, I remove the branches, while allowing the leaves to rot off in the field into biomass. I apply one or two dosages of Jivamrita to the standing crop, before harvest in December. Each dosage consists of Cow urine, Neem leaves, Karanja (*Pongamia*) and Arakha sap (*Calotropis gigantea*), procured locally by hired labour which costs me 200 rupees a day.

I grow rice in the Kharif season while using local variants of seed. State seed distribution is non existent in our area, with seeds only black marketed by shopkeepers. Therefore, I resort to local variants only. I treat them with Bijamrita and I use Jivamrita in between to ensure plant health. Fifteen to twenty years back, I used to grow millets only, but back then we used to get very less price for it. So, I switched to a combination of Turmeric, Ginger, Rice, Millets, Potatoes and local vegetables for better income and sustenance. My field yields 10-12 quintals of rice and 24 quintals of turmeric a year. I sell half of the rice to the govt procurement agency at rupees 18 per kilo. The post processing weight of turmeric (Grade B) is about 5-6 quintals, which KASAM procures at rupees 61 per kilo (unlike the local traders who demand less than half the MSP).

I have been an active member of the OMM with Swati Organisation. I am also a BOD of Raikia Farmer Cooperative Society, a 300 membered organisation that is aimed at influencing the farmers for better farm methods. I have influenced around 1 farmers to switch to natural farming methods and usage of bio inputs. A few farmers of our region, especially the ones that grow cabbage and cauliflowers use chemical fertilisers to increase yield. Although they ask people to switch, farmers still use traditional methods of their forefathers, I have personally seen a reduction in soil fertility of those cabbage famers over a short span. I toil in my field assisted by my family members, my wife and two children, to work close to nature and live a healthy life.

**Srinath Reddy's Journey from Graphic Engineer to Agriculture Entrepreneur.**

The story of Srinath Reddy is an inspiring tale of reverse migration in the rural village of Andhra Pradesh. Mr. Srinath Reddy is from B.Rajapalli village in Kadapa district in Andhra Pradesh. Srinath Reddy moved to Bangalore to complete his education and started working as a Graphic engineer in a Design firm in Bangalore. After a few years of working, he relocated to his native in 2015 to help his father with Farming.

In 2016 after getting information from RySS (Rythu Sadhikara Samstha) field cadres he decided to start Natural farming in his 14 acres mango orchard. Through knowledge gained by field cadres and undertaking trial and error methods, he devised a procedure using organic growth promotors and organic insecticides to ensure high-quality mango yields in his orchard. Efficacy of the results strengthened his Belief in APCNF.

He started accompanying the RySS field cadres to inform them about the benefits of APCNF and help chemical farmers transition to natural farming. During these meetings, he concluded that the farmers are wary of Natural farming due dearth of knowledge and market for Organic produce. Growing up in his native village he was well aware of the exploitation of farmers through middlemen and debt caused by chemical farming. This in turn motivated him to start an NPM (NonPesticide Management) shop so that farmers had access to organic inputs.

"Agriculture is not considered a lucrative career amongst youth but that mentality should change in future as Agriculture sector has a lot of untapped potentials."

In 2018, Srinath Reddy set up an NPM shop. He started providing Natural Inputs to farmers in his village. To ensure the efficacy of his organic inputs Mr. Reddy started to experiment using demo plots in his fields. In 2018, Srinath Reddy started with a customer base of 430 farmers undertaking Natural farming in 688 Acres of land and due to high-quality inputs and in-person visits conducted to the farmer's field, his customer base exponentially increased. In 2019 this NPM shop is servicing 1890 Natural farmers and 3969 acres.

While the harvest from Natural farming was promising, Mr. Reddy realized the bottleneck came in finding the buyers willing to purchase the product at a remunerative price. To solve this problem, he set up an output shop to sell organic produce to small-scale farmers. Using his business acumen and contacts from his co-workers and clients from Bangalore he started selling rice, millets, groundnuts, chilies, mangoes. This clientele base is spread across major cities in India like Bangalore, Visakhapatnam, and Hyderabad.

During Pandemic, Srinath Reddy helped small-scale mango farmers sell their products at remunerative prices to buyers, after the word spread all the neighboring village farmers also started

selling their mangoes through the output shop and the total business for the season was around 1 Crore rupees.

Srinath Reddy also helps PoP (Poorest of the Poor) farmers by providing inputs and consultation free of cost. He organizes and helps in community input preparation to create awareness about APCNF (Andhra Pradesh Community Managed Natural Farming). Through his efforts and resilience, Mr. Srinath Reddy has created large-scale dissemination of Natural farming and brought efficient market linkage to small-scale farmers in his village. He is inspiring many youths in his village to follow in his footsteps.

# Padmavatha Amma Eddula –

## Upcoming Entrepreneur in Rural Andhra Pradesh

Working at her picturesque mango orchard in Lodipalli village, Kurnool, Padmavatha Amma Eddula seems like a simple farmer but further investigation reveals that she is an upcoming entrepreneurial woman who juggles four occupations with effective balance and thrives in each one of them. Padmavatha Amma is an ICRP (Internal Community Resource Person), successful NPM (Non-Pesticide Management) shop owner, Diary business owner, and an APCNF farmer owning a successful mango business with a huge customer base spanning across three metropolitan cities. Married at the age of 13 after dropping out of school, she faced financial hardships after marriage. In 1994, Self Help Group movement started across Andhra Pradesh, Activist from UNDP and Government started advocating the importance of microfinance and financial independence to women in Lodipalli, gauging it as an opportunity for financial relief and self-sufficiency Padmavatha Amma joined Sri Lakshmi Anthwa SHG in 1995. Padmavatha Amma said this gave an impetus to her entrepreneurial skills and developed her confidence.

"Sri Lakshmi SHG Provided me with a community where I developed confidence that I could be an active contributor towards improving the financial condition of my family."

After taking a loan from SHG she bought three buffaloes and set up a dairy business. She started the business to facilitate higher education for her three children. As the dairy business flourished, she could provide for her family and funded her children's education, her son Hemasundar Eddula Reddy completed his engineering degree from Bangalore and returned to the village to help his mother with farming. In 2016 many of the farmers in Kurnool were still practicing chemical input-based farming which was ruining the quality of soil and causing an increase in farmer debt due to the high cost of chemical inputs. During this time the government of Andhra Pradesh started to encourage people to practice APCNF (Andhra Pradesh Community Managed Natural Farming). Volunteers from the government explained the advantages of natural farming and using organic inputs this, in turn, encouraged Mr. Hemasundar Reddy and Padmavatha Amma to take up regenerative farming in her mango orchard. According to her son

"Sustainability and Profitability are important for any business to flourish and that is the reason ideology of APCNF resonated with me."

She was one of the first farmers who took up organic farming in her village.

To upscale her dairy business Padmavatha amma bought two more buffaloes. She encountered problems gathering fodder to cater to an increased number of cattle to counter this she started feeding cattle fodder which she grew on her farm. This led to a substantial increase in the quality and quantity of milk production which in turn resulted in a rise in demand for her product not only in Lodipalli but also nearby villages further solidifying Padmavath Amma's belief in APCNF.

In 2017, Padmavatha amma joined as an ICRP and started convincing chemical input-based farmers to transition to regenerative farming and advocated the positive financial and

environmental effects of APCNF. As an ICRP she realized that even though farmers were willing to try APCNF many of couldn't try it because of lack of availability of good quality inputs and it was difficult to convince farmers to try organic farming without easy availability of high-quality organic inputs so when she selected as one of the few people in 2018 to set up an NPM shop, she worked hard to ensure the success of her NPM shop, many factors facilitated the success of her NPM shop. Two of the main aspects that resulted in the success of her business are business acumen and penchant for marketing and networking. She used her network from the other occupations to create a potential clientele base for NPM shop. She also maintained extensive records of her sales while emphasizing on highest selling products to extrapolate future needs of her client. She would reach them out on a regular basis for feedbacks and requirement for organic inputs.

"Customer Tracking and Customer feedback are the important aspects of managing a successful business. Without customer satisfaction and no business can sustain for long."

A trailblazer in her own merit she started making inputs in NPM shop by using Buffalo dung instead of cow dung which was prescribed by Dr. Subhash Palekar. This risk worked towards her advantage as her customers were impressed by her high-quality products. This encouraged her to start the vermicompost business to complement her organic input business.

After switching to producing APCF mangoes she encountered some trouble selling her produce at local level at a slightly higher price than inorganic produce. To overcome this problem her son started marketing her product as APCNF Mangoes on Facebook, her product attracted high demand in cities like Hyderabad, Vijayawada and Hyderabad. She made it a point to take care of the transportation of mangoes to the metro cities by partnering up with local courier services and taking feedback from the customers on how to improve her services.

During the pandemic the production of mangoes decreased but the demand for APCNF mangoes soared to ensure that demand is met Padmavatha Amma created a group of farmers from nearby villages to facilitate supply of APCF mangoes, this shows true entrepreneurial and leadership qualities along with strong social commitment. This led to customer satisfaction whilst helping farmers in the nearby living to earn income during the pandemic.


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# Rising from the soil

Mulchand grew up in a family of farmers at Kumarkheda village, Khalwa block, Khandwa district, Madhya Pradesh. From past few years due to certain changes in climate, I started putting more chemical pesticides and fertilizers to get more crop yield. Henceforth the input cost for my 5 acres of land was increasing gradually as well as my farmland got addicted to chemicals resulting into degraded soil quality and hard texture.

**Mulchands Farm**

I had received training on natural farming and conservation agriculture by Aga Khan Rural Support Program India in 2015. I was not in the favor of conservation and natural farming fully but somewhere I was curious to see the repercussion of it. I started practicing conservation agriculture in a 20*20 plot in my farmland.

**Making of Organic fertilizer**

CA plot required less water than usual. The soil quality and texture also enhanced. But in the first year the crop yield was relatively less than usual. After I observed changes in soil texture and quality, presence of earthworms on top layer of soil; I expanded the CA plot to 0.5 acre and then there was no looking back. I stopped using chemicals in my farm. As per the availability of mulching material currently I am doing conservation agriculture in 1 acre of land and in rest 4 acres of land I am practicing natural farming where I use *Bijamirt*, *amrit pani*, *panch patti kadha*, GGOC (ginger garlic onion chili chutney), soya tonic, matka khad etc. before natural farming and conservation agriculture practice, the input cost was Rs 10,000 per year but now I don't spend a single penny on chemical fertilizers and pesticides.

With this courage, I have also started cultivating vegetables organically in kitchen garden at backyard of my house. I grow okra, bottle gourd, sponge gourd, brinjal, chili, pumpkin etc. By consuming home-grown organic food, the health of my family is in a better condition. A farmer does farming with all the hard work we can't predict things, farmer face sudden change in the climate or uncertainty of weather but still always hope for the good crop yield.

Initially I struggled to believe the fact that crops can be grown without chemical use. But after using all natural and organic fertilizers and pesticides my perception has changed. Our past generations were also doing natural farming without using chemicals. It is us that wouldn't believe on their vision. As a farmer I understand that the risk-taking capacity is less. But if we are not taking the chances or risks for the change we need to see, how would it be successful?

I strongly believe in the thought - to see the change you be that change!

## Kumar Neeraj

**Dur Hai village, Lakhisarai district, Bihar**
**Agroforestry practitioner since 2018**

As a lawyer I understand contracts, agreements, policies and laws. And these are all made to be broken. So when I moved to my village after years of law training, I decided to leave all my training and etiquette. Instead, I imbibed human connections and chose the village. **Today, what I practice and experiment at the farm are all taught by people.**

Back when I was in college in Dharwad Hubli, I used to visit my friends' place during short vacations. This way I got to visit farms across south India and it is from these experiences that I learnt agro-forestry.

Even though I didn't go back to my village after 8th std, I always remembered how happy the village life was. So when I came back after more than **15 years,** I was disheartened seeing tension and dissatisfaction in a village which once was thriving with joy and contentment. I learnt about the increasing migration and how youths don't want to be in the villages anymore. **So through the agroforestry model of farming I took up the task of demonstrating to the people here of the abundance present in our village.**

One fine day, at around 3:00am, I joined a group of old men talking about various stories for hours. **From these old men I learnt how in the olden days before the green revolution, people here did not grow rice at all. Instead they grew *bajra*, *ragi*, *rahad*, pigeon pea etc, none of which are now grown here and I don't think the younger generations know all these things.** Similarly I travelled across Bihar to learn the different crops grown and practices traditionally followed. It is from these people that I learnt about the region specific companion plant;, what could be grown with what and what could be mixed with what. **When I face challenges on the farm I often reach out to the local people for insight. Like they even taught me alternatives to the various bio inputs like alternatives to neem or cow based inputs.**

In 2018, I began experimenting at my 1.5 acres farm and often invited local youths, women and villagers to join in. I took an integrated approach at farming, I grow a mixture of both crops that were grown traditionally and the modern crops including paddy and timber trees. Slowly I began connecting with the farmers in the village and took up small portions of their farm to experiment. Last year I even built water pockets that act as sponges of water as a measure to conserve water. **Farmers were skeptical of me doing this and laughed at me but when they saw that I am dependent less on the water canals and that my plants are thriving especially during the drought season; they now ask me to teach them the same process.**

From the last 2 years I provide fellowship programmes to women and youths of the villagers on agroforestry. We have had around 40 fellows until now and they have all begun to initiate the processes in their respective lands as well. **In the future I am hoping to work more closely with the children and youth of the villages in and around my area. Because I believe passing on the wisdom to the next generation is critical.**
**Most of our produce is consumed within the village and we rarely have to go to the market to sell.** Villagers are all ready to purchase the produce even if they have to pay a premium amount.

Over time we have taken over small pockets of land as demonstration plots totaling to around 5 to 7 acres of agroforestry land. **Each of these plots have more than 30 species of crops including non food crops.** A major challenge we face is the **absence of a system supporting agroforestry.** For traditional crops like rice the whole system from seeds to fertilisers to processing are available but such a system is missing for agroforestry. Many times I have to get seeds from far off locations so it gets difficult.

At my farms, I don't have any livestock but because of my relationship with the villagers, I get to collect livestock manure of buffaloes, pigs, chicken etc from them. **Farming and village life have taught me that relationships are everything and without building them nothing happens. Our dream is to present our village *Dur Hai* as an agroforestry model.**