



# *Five Days Training Module on* **NATURAL FARMING** *For Krishi Sakhis*



**National Centre For Organic and Natural Farming**

Hapur Road, Kamla Nehru Nagar, Ghaziabad-2  
0120-2764212; 2764906; Fax 0120-2764901  
Email: nbdc@nic.in

**Guidance by:**

**Dr. Yogita Rana, IAS**

**Joint Secretary, INM**

**Department of Agriculture & Farmers Welfare**

**Editor:**

**Dr. Gagnesh Sharma**

**Director**

**National Centre for Organic & Natural Farming,  
Ghaziabad**

**Compiled By::**

**Dr. Priyanka Pradhan, JSO**

**Dr. Chandrashekhar, JSO**

**Dr. Sachin Vaid, JSO**

**Sh. Kishor R. Shedge, JSO**

**Edition: 2023**

**Published by:**

**National Centre for Organic & Natural Farming,**

**Hapur Road, Near CBI Academy**

**Sector 19, Kamala Nehru Nagar, Ghaziabad, U.P. 201002**

**Phone : 0120-2764212 , 0120- 2764906**

**E-mail : nbdc@nic.in Fax :0120-2764901**

## Table of Content

SI. No.	Content
1	Introduction
2	Ecosystem Services & Natural Farming
3	Soil Health & Nutrient Management
4	Bio-Inputs
5	Pest and Disease Management in Natural Farming
6	Water Management
7	Farming systems and Seed System
8	Indigenous Traditional Knowledge and Models
9	Crop and Livestock Integration
10	Health and Nutrition
11	Extension Methods
12	Extension services& Qualities of Para Extension Workers
13	Certification and Marketing of Natural Produce
14	Linkages
	Annexure: Observations by KrishiSakhis

## 1. Introduction

“Agriculture” encompasses many things; cultivation of food crops such as rice, wheat, corn, millets, pulses, fruits and vegetables; beekeeping; raising silkworms and producing silk; cultivation of fiber crops such as cotton; and raising of livestock - beef and dairy cattle, swine, poultry, sheep, goats and other animals used for meat and/or milk or fiber production. Agriculture also entails technology and practices for growing, harvesting, processing, storing and marketing these commodities.

Agricultural development is closely associated with rural development because the majority of the rural population is engaged in some form of farming, and most agricultural production occurs in the rural areas. Rural areas are less densely populated than urban areas, and the majority of the population of developing countries lives in rural areas. Of course, the proportion of rural and urban populations varies from nation to nation.

Natural Farming is a holistic farming system which helps in improving soil regeneration, water and air quality and produce nutrient-rich food. KrishiSakhis will be mobilized to work in harmony with nature, while also maintaining and improving economic viability.

- **Techniques and practices of Natural farming**

- ✓ Minimize the physical, biological, and chemical disturbance of the soil.
- ✓ Keep the soil covered with vegetation or natural material.
- ✓ Integrate animals into the farm as much as possible.
- ✓ Use of on farm inputs/ bio formulations

- **India’s Strategy to combat the issues of climate change and restoring fertility of soil**

- **Adopting Natural Farming:-**

Natural Farming is a chemical-free alias traditional farming method. It is considered as agroecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity.

- **Why Natural Farming?**

- ✓ Research indicates that all the major nutrients required for plant growth are available around the root zone and plants are able to take up nearly 98 to 98.5% nutrients from air, water & solar energy and the remaining 1.5% nutrients from soil.
- ✓ Natural farming is largely based on on-farm biomass recycling with major stress on biomass mulching, use of on-farm cow dung-urine formulations followed by diversifying crop rotations in symbiosis with Nitrogen fixing leguminous crops for efficient recycling of nutrients.
- ✓ Natural farming helps in increasing farmers income through cost reduction and by reducing risks of crop failure
- ✓ Natural farming promotes the usage of on-farm prepared inputs from agro-waste thus making the farmers self-reliant
- ✓ Natural farming eliminates application of synthetic chemical inputs thus provides safe and healthy food which can be affordable to all.

- ✓ Natural farming enhances resilience by reducing vulnerability to drought, pests, diseases and other climate-related risks and shocks; and therefore improves capacity to adapt and grow in the face of longer-term stresses like shortened seasons and erratic weather patterns.
- ✓ Natural farming helps in restoration soil health
- ✓ Natural farming if practiced professionally can generate employment on account of natural farming input enterprises, value addition, certification and marketing in local areas, etc.
- ✓ Natural Farming helps in reducing water consumption in which mulch and diverse crops cover the soil to prevent unnecessary water loss through evaporation, thus it optimizes the amount of ‘crop per drop’.

### • Definition of Natural Farming

The Ministry of Agriculture and Farmers' Welfare-Definition of Natural Farming (NF) A chemical-free natural farming system wherein use of low-cost inputs (cow dung/urine and plant extractbased) coupled with recommended agronomic practices like mulching and intercropping are promoted.

According to NITI Aayog, Natural Farming can be defined as “chemical- free and livestockbasedfarming”. Thisdefinitionisbasedontheprevailingpractices. Soundlygroundedin gro-ecology, it is a diversifiedfarmingsystemthatintegratescrops,treesandlivestock,allowingthe optimum useoffunctionalbiodiversity.

### • Principles of Natural Farming

- a) Principle of care and maintenance of Panchamahabooth (Soil, Air, Water, Akash and fire/energy)
- b) Principle of Soil as living entity
- c) Principle of integrating plants, animal and human beings.
- d) Principle of Bio diversity, and Sustainable Agriculture
- e) Principle of climate resilient practices

### • Significance of Natural Farming

- ✓ According to natural farming principles, plants get 98% of their supply of nutrients from the air, water, and sunlight. And the remaining 2% can be fulfilled by good quality soil with plenty of friendly microorganisms. (Just like in forests and natural systems)
- ✓ The soil is always supposed to be covered with organic mulch, which creates humus and encourages the growth of friendly microorganisms.
- ✓ Farm made bio-cultures named ‘Jeevamrit, Beejamrit etc.’ are added to the soil instead of any fertilizers to improve microflora of soil. Jeevamrit, Beejamrit are derived from very little cow dung and cow urine of desi cow breed.
- ✓ It holds the promise of enhancing farmers’ income while delivering many other benefits, such as restoration of soil fertility and environmental health, and mitigating and/or reducing greenhouse gas emissions.
- ✓ The system requires cow dung and cow urine (Gomutra) obtained from Indian breed cow only. Desi cow is apparently the purest as far as the microbial content of cow dung, and urine is considered.

- ✓ In natural farming, neither chemical nor organic fertilizers are added to the soil. In fact, no external fertilizers are added to soil or given to plants whatsoever.
- ✓ In natural farming, decomposition of organic matter by microbes and earthworms is encouraged right on the soil surface itself, which gradually adds nutrition in the soil, over the period.
- ✓ Natural, farm-made pesticides like Dashparni ark and Neem Astra are used to control pests and diseases.
- ✓ Multi-cropping is encouraged over single crop method.

\*\*\*\*\*

## 2. Ecosystem services and Natural Farming

### • Benefits of Natural Farming

	➢ <b>Improve Yield:</b> Farmers practicing Natural Farming reported similar yields to those following conventional farming. In several cases, higher yields per harvest were also reported.
	➢ <b>Ensures Better Health:</b> As Natural Farming does not use any synthetic chemicals, health risks and hazards are eliminated. The food has higher nutrition density and therefore offers better health benefits.
	➢ <b>Environment Conservation:</b> Natural Farming ensures better soil biology, improved agrobiodiversity and a more judicious usage of water with much smaller carbon and nitrogen footprints.
	➢ <b>Increased Farmers' Income:</b> Natural Farming aims to make farming viable and aspirational by increasing net incomes of farmers on account of cost reduction, reduced risks, similar yields, incomes from intercropping.
	➢ <b>Employment Generation:</b> Natural farming generates employment on account of natural farming input enterprises, value addition, marketing in local areas, etc. The surplus from natural farming is invested in the village itself.
	➢ <b>Reduced Water Consumption:</b> By working with diverse crops that help each other and cover the soil to prevent unnecessary water loss through evaporation, Natural Farming optimizes the amount of 'more crop per drop'.
	➢ <b>Minimized Cost of Production:</b> Natural Farming aims to drastically cut down production costs by encouraging farmers to prepare essential biological inputs using on-farm, natural and home-grown resources.
	➢ <b>Eliminates Application of Synthetic Chemical Inputs:</b> The overuse of synthetic fertilizers, especially urea, pesticides, herbicides, weedicides etc. alters soil biology and soil structure, with subsequent loss of soil organic carbon and fertility.
	➢ <b>Rejuvenates Soil Health:</b> The most immediate impact of Natural Farming is on the biology of soil—on microbes and other living organisms such as earthworms. Soil health depends entirely on the living organisms in it.
	➢ <b>Livestock Sustainability:</b> The integration of livestock in the farming system plays an important role in Natural farming and helps in restoring the ecosystem. Ecofriendly bio-inputs, such as Jeevamrit and Beejamrit, are prepared from cow dung and urine, and other natural products.

Ref: <https://ncof.dacnet.nic.in/BenefitsNaturalFarming>

- **Ecosystem services and natural farming**

### ECOSYSTEMS

living elements which interact with each other and their non-living environments – provide benefits, or services, to the world.

### ECOSYSTEM SERVICES

Ecosystem services make human life possible by, for example, providing nutritious food and clean water, regulating disease and climate, supporting the pollination of crops and soil formation, and providing recreational, cultural and spiritual benefits.

### BIODIVERSITY

Biodiversity includes diversity within and among species and ecosystems. Changes in biodiversity can influence the supply of ecosystem services. Biodiversity, as with ecosystem services, must be protected and sustainably managed.

Since agriculture, livestock, forestry and fisheries both benefit from and influence ecosystem services, impact goes both ways. These impacts from agriculture, livestock, forestry and fisheries on ecosystem services can be positive or negative, for example:

<b>Positive impact on ecosystem services</b>	<b>Negative impact on ecosystem services</b>	<b>Natural Farming on the balance in comparison to Chemical farming</b>
Agriculture provides habitats to wild species and creates aesthetic landscapes	Pesticides, as well as landscape homogenisation, can decrease natural pollination	
Forests help maintain healthy aquatic ecosystems and provide reliable sources of clean water	Deforestation or poor management can increase flooding and landslides during cyclones/ monsoon	
Animal excreta can be an important source of nutrients, seed dispersal and can maintain soil fertility in grazed grasslands	Excess of animal excreta and poor management can lead to water pollution and threaten aquatic biodiversity	

Ref:<https://www.fao.org/ecosystem-services-biodiversity/en>

- **Ecosystem services and relevance to natural farming**

### 1. Provisioning services

Water, food, wood and other goods are some of the material benefits people obtain from ecosystems called '**provisioning services**'. Many provisioning services are traded in markets. However, in many regions, rural households also directly depend on provisioning services for their livelihoods. In this case, the services value may be much more important than is reflected in the prices they fetch on local markets.

	<b>Food</b> Virtually all ecosystems provide the conditions for growing, collecting, hunting or harvesting food.
	<b>Raw materials</b> Ecosystems provide a great diversity of materials including wood, biofuels, and fibers from wild or cultivated plant and animal species
	<b>Freshwater</b> No water, no life. Ecosystems play a vital role in providing the flow and storage of fresh water.
	<b>Medicinal resources</b> Natural ecosystems provide a variety of plants and mushrooms which offer effective cures for many kinds of health problems. They are used in popular and traditional medicine, and for developing pharmaceuticals.

### 2. Regulating services

Maintaining the quality of air and soil, providing flood and disease control, or pollinating crops are some of the '**regulating services**' provided by ecosystems. They are often invisible and therefore mostly taken for granted. When they are damaged, the resulting losses can be substantial and difficult to restore.

	<b>Local Climate Air Quality</b> Ecosystems influence the local climate and air quality. For example, trees provide shade whilst forests influence rainfall and water availability both locally and regionally. Trees or other plants also play an important role in regulating air quality by removing pollutants from the atmosphere.
	<b>Carbon sequestration and storage</b> Ecosystems regulate the global climate by storing greenhouse gases. For example, as trees and plants grow, they remove carbon dioxide from the atmosphere and effectively lock it away in their tissues.
	<b>Moderation of extreme events</b> Ecosystems and living organisms create buffers against natural disasters. They reduce damage from floods, storms, tsunamis, avalanches, landslides and droughts.

	<b>Waste-water treatment</b> Ecosystems such as wetlands filter effluents, decompose waste through the biological activity of microorganisms, and eliminate harmful pathogens.
	<b>Erosion prevention and maintenance of soil fertility</b> Vegetation cover prevents soil erosion and ensures soil fertility through natural biological processes such as nitrogen fixation. Soil erosion is a key factor in the process of land degradation, loss of soil fertility and desertification, and contributes to decreased productivity of downstream fisheries.
	<b>Pollination</b> Insects and wind pollinate plants and trees which is essential for the development of fruits, vegetables and seeds. Animal pollination is an ecosystem service mainly provided by insects but also by some birds and bats. In agro-ecosystems, pollinators are essential for orchard, horticultural and forage production, as well as the production of seed for many root and fibre crops. Pollinators such as bees, birds and bats affect 35 percent of the world's crop production, increasing outputs of around 75% of the leading food crops worldwide.
	<b>Biological control</b> The activities of predators and parasites in ecosystems that act to control populations of potential pest and disease vector.
	<b>Regulation of Water Flow</b> Water flow regulation is a key service provided by land cover and configuration, but its dynamics are poorly understood by most policy makers and land management organizations.

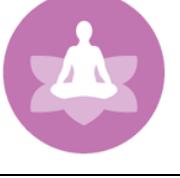
### 3. Supporting services

Providing living spaces for plants or animals and maintaining a diversity of plants and animals, are 'supporting services' and the basis of all ecosystems and their services.

	<b>Habitat for species</b> Ecosystems provide living spaces for plants and animals; they also maintain a diversity of complex processes that underpin the other ecosystem services.. Some habitats have an exceptionally high number of species which makes them more genetically diverse than others; these are known as 'biodiversity hotspots'
	<b>Maintenance of genetic diversity</b> Genetic diversity (the variety of genes between, and within, species populations) distinguishes different breeds or races from each other, providing the basis for locally well-adapted cultivars and a gene pool for developing commercial crops and livestock.

#### 4. Cultural services

The non-material benefits people obtain from ecosystems are called ‘**cultural services**’. They include aesthetic inspiration, cultural identity, sense of home, and spiritual experience related to the natural environment. Typically, opportunities for tourism and for recreation are also considered within the group. Cultural services are deeply interconnected with each other and often connected to provisioning and regulating services: Small scale fishing is not only about food and income, but also about fishers’ way of life. In many situations, cultural services are among the most important values people associate with Nature – it is therefore critical to understand them.

	<b>Recreation and mental and physical health</b> Nature-based opportunities for recreation play an important role in maintaining mental and physical health, e.g. walking and playing sports in parks and urban green spaces.
	<b>Tourism</b> Enjoyment of nature attracts millions of travelers worldwide. This cultural ecosystem service includes both benefits to visitors and income opportunities for nature tourism service providers.
	<b>Aesthetic appreciation and inspiration for culture, art and design</b> Animals, plants and ecosystems have been the source of inspiration for much of our arts, culture, and design; they increasingly inspire science as well.
	<b>Spiritual experience and sense of place</b> Nature is a common element in most major religions. Natural heritage, spiritual sense of belonging, traditional knowledge, and associated customs are important for creating a sense of belonging.

---

Ref: <https://www.fao.org/ecosystem-services-biodiversity/en/>

\*\*\*\*\*

### **3. Soil Health & Nutrient Management**

- What is Soil?**

Technically, the soil is a mixture that contains minerals, organic matter, and living organisms. But broadly speaking, soil can refer to any loose sediment. Moreover, there are many types of soil that are distributed around the world and these are generally classified into the following:

1. Clay Soil
2. Sandy soil
3. Loamy Soil
4. Silt Soil

Typically, the soil consists of 45% minerals, 50% empty spaces or voids and 5% organic matter. Furthermore, soil performs many important functions such as:

1. Providing a growth medium for the plants
2. Acts a modifier of the earth's atmosphere
3. One of the most crucial components of the biosphere
4. Provides habitat for organisms

- Soil Health Management**

Agriculture, globally as well as in India, has witnessed several technological advancements. However, today sustainability of agricultural production systems vis-à-vis environment is a major concern. Soil and crop management practices affect the relationship between soil processes and agro-ecosystem function to a great extent, and thus affect the sustainability of agricultural production systems (Jernigan et al. 2020 and White et al. 2012).

- Soil health and present day concerns with Soil**

Soil is a fundamental and essential natural resource for existence of all living organisms.

- Soil health or quality is defined as the capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality and promote plant and animal health
- A healthy soil would ensure proper retention and release of water and nutrients, promote and sustain root growth, maintain soil biotic habitat, respond to management and resist degradation
- Healthy soil is the foundation of productive, profitable and environment friendly agricultural systems
- Intensive crop cultivation using broadly using imbalanced fertilizer, high nutrient mining through monoculture, decline in organic matter status, deficiencies of secondary and micronutrients, etc. have deteriorated the soil health across the country, resulting into declining crop productivity growth.
- There are 6 major soil types in India- Alluvial soil, Red soil, Black soil, Laterite soil, Arid soil and Forest & mountain soil. Each soil type has its own characteristics in terms of physical and chemical properties, like Alluvial soil is highly fertile, with high phosphorus and potash content. Laterite soil is acidic in nature, while Black soil is rich in potash and

magnesium, but poor in phosphorus. Red soil has high iron and potash content but lacks phosphate.

- **Nutrient deficiencies in Indian soils:** Overall, about 59 and 36 per cent of Indian soils are low and medium in available N, respectively. Similarly, soils of about 49 and 45 percent area are low and medium in available P, respectively; while soils of around 9 and 39 per cent area are low and medium in available K, respectively (Chaudhari et al., 2015). Among various soil characteristics that affect the availability and uptake of micronutrients, soil pH and organic carbon content are the two most important factors.

- **Role of Micro-organisms in Nutrient Management**

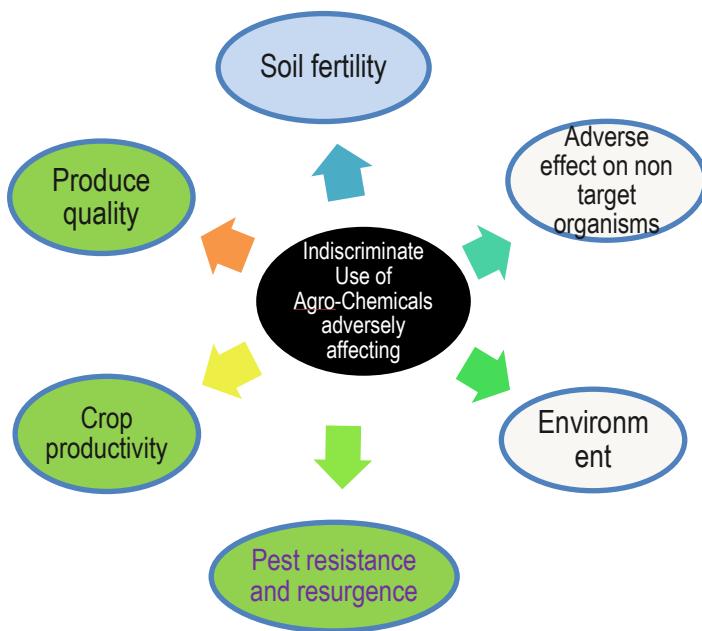
Microbes can make nutrients and minerals in the soil available to plants, produce hormones that spur growth, stimulate the plant immune system and trigger or dampen stress responses. In general, a more diverse soil microbiome result in fewer plant diseases and higher yield.

- Soil microorganisms play an active role in soil fertility as a result of their involvement in the cycle of nutrients like carbon and nitrogen, which are required for plant growth.
  - For example, soil microorganisms are responsible for the decomposition of the organic matter entering the soil (e.g. plant litter) and therefore in the recycling of nutrients in soil.
  - Certain soil microorganisms such as mycorrhizal fungi can also increase the availability of mineral nutrients (e.g. phosphorus) to plants.
  - Other soil microorganisms can increase the amount of nutrients present in the soil. The group of bacteria called rhizobia live inside the roots of legumes and fix nitrogen from the air into a biologically useful
  - The microorganisms, which improve the fertility status of the soil and contribute to plant growth, have been termed 'biofertilizers'
  - Several microorganisms have been found to produce compounds (such as vitamins and plant hormones) that can improve plant health and contribute to higher crop yield. These microorganisms are called 'phyto-stimulators'
- Certain native microorganisms present in the soil are antagonistic to pathogenic microorganisms and can prevent the infection of crop plants.
- Other soil microorganisms produce compounds that stimulate the natural defense mechanisms of the plant and improve its resistance to pathogens. Collectively, these soil microorganisms have been termed 'biopesticides'
  - Azospirillum induces the proliferation of plant root hairs which can result in improved nutrient uptake.
  - Mycorrhizae or root fungi form a dense network of thin filaments that reach far into the soil, acting as extensions of the plant roots they live on or in. These fungi facilitate the uptake of water and a wide range of nutrients, thereby improving plant growth and overall health.

- **SOM is the prime indicator of soil health**

- Food source for soil microorganisms
- Highly decomposed organic matter (humus) provides a storehouse for the exchangeable and available cations.
- Acts as a buffering agent which checks rapid chemical changes in pH and soil reaction
- Index of the productivity of the soil

- Creates a granular condition of soil which maintains favorable condition of aeration and permeability
- Increases water holding capacity of soil and reduces surface runoff, erosion etc.



- **What is Humus?**

Humus is dark, organic material formed by decay of plant and animal matter.

- **Process of humus formation:**

Plants drop leaves, twigs, and other material to the ground. These materials pile up and form leaf litter. When animals die, their remains add to the litter. Over time, all this litter decomposes/breaks down, into its most basic chemical elements through the process known as **humification**. The thick brown or black substance that remains after most of the organic litter has decomposed is called humus. The humus produced by humification is thus a mixture of compounds and complex biological chemicals of plant, animal, or microbial origin that has many functions and benefits in soil.

- **Humification:**

- Plant remains, including those that animals digested and excreted, contain organic compounds: sugars, starches, proteins, carbohydrates, lignins, waxes, resins, and organic acids.
- These organic matters are acted upon by saprotrophic fungi, bacteria, microbes and animals such as earthworms, nematodes, protozoa, and arthropods,
- Decay in the soil begins with the decomposition of sugars and starches from carbohydrates.
- Cellulose and lignin decompose more slowly.
- Proteins, organic acids, starches, and sugars decompose rapidly.

- Crude proteins, fats, waxes, and resins remain relatively unchanged for longer periods of time.

- **Benefits of Humus:**

- Makes the soil fertile as it contains many useful nutrients for healthy soil. One of the most important is nitrogen. Nitrogen is a key nutrient for most plants.
- It helps in suppression of soil –borne diseases
- It helps the soil retain moisture by increasing microporosity
- Encourages the formation of good soil structure.
- Increases availability of plant nutrients
- Humus are additional sources of nutrients for microbes.



- **Role of Earthworms in Nutrient Management**

Earthworms consume biodegradable materials and convert it into rich manure. **Earthworms** "plow" and mix up the soil. Their tunneling loosens the soil so water and nutrients **can** go downward. The nutrients in **worm** castings enrich the soil. The slime they secrete contains nitrogen, an important nutrient for plants.

- **Improved nutrient availability**

Worms feed on plant debris (dead roots, leaves, grasses, manure) and soil. Their digestive system concentrates the organic and mineral constituents in the food they eat, so their casts are richer in available nutrients than the soil around them. Nitrogen in the casts is readily available to plants. Worm bodies decompose rapidly, further contributing to the nitrogen content of soil.

#### **Improved drainage**

The extensive channelling and burrowing by earthworms loosens and aerates the soil and improves soil drainage. Soils with earthworms drain up to 10 times faster than soils without earthworms. In zero-till soils, where worm populations are high, water infiltration can be up to 6 times greater than in cultivated soils. Earthworm tunnels also act, under the influence of rain, irrigation and gravity, as passageways for lime and other material.

- **Improved soil structure**

Earthworm casts cement soil particles together in water-stable aggregates. Upon cast deposition, microbial products, in addition to earthworm mucilages, bind soil particles and contribute to the formation of highly stable aggregates. These are able to store moisture without dispersing. Research has shown that earthworms which leave their casts on the soil surface rebuild topsoil. In favorable conditions they can bring up about 50 t/ha annually, enough to form a layer 5 mm deep.

- **Improves activities of soil microorganisms**

They concentrate nutrients and resources that are further used by soil microorganism communities. In addition to this mixing effect, mucus production associated with water excretion in the earthworm gut is known to stabilize SOM through its incorporation and protection in their casts.

- **Increase soil pH**

An important role of EWs is the dramatic increase in soil pH by incorporating organic matter into the soil.



- **What is a Soil Health Card?**

SHC is a printed report that a farmer will be handed over for each of his holdings. It will contain the status of his soil with respect to 12 parameters, namely N,P,K (Macro-nutrients); (Secondary-nutrient); Zn, Fe, Cu, Mn, Bo(Micro - nutrients); and pH, EC, OC (Physical parameters). Based on this, the SHC will also indicate fertilizer recommendations and soil amendment required for the farm.

- **Importance of Soil Health Card:**

The card will contain an advisory based on the soil nutrient status of a farmer's holding. It will show recommendations on dosage of different nutrients needed. Further, it will advise the farmer on the fertilizers and their quantities he should apply, and also the soil amendments that he should undertake, so as to realize optimal yields.

It will be made available once in a cycle of 3 years, which will indicate the status of soil health of a farmer's holding for that particular period. The SHC given in the next cycle of 3 years will be able to record the changes in the soil health for that subsequent period.



- **Procedure of sampling:**

Soil samples will be drawn in a grid of 2.5 ha in irrigated area and 10 ha in rain-fed area with the help of GPS tools and revenue maps. Soil Samples will be collected by a trained person from a depth of 15-20cm by cutting the soil in a “V” shape. It will be collected from four corners and the centre of the field and mixed thoroughly and a part of this picked up as a sample. Areas with shade will be avoided. The sample chosen will be bagged and coded. It will then be transferred to soil test laboratory for analysis.

The State Government collect samples through the staff of their Department of Agriculture or through the staff of an outsourced agency. Soil Samples are taken generally two times in a year, after harvesting of Rabi and Kharif Crop respectively or when there is no standing crop in the field.

- **Soil test laboratory:**

It is a facility for testing the soil sample for 12 parameters as indicated in reply to question number 2. This facility can be static or mobile or it can even be portable to be used in remote areas.

The soil sample will be tested as per the approved standards for all the agreed 12 parameters in the following way:

- i. At the STLs owned by the Department of Agriculture and by their own staff.
- ii. At the STLs owned by the Department of Agriculture but by the staff of the outsourced agency.
- iii. At the STLs owned by the outsourced agency and by their staff.
- iv. At ICAR Institutions including KVK sand SAUs.
- v. At the laboratories of the Science Colleges / Universities by the students under supervision of a Professor / Scientist.

- **Software for generation of soil health cards:**

National Informatics Center (NIC) has developed a web-portal ([www.soilhealth.dac.gov.in](http://www.soilhealth.dac.gov.in)) for generation of uniform soil health card and fertilizer recommendation.

**Information taken from: [www.soilhealth.dac.gov.in](http://www.soilhealth.dac.gov.in)**

\*\*\*\*\*

## **4. Bio-inputs**

Bio inputs are products made from beneficial organisms such as bacteria, fungi, viruses, and insects, or natural extracts obtained from plants, that can be used in agricultural production to control pests, or promote the development of plants. They are products that do not leave toxic residues in the environment and whose use does not imply risks to the health of farmers and consumers.

India is naturally endowed with various types of naturally available organic form of nutrients. This considerably helps in organic cultivation of crops. The potential of biopesticides and biofertilizers for promoting sustainable agriculture has been known for many years. Recycling nitrogen on the farm by using manure and nitrogen fixing plants enhances soil quality, much neglected and least understood soil biology while providing nutrients to the plants. Plants use nutrients from organic sources through mineralization and billions of microorganisms are available in soil for this job. This is the predominant technique of organic and low external input agriculture.

- **Significance of Bio-inputs**

- On farm inputs enable a stable level of organic matter in the soil, which provides many benefits such as:
- Improvement of the soil structure
- Stimulation of the biological activity
- Increase in water retention
- Tillage facilitation
- Plant health
- They can also play a role in protecting crops from pests and diseases (repellent, stimulator of the plant natural defence mechanisms etc)
- The contribution of on farm inputs is an important agro-ecological lever to preserve the agricultural soil quality.

- **Types of Bio-inputs**

- ✓ **Bio-inputs for Soil Health and Nutrient Management**
- ✓ **Bio-inputs for Pest & Disease Management**

- **Bio-inputs for Soil Health and Nutrient Management**

There are number of formulations which farmers can prepare on their farm such as:

**A. BIJAMRIT**

➤ **Ingredients**

- ✓ Cow Dung- 5kg
- ✓ Cow urine- 5L
- ✓ Cow milk- 1L
- ✓ Lime- 50g
- ✓ Water- 20L
- ✓ Healthy soil-50g

➤ **Methodology:**

- ✓ Take 20 litres water.
- ✓ Then take 5 Kg Desi cow dung.

- ✓ Mix it by the fingers.
- ✓ Take it in a cloth and bound it by small rope as a small bundle
- ✓ Hang this bundle of cow dung in the taken 20-litre water for a night (12hours).
- ✓ Take one litre water and add 50 gm lime in it, let it stable for a night.
- ✓ Then next morning, squeeze this bundle of the cow dung in that water thrice continuously, so that all essence of cow dung will accumulate in that water.
- ✓ Then add a handful of soil in that water solution and stir it well.
- ✓ Then add 5 litre Desi cow urine or human urine in that solution
- ✓ Then add the lime water and stir it well.
- ✓ Keep it overnight for proper fermentation.
- ✓ Now Bijamrita is ready to treat the seeds.

*Scientifically Validated by: TNAU, Coimbatore and CSKHPKV, Palampur*

## B. JIVAMRIT

### ➤ Ingredients

- ✓ Cow dung- 10kg
- ✓ Cow urine- 10L
- ✓ Jaggery- 2kg
- ✓ Flour of gram (Tur, Moong, Cowpea, Urad) – 2kg
- ✓ Live soil (Healthy soil)- one handful
- ✓ Water- 200L
- ✓

### ➤ Methodology:

- ✓ Take 200 litres water in a barrel for one acre crop utilization.
- ✓ Add 10 kg Cow dung in that water. Mix the desi cow dung in that water by the tips of your fingers well.
- ✓ Stir it well by a stick clock wise.
- ✓ Dissolve 2 kg Jaggery in water in a container and add it to above solution.
- ✓ Again stir it well.
- ✓ Then Dissolve Pulses flour in water in another container and add to above solution.
- ✓ Then add Desi cow urine
- ✓ Add handful soil from the bund or forest in that solution.
- ✓ Stir it well.
- ✓ Keep the cover of jute bag on the barrel.
- ✓ Keep this solution quite stable for three days to ferment.

During fermentation, the poisonous gases like Ammonia, Methane, Carbon-mono-oxide, Carbon dioxide, are emitted. Through the holes of jute bag these gases are evacuated in the atmosphere and aerobic fermentation process is going on with the high speed. For that purpose, we have utilized jute bag to cover the barrel.

Stir this solution by the branch of tree thrice a day.

Keep the barrel in shade or shadow. Do not expose Jiwamrita to straight sunlight or rain.

Now *Jiwamrita* is ready for utilization.

### ➤ Uses

Promoting growth and flowering along with acting as a yield enhancer (@5-10% spray with water)

Soil fertility enhancer (applied along with irrigation water)

**Application of Jeevamrit:** This mixture should be applied every fortnight. It should be either sprayed directly on the crops or mixed with irrigation water. In the case of fruit plants, it should be applied on individual plants. The mixture can be stored for up to 15 days.

In summer, spray to be done in the early morning or evening. In winter any time of the day can be sprayed. It can also be applied by hand whenever there is a water scarcity problem or no sprayer available, still we can use jeevamrit.

### **Application**

- First spray one month after seed sowing or transplanting of seedling. Take 100-litre water and add 5 litres of filtered Jeevamrit.
- Second spray – 21 days after the first spray. 150 litres of water plus 10 litres of filtered jeevamrit.
- Third spray – 21 days after the second spray, 200 litres of water plus 20 litres of filtered jeevamrit.
- Fourth spray – When fruits are beginning to show up. 200 litres of water plus 6 litres sour buttermilk can be sprayed for one acre.

### **Application Method and preparation of semi-solid state jeevamrit**

Requirements for semi solid jeevamrit are 100 kg cow dung, 5 litre urine, 1 kg jaggery, 1 kg pulse, one handful of soil from the same land. Mix these with a small amount of water. Make small balls out of the mixture. Keep these balls in full sunlight to dry. Now, these dried balls can be kept near the mouth of a dripper or near the sprinkler. When the water falls on the semi-solid jeevamrit, microbes get activated again.

### **Science behind the technique**

Natural Farming argues that the dung of indigenous cows/livestock and undisturbed soil from the field has a huge number of diverse microorganisms which help in increasing the bioavailability of nutrients to the plants. Soil is a complex ecosystem hosting bacteria, fungi, plants, and animals. Soil microbes metabolise recalcitrant forms of soil-borne nutrients to liberate these elements for plant nutrition. In natural ecosystems, most nutrients such as N, P, and S are bound inorganic molecules and are therefore minimally bio available for plants. To access these nutrients, plants are dependent on the growth of soil microbes such as bacteria and fungi, which possess the metabolic machinery to depolymerise and mineralize organic forms of N, P, and S have isolated many different bacterial genera such as *Citrobacterkoseri*, *Enterobacteraerogenes*, *Escherichia coli*, *Klebsiellaoxytoca*, *Klebsiellapneumoniae*, *Kluyvera* spp., *Morgarellamorganii*, *Pasteurella* spp., *Providenciaalcaligenes*, *Providenciaastuartii* and *Pseudomonas* spp. from cow dung found that many cow dung microorganisms have shown natural ability to increase soil fertility through phosphate solubilisation. Isolated 219 bacterial strains from cow dung, among which 59 isolates displayed nematicidal activity against >90 percent of the tested nematodes. Cow dung has an antifungal substance that inhibits the growth of coprophilous fungi.

**Source: TNAU, Coimbatore, CSKHPKV, Palampur and UAS, Bangalore**

## **C. GHANAJIVAMRIT**

### **➤ Ingredients**

- ✓ Cow dung- 100 kg
- ✓ Cow urine- As needed
- ✓ Jaggery- 1kg
- ✓ Flour of gram (Tur, Moong, Cowpea, Urad) – 2kg
- ✓ Live soil (Healthy soil)- one handful

➤ **Methodology:**

- ✓ Take 100 Kg Desi cow dung.
- ✓ Take 1 Kg Jaggery and Make its powder.
- ✓ Then mix it well in that cow dung.
- ✓ Then take 2 Kg flour of pulse and mix it in that cow dung properly.
- ✓ Then mix handful soil from the bund of the farm in it.
- ✓ Then mix this mixture properly.
- ✓ Add some desi cow urine in it if required.
- ✓ Keep it in the shadow for drying for 48 hours.
- ✓ Cover it by gunny Jute bag. Do not expose it to sunlight while drying. Dry it in the shadow.
- ✓ After 48 hours let it to dry in the shadow. After drying crush it properly and then sieve it and store in the gunny bags.
- ✓ Utilize this 200 Kg GhanJivamrit per acre either by spreading out before sowing OR by sowing it with the seeds.

➤ **Application:**

At the sowing period, use 200kg Ghanjeevamrit per acre. Again during the flowering period of the crop, add 50 kg of Ghanjeevamrit in between two crop lines on the soil per acre. It helps the soil to activate their available nutrients, microorganisms to make them available for the crop sown in that particular area. It increases the count of earthworms in soil which is beneficial for soil fertility. Jeevamrit has a large number of nutrients like nitrogen, phosphorus, calcium, and other micronutrients. This will ensure higher yield by enhancing the availability of nutrients through faster decomposition of bulky organic manures by boosting the microbial activity in the soil. Many of these formulations are rich in beneficial micro flora and can act as efficient plant growth promoters.

• **Research Validation :Jeevamrit&Beejamrit**

Jeevamrit &Beejamrit are those organic fertilizers which are prepared by using cow dung of indigenous cows. Cow dung of indigenous cows has a huge number of diverse microorganisms which help in increasing the bioavailability of nutrients to the plants.

Cow dung microorganisms have shown natural ability to increase soil fertility through phosphate solubilization. isolated 219 bacterial strains from cow dung, among which 59 isolated is played nematicidal activity against >90 percent of the tested nematodes. Cow dung has an antifungal substance that inhibits the growth of coprophilous fungi.

Jeevamrit has number of nutrients like nitrogen, phosphorus, calcium, and other micronutrients. This will ensure higher yield by enhancing the availability of nutrients through faster decomposition of bulky organic manures by boosting the microbial activity in the soil. Many of these formulations are rich in beneficial micro flora and can act as efficient plant growth promoters. Jeevamrut is a liquid organic manure which is an excellent source of natural carbon and biomass that contains macro and micro nutrients required by crops. that fixes the nitrogen and solubilize phosphorus and also it is a rich source of carbon, nitrogen, phosphorus, potassium and many micronutrients.

- **Bio-inputs for Pest & Disease Management**

#### **D. BRAHMASTRA (broad spectrum botanical pesticide)**

➤ **Ingredients**

- ✓ Neem Leaves - 3 Kg
- ✓ Karanj Leaves - 2 Kg
- ✓ Custard Apple Leaves - 2 Kg .
- ✓ Papaya Leaves - 2 Kg
- ✓ Guava Leaves - 2 Kg
- ✓ Cow Urine - 10 Litre

➤ **Methodology:**

- ✓ Take 10 liters of cow urine
- ✓ Add 03 kg of crushed green leaves of neem.
- ✓ Add 02 kg crushed Karanj Leaves.
- ✓ Add 02 kg crushed Custard Apple Leaves.
- ✓ Add 02 kg crushed Papaya Leaves.
- ✓ Add 02 kg crushed Guava Leaves.
- ✓ Now dissolve all this mixture in cow urine and boil it.
- ✓ After 3-4 boils, take it down from the fire.
- ✓ Let it cool for 48 hours and then filter the solution with a cloth.
- ✓ Now Solution is ready to spray on the crop.

➤ **How to Use?**

- ✓ 2-3% Spray with water

➤ **Uses**

- ✓ For the control of sucking insects and pod/fruit borer.

*Source: NCONF, Ghaziabad (2011-12)*

#### **E. NEEMASTRA (broad spectrum botanical pesticide)**

➤ **Ingredients**

- ✓ Neem Leaves - 5 Kg
- ✓ Cow Urine - 5 Litre
- ✓ Cow Dung - 1 Kg
- ✓ Water - 100 Litre
- ✓

➤ **Methodology:**

- ✓ Take five kg of green leaves of neem or take five kg of dried fruits of neem and keep the leaves or fruits crushed.
- ✓ Add this crushed neem or fruit powder in 100 liters of water.
- ✓ Put 5 liters of cow urine in it and mix one kg of cow dung.
- ✓ Stir it with wood and keep it covered for 48 hours.
- ✓ Dissolve thrice a day and after 48 hours filter the solution with a cloth. Now spray on the crop.

➤ **How to Use?**

- ✓ 2-3% Spray with water

➤ **Uses**

- ✓ For the management of sap sucking insects and small caterpillars.

**Source:** NCONF, Ghaziabad (2011-12)

**F. AGNEYASTRA**

➤ **Ingredients**

- ✓ Neem Leaves - 5 Kg
- ✓ Green Chilli - 0.5 Kg
- ✓ Garlic - 0.5 Kg.
- ✓ Cow Urine - 20 Litre

➤ **Methodology**

- ✓ Take 20 liters of cow urine
- ✓ Add 05 kg of crushed green leaves of neem.
- ✓ Add 0.5 kg crushed Green Chilli.
- ✓ Add 0.5 kg crushed Garlic.
- ✓ Now dissolve all this mixture in cow urine and boil it.
- ✓ After 3-4 boils, take it down from the fire.
- ✓ Let it cool for 48 hours and then filter the solution with a cloth.
- ✓ Now Solution is ready to spray on the crop.

➤ **How to Use?**

- ✓ 2-3% Spray with water

➤ **Uses**

- ✓ For insects living in tree trunks or stalks, all types of large bollworms and caterpillars.

● **Some other pest control formulations**

Many organic farmers and NGOs have developed large number of innovativeformulations which are effectively used for control of various pests. Although none of these formulations have been subjected to scientific validation but their wide acceptance by farmers speak of their usefulness. Farmers can try theseformulations, as they can be prepared on their own farm without the need of anypurchases. Some of the popular formulations are listed below:

● **Cow urine**

Cow urine, popularly known as “gomutra,” is well known for its germicidal, antibiotic, antimicrobial, and medicinal properties that have been evident since ancient times. Nutrient-rich cow urine with nitrogen, potassium, and phosphorous is highly beneficial to soil for dilution and direct application or with formulations and indirect applications. Besides macronutrients, the presence of sulfur, sodium, manganese, iron, enzymes, and chlorine make cow urine an integral natural pest repellent that requires low external input for sustainable agriculture.

Cow urine diluted with water in ratio of 1: 20 and used as foliar spray is not only effective in the management of pathogens & insects, but also acts as effective growth promoter for the crop.

- **Fermented curd water**

In some parts of central India fermented curd water(butter milk or Chaach) is also being used for the management of white fly, jassids aphids etc.

- **Dashparni extract**

Crush neem leaves 5 kg, Vitexnegundo leaves 2 kg,Aristolochia leaves 2 kg, papaya (Carica Papaya) 2 kg, Tinosporacordifolia leaves 2 kg, Annona squamosa (Custard apple) leaves 2 kg, Pongamia pinnata(Karanja) leaves 2 kg, Ricinus communis (Castor) leaves 2 kg, Nerium indicum 2 kg, Calotropis procera leaves 2 kg, Green chilly paste 2 kg, Garlic paste 250 gm, Cow dung 3 kg and Cow Urine 5 lit in 200 lit water ferment for one month.Shake regularly three times a day. Extract after crushing and filtering. The extract can be stored up to 6 months and is sufficient for one acre.

\*\*\*\*\*

## 5. Pest and Disease Management in Natural Farming

- Pest identification

### Type of Pests

1. Regular pest- Frequently- Rice stem borer, Pod borer.
2. Occasional – Case worm in rice, Mango stem borer.
3. Seasonal Pests- Red Hairy Caterpillar, Cotton pink bollworm, Mango Hopper.
4. Persistent pests- Round the year- Thrips, Mealy bug, cotton ball worm.



- Causes for outbreak of pests

1. Destruction of forest or bringing forest area under cultivation.
2. Indiscriminate use of pesticides leads to destruction of natural enemies, pest resistance, pest resurgence.
3. Intensive cultivation.
4. Introduction of new crops and varieties ( many high yielding varieties are more susceptible to insects)
5. Improved agronomic practices (higher 'N', close, spacing, weed control etc. improved crop growth and reduced competition for food to the insects)
6. Introduction of new pest in a new area.
7. Accidental introduction of foreign pests (.
8. Large scale storage of food grains (outbreak of stored product pests, rat problem)

<http://ecoursesonline.iasri.res.in/mod/page/view.php?id=12435>

- Pest management in natural farming

### 1. Preventive Measures:

- Selection of varieties
- Selection of safe seeds/ planting material.
- Mixed cropping systems
- Use of good water management:

- Conservation and promotion of natural enemies
- optimal planting time.
- Sufficient distance between the plants.
- Remove infected plant parts

## **2. Curative methods:**

- Minimize the application of natural pesticides
- Allow some pests to live in the field which will serve as food or host for natural enemies.
- Establish a diverse cropping system (e.g. mixed cropping).
- Include host plants providing food or shelter for natural enemies (e.g. flowers which adult beneficial insects feed on).

## • **Plant based concoctions and decoctions for pest and disease management**

### **A. BRAHMASTRA (broad spectrum botanical pesticide)**

#### ➤ **Ingredients**

- ✓ Neem Leaves - 3 Kg
- ✓ Karanj Leaves - 2 Kg
- ✓ Custard Apple Leaves - 2 Kg .
- ✓ Papaya Leaves - 2 Kg
- ✓ Guava Leaves - 2 Kg
- ✓ Cow Urine - 10 Litre

#### ➤ **Methodology:**

- ✓ Take 10 liters of cow urine
- ✓ Add 03 kg of crushed green leaves of neem.
- ✓ Add 02 kg crushed Karanj Leaves.
- ✓ Add 02 kg crushed Custard Apple Leaves.
- ✓ Add 02 kg crushed Papaya Leaves.
- ✓ Add 02 kg crushed Guava Leaves.
- ✓ Now dissolve all this mixture in cow urine and boil it.
- ✓ After 3-4 boils, take it down from the fire.
- ✓ Let it cool for 48 hours and then filter the solution with a cloth.
- ✓ Now Solution is ready to spray on the crop.

#### ➤ **How to Use?**

- ✓ 2-3% Spray with water

#### ➤ **Uses**

- ✓ For the control of sucking insects and pod/fruit borer.

**Source: NCONF, Ghaziabad (2011-12)**

### **B. NEEMASTRA (broad spectrum botanical pesticide)**

#### ➤ **Ingredients**

- ✓ Neem Leaves - 5 Kg
- ✓ Cow Urine - 5 Litre
- ✓ Cow Dung - 1 Kg
- ✓ Water - 100 Litre

➤ **Methodology:**

- ✓ Take five kg of green leaves of neem or take five kg of dried fruits of neem and keep the leaves or fruits crushed.
- ✓ Add this crushed neem or fruit powder in 100 liters of water.
- ✓ Put 5 liters of cow urine in it and mix one kg of cow dung.
- ✓ Stir it with wood and keep it covered for 48 hours.
- ✓ Dissolve thrice a day and after 48 hours filter the solution with a cloth. Now spray on the crop.

➤ **How to Use?**

- ✓ 2-3% Spray with water

➤ **Uses**

- ✓ For the management of sap sucking insects and small caterpillars.

**Source: NCONF, Ghaziabad (2011-12)**

**C. AGNEYASTRA**

➤ **Ingredients**

- ✓ Neem Leaves - 5 Kg
- ✓ Green Chilli - 0.5 Kg
- ✓ Garlic - 0.5 Kg.
- ✓ Cow Urine - 20 Litre

➤ **Methodology**

- ✓ Take 20 liters of cow urine
- ✓ Add 05 kg of crushed green leaves of neem.
- ✓ Add 0.5 kg crushed Green Chilli.
- ✓ Add 0.5 kg crushed Garlic.
- ✓ Now dissolve all this mixture in cow urine and boil it.
- ✓ After 3-4 boils, take it down from the fire.
- ✓ Let it cool for 48 hours and then filter the solution with a cloth.
- ✓ Now Solution is ready to spray on the crop.

➤ **How to Use?**

- ✓ 2-3% Spray with water

➤ **Uses**

- ✓ For insects living in tree trunks or stalks, all types of large bollworms and caterpillars.

• **SOME OTHER PEST CONTROL FORMULATIONS**

Many organic farmers and NGOs have developed large number of innovative formulations which are effectively used for control of various pests. Although none of these formulations have been subjected to scientific validation but their wide acceptance by farmers speak of their usefulness.

Farmers can try these formulations, as they can be prepared on their own farm without the need of any purchases. Some of the popular formulations are listed below:

- **Cow urine**

Cow urine diluted with water in ratio of 1: 20 and used as foliar spray is not only effective in the management of pathogens & insects, but also acts as effective growth promoter for the crop.

- **Fermented curd water**

In some parts of central India fermented curd water (butter milk or Chaach) is also being used for the management of white fly, jassids aphids etc.

- **Dashparni extract**

Crush neem leaves 5 kg, Vitexnegundo leaves 2 kg, Aristolochia leaves 2 kg, papaya (Carica Papaya) 2 kg, Tinosporacordifolia leaves 2 kg, Annona squamosa (Custard apple) leaves 2 kg, Pongamia pinnata (Karanja) leaves 2 kg, Ricinus communis (Castor) leaves 2 kg, Nerium indicum 2 kg, Calotropis procera leaves 2 kg, Green chilly paste 2 kg, Garlic paste 250 gm, Cow dung 3 kg and Cow Urine 5 lit in 200 lit water ferment for one month. Shake regularly three times a day. Extract after crushing and filtering. The extract can be stored up to 6 months and is sufficient for one acre.

- **Neem-Cow urine extract**

Crush 5 kg neem leaves in water, add 5 lit cow urine and 2 kg cow dung, ferment for 24 hrs with intermittent stirring, filter squeeze the extract and dilute to 100 lit, use as foliar spray over one acre. Useful against sucking pests and mealy bugs.

- **Mixed leaves extract**

Crush 3 kg neem leaves in 10 lit cow urine. Crush 2 kg custard apple leaf, 2 kg papaya leaf, 2 kg pomegranate leaves, 2 kg guava leaves in water. Mix the two and boil 5 times at some interval till it becomes half. Keep for 24 hrs, then filter squeeze the extract. This can be stored in bottles for 6 months. Dilute 2-2.5 lit of this extract to 100 lit for 1 acre. Useful against sucking pests, pod/fruit borers.

- **Chilli-garlic extract**

Crush 1 kg Ipomea (besharam) leaves, 500 gm hot chilli, 500 gm garlic and 5 kg neem leaves in 10 lit cow urine. Boil the suspension 5 times till it becomes half. Filter squeezes the extract. Store in glass or plastic bottles. 2-3 lit extract diluted to 100 lit is used for one acre. Useful against leaf roller, stem/fruit/pod borer.

- **Broad spectrum formulation - 1**

In a copper container mix 3 kg fresh crushed neem leaves and 1 kg neem seed kernel powder with 10 lit of cow urine. Seal the container and allow the suspension to ferment for 10 days. After 10 days boil the suspension, till the volume is reduced to half. Ground 500 gm green chillies in 1 lit of water and keep overnight. In another container crush 250 gm of garlic in water and keep overnight. Next day mix the boiled extract, chilli extract and garlic extract. Mix thoroughly and filter. This is

a broad spectrum pesticide and can be used on all crops against wide variety of insects. Use 250 ml of this concentrate in 15 lit of water for spray.

- **Broad spectrum formulation - 2**

Suspend 5 kg neem seed kernel powder, 1kg Karanj seed powder, 5 kg chopped leaves of besharam (*Ipomea* sp.) and 5kg chopped neem leaves in a 20lit drum. Add 10-12 lit of cow urine and fill the drum with water to make 150 lit. Seal the drum and allow it to ferment for 8-10 days. After 8 days mix the contents and distil in a distiller. Distillate will act as a good pesticide and growth promoter. Distillate obtained from 150lit liquid will be sufficient for one acre. Dilute in appropriate proportion and use as foliar spray. Distillate can be kept for few months without any loss in characteristics.

- **Tutikadarasam**

Tutikadarasam is prepared from *Datura* leaves and cow urine. The leaves are boiled in cow urine for 2-3 hours, cooled and then filtered using cloth.

- **Sonthastra**

Take 2 litres of water, add 200 grams of ginger powder (Sonth) and mix it and cover with a lid. Now boil it till it reduces to half of the solution. Keep this solution for cooling. Take 2 litre milk in another container and boil it slowly on low flame. After boiling milk, allow it to cool down, remove the cream from the milk. Now take 200 litres of water, add a solution of ginger powder and milk without cream. Mix it properly and cover this solution with gunny bags for two hours. During this process ion exchange will occur, filter it with muslin cloth and spray this solution within 48 hours.

- **Jungle Ki Kanddi**

Take kanddi powder (powder of indigenous cow's dung also known as jungle kikanddi) and keep it in muslin cloth. Tie one end of this bag in the centre of a wooden stick in such a way so that this bag hangs above the centre of the drum filled with 200 litres of water. After this, keep 5 Kg kanddi powder bags into 200 litres of water drum and leave for 48 hours. Stir this solution two times in a day for 2-3 minutes in the clockwise direction. The colour of the solution will change to a reddish brown colour (Katha/brass colour). After 48 hours, take out this bag and squeeze it, dip it again and then squeeze. Repeat this process three times. Stir this solution properly. Spray this solution within 48 hours. Before spraying, filter this solution.

- **Non-Insect Pests:**

Other than insects, there are a group of animals known as non-insect pests viz., rodents, birds, mollusks, monkeys, mites, snails, slugs and wild animals are all included that cause significant output losses in agricultural crops.

**Management of Non-Insect Pests:**

***Cultural control :***Regular monitoring of crop for pest incidence is essential.

**Mechanical control :**An effective tool to manage the mites and other small bodied arthropods. A forceful stream of water should be used on where the mite population are high while on the sturdy plants take measures to avoid damage. Mechanical Traps and sound deterrents can be used for managing wild animals and birds.

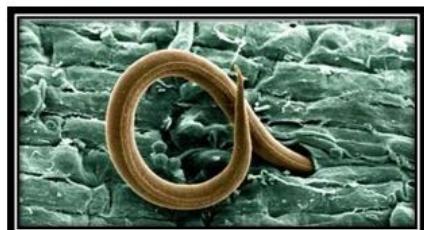
**Use of Deterrents Decoctions:** Deterrent and test altering decoctions prepared from bitter smelling and test botanicals and livestock byproducts can be used to protect the crop from non-insect pests.



Mollusks, snails & slugs



Rats, Mice and Rodents



Nematodes



Birds



Wild Animals



Monkeys

### **Non-Insect Pests**

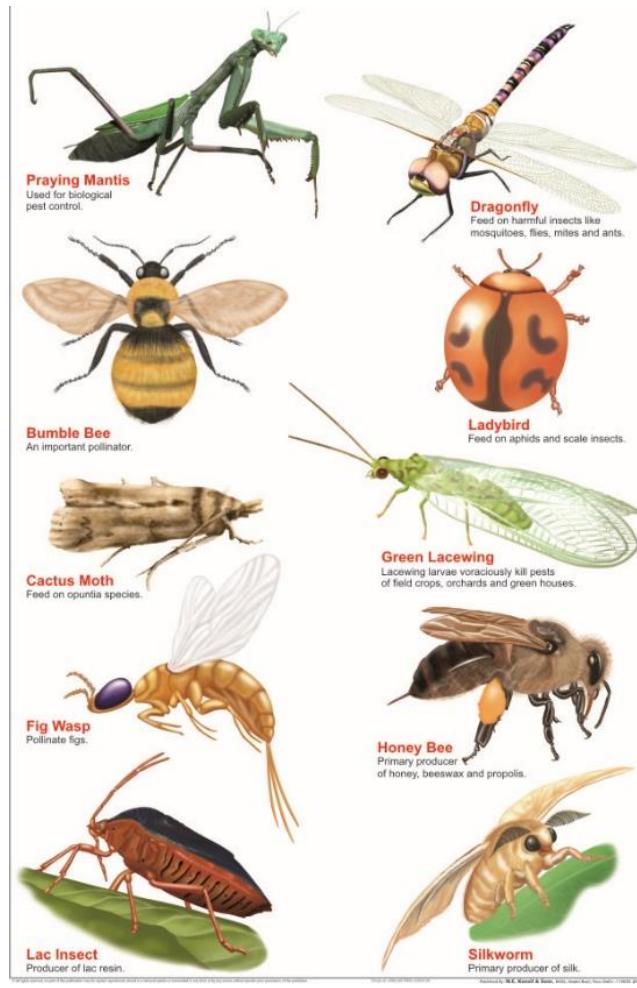
#### **Beneficial Insects:**

Beneficial insects belong to three categories: predators, parasitoids, and pollinators.

**Predators** capture and eat other organisms such as insects or mites. Predators include ladybird beetles and wasps.

**Parasitoids** are insects that parasitize other insects. The immature stages of parasitoids develop on or within its host, eventually killing it.

**Pollinators** include honeybees, other wild bees, butterflies, moths and other insects that visit flowers to feed on nectar and pollen. Pollinators transfer pollen in and between flowers of the same species (pollination) which is essential to seed and fruit production for plants.



\*\*\*\*\*

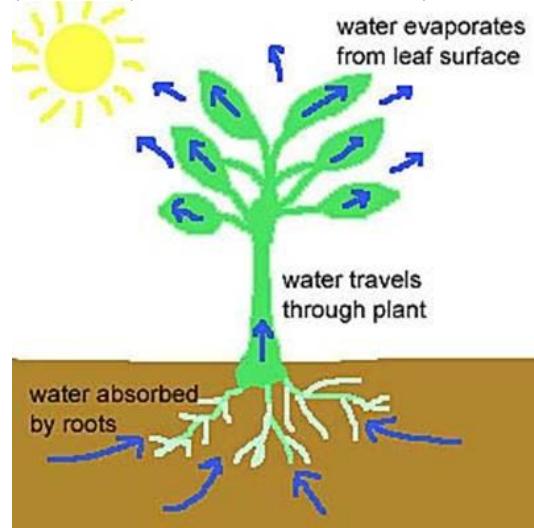
## 6. Water management

- Where and in which form water exists?

For Agriculture purpose, water exists in:

**Ground Water:** Groundwater is the water present beneath Earth's surface in rock and soil pore spaces and in the fractures of rock formations. About 30 percent of all readily available freshwater in the world is groundwater

**Surface water:** Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation (Rainfall) and naturally lost through discharge to the oceans, evaporation, evapotranspiration and groundwater recharge. The only natural input to any surface water system is precipitation (Rain fall) within its watershed (Catchment area).



- How do we harvest and retain rainfall in the soil?,

**Why rain water harvesting?:**

- Surface water is inadequate to meet our demand and we have to depend on ground water.
- Due to rapid urbanization, infiltration of rain water into the sub-soil has decreased drastically and recharging of ground water has diminished.
- Irrigation requirements

**Rain water harvesting techniques :**

There are two main techniques of rain water harvestings.

- Storage of rainwater on surface for future use.
- Recharge to ground water.

**Techniques for water Harvesting :**

**Pits** :- Recharge pits are constructed for recharging the shallow aquifer. These are constructed 1 to 2 m, wide and to 3 m. deep which are back filled with boulders, gravels, coarse sand.



**Trenches:-** These are constructed when the permeable stratum is available at shallow depth. Trench may be 0.5 to 1 m. wide, 1 to 1.5m. deep and 10 to 20 m. long depending upon availability of water. These are back filled with filter materials.



**Dug wells:-** Existing dug wells may be utilised as recharge structures and water should pass through filter media before putting into dug well.



**Hand pumps :-** The existing hand pumps may be used for recharging the shallow/deep aquifers, if the availability of water is limited. Water should pass through filter media before diverting it into hand pumps



**Recharge wells** :- Recharge wells of 100 to 300 mm. diameter are generally constructed for recharging the deeper aquifers and water is passed through filter media to avoid choking of recharge wells.

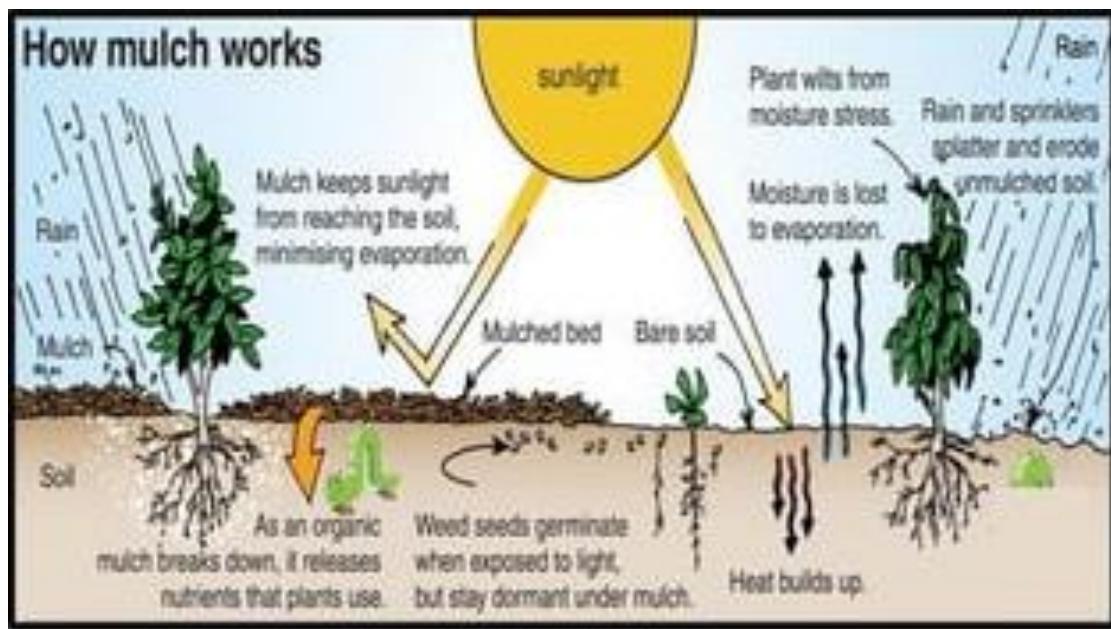
- **Diversion of runoff into existing surface water bodies**

Construction activity in and around the city is resulting in the drying up of water bodies and reclamation of these tanks for conversion into plots for houses. Free flow of storm runoff into these tanks and water bodies must be ensured. The storm run off may be diverted into the nearest tanks or depression, which will create additional recharge.

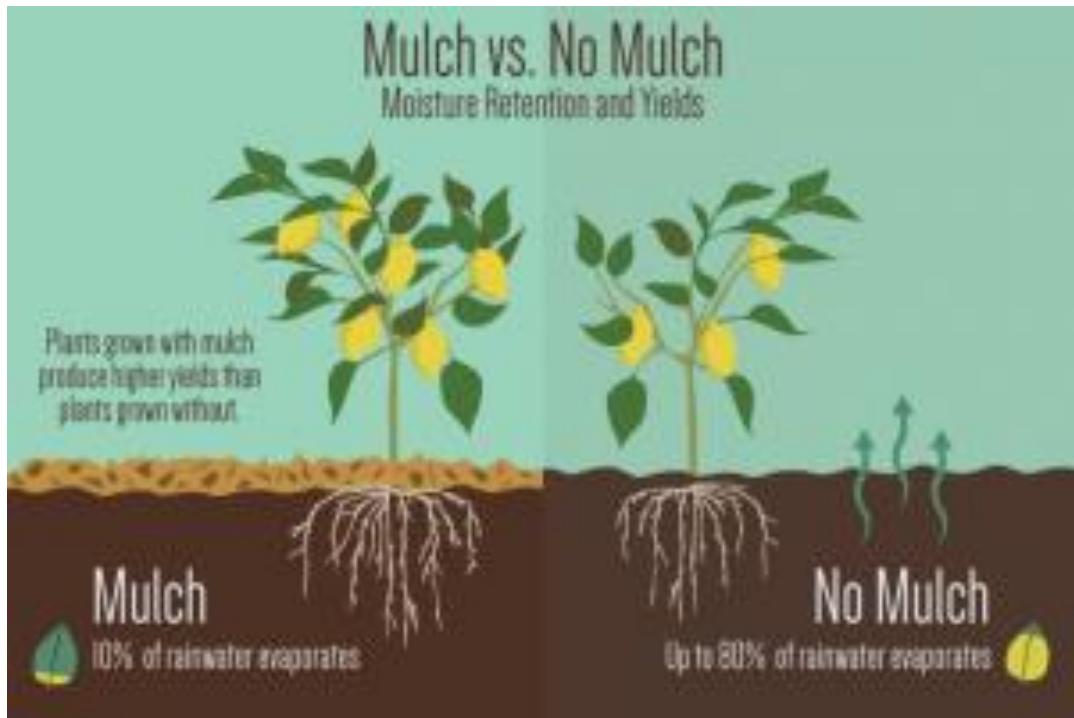
- **Water and moisture management through Mulching**

#### **Mulching**

Mulching is defined as covering of soil surface using either live crops or straw (dead plant biomass) to conserve moisture, increase infiltration, lower soil temperature around plant roots, prevent soil erosion, improve soil structure, reduce runoff and weed growth. Mulching prevents the formation of hard crust after each rain.



**Working of A Mulch**



### Role of Earthworms in water recharge

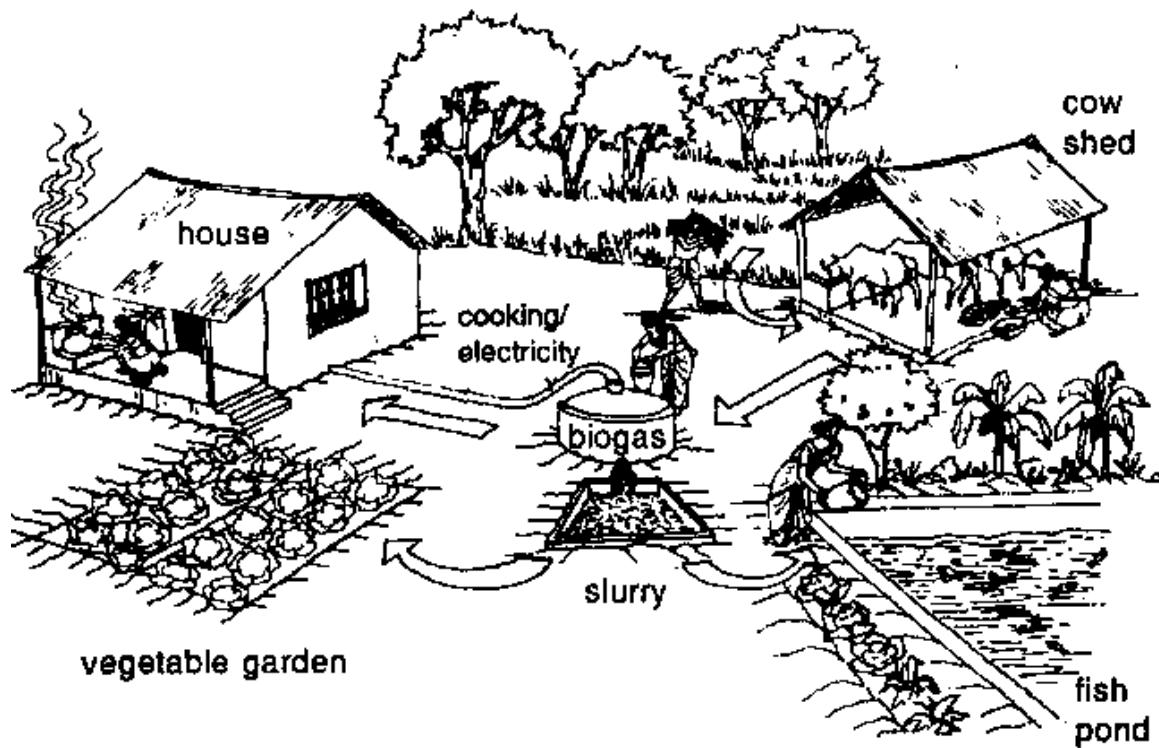
The native earthworms are also known as indicators of soil fertility. Some thinkers also consider the native earthworms as “heart of Mother Earth”, as these earthworms also create vibrations in the soil surface as they move up and down, like our heartbeats. As the native earthworms traverse the soil, they fertilize it and enrich it with nutrients by secreting mucilaginous substances, which helps in binding of soil particles and thus enhances the water holding capacity of soil. Earthworms require shade to function as well and thus the micro-climate formed under the mulch helps the process. If there is an absence of a microenvironment, earthworms cannot do their work, and the soil cannot become productive.

Soil pores formed by earthworms also improves water infiltration rate, distribution of nutrient, and gas exchange during the plant respiration and thus promote root growth besides enhancing the microbial decomposition of organic matter. Water infiltration in the soil is mainly dependent upon the soil porosity rather than the other soil properties. Large macro pores created by native earthworms play a vital role in the regulation of water infiltration.

\*\*\*\*\*

## 7. Farming systems and Seed System

- Diversity (through integrated farming system)



- Integrated Farming System Model

<b>Advantages of IFS:</b>	<b>SCOPE OF INTEGRATION</b>
<ul style="list-style-type: none"> <li>➢ Higher food production</li> <li>➢ Increased farm income</li> <li>➢ Sustainable soil fertility</li> <li>➢ nutritious food</li> <li>➢ Reduced production cost</li> <li>➢ Regular stable income</li> <li>➢ Avoidance of soil loss</li> <li>➢ Regular employment</li> </ul>	<p><b>SCOPE OF INTEGRATION</b></p> <p>Crop Husbandry, Pasture Development, Vegetable Cultivation, Flower Cultivation, Fruit Orchards, Forestry, Mushroom Production, Animal Husbandry, Dairy Production, Fisheries, Bee Keeping, Sericulture, Poultry etc, the major fields of farming may be integrated as per the requirement and profitabilit</p>

Some Popular and ICAR recommended IFS models

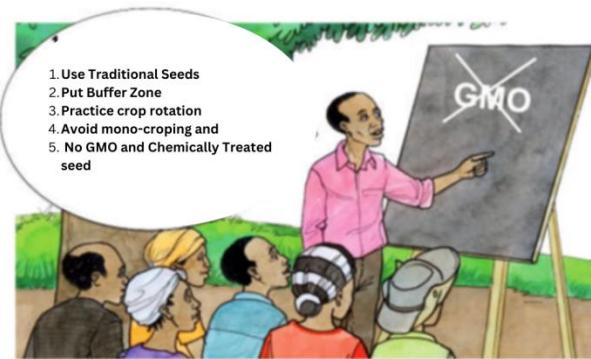
- Agriculture + Animal Husbandry

- Agriculture + Poultry + Goat/Sheep Husbandry
- Horticulture + Fisheries + Poultry
- Piggeries + Fisheries + Duck Farming
- Agricultural + Silvipasture
- Sericulture + Fisheries
- fish culture + Sericulture
- Agricultural(rice) + Fisheries + Mushroom Production
- Agricultural + Duck Farming + Poultry
- Poultry + Fisheries
- Rice + Fisheries + Vegetable
- Rice + Fisheries + Poultry
- Piggeries/poultry + Fisheries +Vegetable



- **Seed and planting material in natural farming**

The choice of quality seed and plant propagation material of suitable varieties are important for successful farming through product quality, crop resilience, considerate use of non-renewable resources and for increased genetic and species diversity.





## PREVENTIVE MEASURES AGAINST STORAGE PESTS AND DISEASES

### Importance of Traditional Seed

- Traditional seeds are locally available because farmers collect good seeds from their own plots and keep them for the next season.
- Farmers either buy or exchange their seed with other farmers or grow their own seeds, therefore the cost of seeds is minimal.
- Native seeds are geared to a subsistence economy as the farmers first grow food for his subsistence and/or stock seed for the next season and market only the surplus.
- Native seeds embody indigenous knowledge. A farmer who uses native seeds use his/her traditional knowledge, skills and wisdom to grow them, promoting self-reliance.
- An outstanding feature of native seeds is diversity.
- Native seeds are hardy, as they have, over the years, developed resistance to the pests and diseases.
- Traditional seeds have high level of tolerance to conditions of stress and are adapted to local agro-climatic conditions.

Ref Shiva V., Pande P., Singh J. 2004. Principles of organic farming: Renewing the Earth's harves. Published by Navdanya, New Delhi, India.

### SECTION OF SEED

Good quality seed is the sum of its genetic, physiological, physical and health traits. When a farmer wants to select his own genetic material, he has to bear many details in mind:

- Choose the best plants on the farm: vigorous growth, high yielding plants, good quality fruits (shape, colour and flavour (when applicable)), best fruit covering, good health, etc.
- The selected plants should be looked after with the utmost care.
- Every plant not corresponding to the chosen type should be eliminated, and isolation distance strictly respected.
- Neighbouring plants having pest or diseases must be eliminated.
- Fruits must be picked at optimum maturity.
- Once picked, the seeds should be taken out at once.



## Seed Treatment in Natural Farming

### Why we need seed treatment?

Seed treatment provides better germination and prevents seed and soil borne diseases in plant. Outcome is healthy (disease free) and high yielding crop.

### Advantages of Seed Treatment:

- It protects germinating seeds and seedlings against soil and seed-borne pests and diseases.
- It improves the germination process and increases the germination percentage.
- It enhances the seed viability and vigour which are the two most important factors in agriculture or cultivation practices.
- It results in the early and uniform establishment and growth of the crop or plants.
- It enhances nodulation in legume crops.
- It results in uniform crop stand especially in adverse situations like low moist and high moist conditions.

### Beejamrit

Beejamrit is a traditional liquid organic concoction commonly used for seed treatment in Zero-budget natural farming (now Subhash Palekar Natural Farming). It is a mix of cow dung, cow urine, water, lime and a handful of soil. Treatment with beejamrit makes germinating plant to grow faster and healthily; as well as increasing immunity; preventing harmful microbes and insects from attacking the seed. The beneficial microorganisms present in beejamrit are known to protect the crop from harmful soil and seed-borne pathogens. Smearing of the seeds with beejamrit before sowing controls many diseases that attack the plant right from its seedling stage.

In transplanted crops, saplings are dipped in the beejamrit before transplanting. The important beneficial microbial communities present in Beejamrit are bacteria, yeast, actinomycetes and certain other fungi.

### Preparation of Beejamrit

Beejamrit is prepared using protocol given as below:

- Take 5 kg fresh cow dung in a cloth and bound it by rope and hang this in a drum having 20 liter water, for 12 hours
- Take one liter water in another pot and add 50 g lime in it, keep for a night
- On next day, squeeze the bundle of cow dung for 2-3 times in the same water to extract most of its content
- Add one handful of virgin soil, 5 litre cow urine and lime water and stir it well with wooden stick
- Beejamrit is ready to treat the seeds

		<p><b>Application of Beejamrit</b> Readybeejamrit can be used for treating the seeds. Twenty litre of beejaamrit is sufficient for treating 100 kg of seeds. After treatment, shade dry the seeds before sowing. Vegetative planting materials like rhizomes, stem, root cuttings, leaf cuttings, tuber etc. and roots of crop seedlings are dipped for 5 minutes in beejamrit before sowing.</p>
<b>Ist Day</b>	<b>IIInd Day</b>	

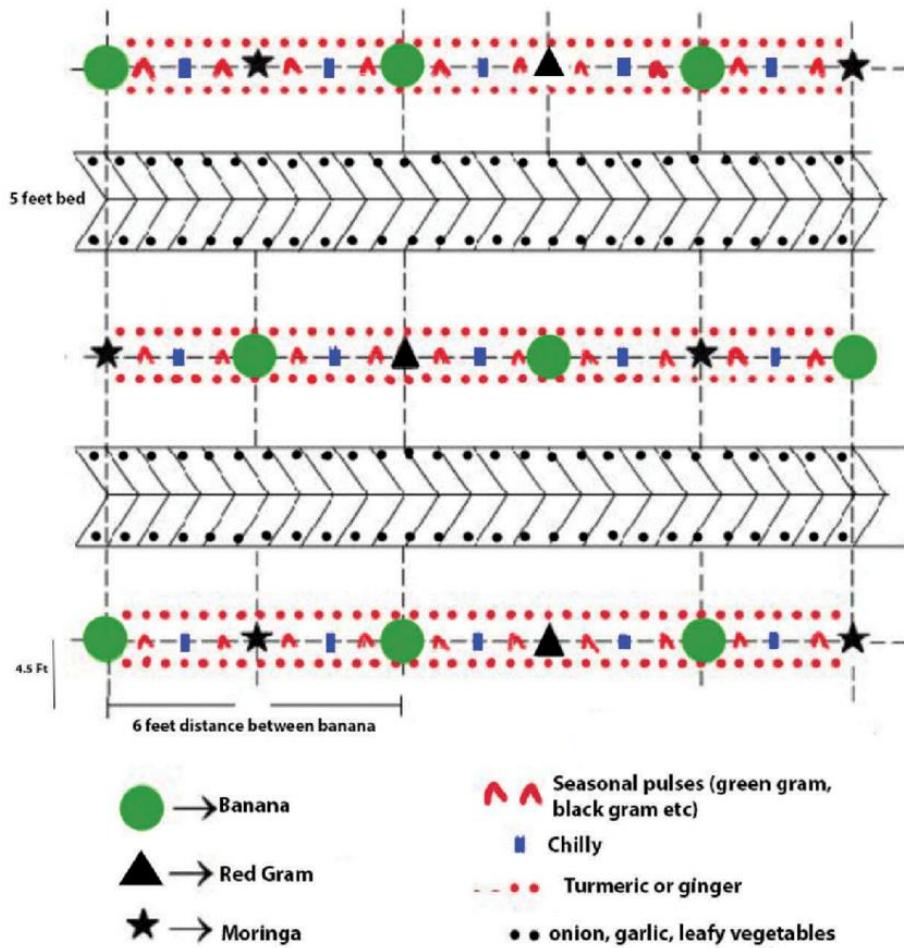
## 8. Indigenous Traditional Knowledge and Models

Indigenous Technical Knowledge (ITK) refers to the practical application of local people's knowledge and understanding in various agricultural and allied activities. It encompasses the unique, traditional, and locally developed knowledge that is specific to a particular geographic area and the indigenous communities residing there.

### Types of multi-cropping models:

- **Five Layer Model:** In this model, a section of land is divided into equal squares of 36ft X 36ft. Each square is further divided into four 9ft X 9ft sub-squares. Each 9ft X 9ft space can be used to grow around 170 trees, including 1 banana tree, 4 areca nut trees, 4 black pepper creepers on the areca nut trees, 2 coffee plants, 2 gliricidia trees, and 32 ginger plants.

Layer 1	Mango and /or Sapota	Trees-Can grow upto 90 feet in height and 80 feet in width	Qty 4 per 36X36 Sqft plot. We can divide the 1 acre into plots leaving the walking space in between.
Layer 2	Gooseberry/ Oranges/Guava	Trees/Shrubs- Max can grow up to 50 ft.	Qty 1 in centre
Layer 3	Custard Apple/Pomegranate /Lemon	Shrubs-This is even smaller. No more than 20 feet	Qty 20
Layer 4	Castor+ Beans to climb	Plants-Even smaller just 6 ft in height	Qty 20
Layer 5	Drumstick+ Creeper vegetables	Trees must be pruned when 8-12 ft in height	Qty 16 drumstick trees will help in nitrogen fixation for each 9X9 Sqft plot as subdivided in the 36X36 layered plot.



- **Multicropping Model:** Multicropping involves growing two or more crops on the same farmland within a single calendar year. It includes various approaches like inter-cropping, mixed-cropping, and relay cropping.
- **Inter-cropping:** Growing two or more crops simultaneously in a definite cropping pattern.
- **Relay cropping:** Growing multiple crops on the same field, with the second crop planted after the first one has reached its reproductive stage.
- **Mixed intercropping:** Growing more than one crop simultaneously without a distinct row arrangement.

<b>Intercropping</b>	<b>Relay Cropping</b>	<b>Mixed Cropping</b>

### Economical Benefits of multi-cropping:

- ✓ **Higher Productivity:** Multi-cropping maximizes land productivity by intensifying land and labor use for better profit and income stability.
- ✓ **Fodder Stock:** Growing multiple crops ensures an adequate supply of fodder for livestock.
- ✓ **Food Security:** Even if one or two crops fail, other crops can still be harvested, ensuring food availability throughout the year.
- ✓ **Multiple Uses:** Crops provide not only grains but also fodder and fuelwood.

### Agronomic Benefits of multi-cropping:

- ✓ **Pest Management:** Growing a variety of crops together reduces pest problems and optimizes soil nutrients, water, and land use.
- ✓ **Nitrogen Fixation:** Intercropping leguminous crops with others reduces the demand for nitrogen.
- ✓ **Weed Management:** Multi-cropping suppresses weed growth, making efficient use of resources.
- ✓ **Sustainable Crop Production:** It reduces the need for chemical fertilizers and pesticides.

### System of Rice Intensification (SRI) Method of Rice Cultivation:

The System of Rice Intensification (SRI) is a methodology that aims to increase the productivity of irrigated rice by changing the management of plants, soil, water, and nutrients, especially by encouraging greater root growth.

### Nursery area, seed rate, and management:

- ✓ About 7-8 kg of seed is required for 1 hectare of land.
- ✓ The nursery should be raised in an area of 100m<sup>2</sup>/ha.
- ✓ Well-decomposed good quality FYM should be used, and seed treatment can be done with *Pseudomonas* and a consortium of *Azotobacter*, *Azospirillum*, and *Phosphobacterium*.
- ✓ The recommended age for transplanting seedlings is 14 days (3-leaf stage).



### Main field preparation:

- ✓ Plough the land during the summer to economize on water requirement for initial preparation.
- ✓ Flood the field before plowing to allow water to soak in.
- ✓ Puddle the field with a water depth of 2.5 cm.

### **Water Management:**

- ✓ Initially, irrigate to moisten the soil for the first 10 days.
- ✓ Maintain a depth of 2.5 cm of water after the development of hairline cracks in the soil until panicle initiation.
- ✓ Increase irrigation depth to 5.0 cm after panicle initiation one day after disappearance of ponded water.

### **Rice-Fish System:**

A rice-fish system involves growing fish concurrently or alternately with rice in an integrated manner. Fish may be deliberately stocked or enter fields naturally during flooding. Common fish species found in rice fields include Danios, Barbs, Gourami, Snakehead, Catfish, Climbing Perch, and others. Rice field fisheries can be managed to attract and harvest fish through various methods such as netting, trapping, harpooning, and draining the field.



### **Integrated Farming with Allied Activities:**

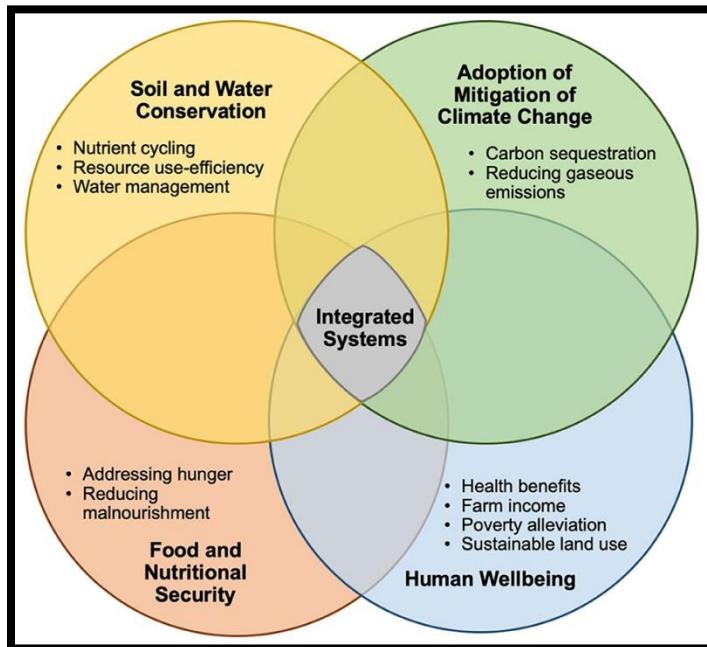
Integrated Farming Systems (IFS) involve integrating natural resources and regulation mechanisms into farming activities to achieve sustainable production, secure high-quality food, eliminate or reduce pollution generated by agriculture, and maintain multiple functions of agriculture. Various allied activities can be integrated into farming, such as fruit orchards, dairy, goatery, poultry, piggery, aquaculture, mushroom cultivation, apiary, biogas, sericulture, rooftop gardening, compost yards, kitchen garden, boundary/bund plantation, agroforestry, horti-pasture, and processing and value addition of marketable surplus products. Farmers can select these modules based on their resource availability and aim to increase their income while reducing production costs and enhancing sustainability.

\*\*\*\*\*

## 9. Crop and Livestock Integration

**Crop and livestock integration** - As a principle of agro-ecology, it consists of a range of resource-saving practices that favors an efficient recycling of natural resources by creating a beneficial synergy between crop and livestock production, thus using the outputs of one system as inputs or resources for the other system. This integration is based on four main pillars:

- 1) Feeds produced from crop production used in favor of animal production (forage crops, crop residues, fallow), etc.
- 2) Livestock as source of diverse food and nonfood products, such as milk, meat, honey, wool, leather and eggs, and sources of biogas fuel etc.
- 3) Transport and draught power in favor of crop production and other farming activities, such as tillage, irrigation, sowing, weeding, transport of harvest, etc.
- 4) Livestock as inputs for farming activities, such as manure, pasture management, and animal trampling enhancing soil structure by breaking up the hard soil crusts.



### CRITICAL ASPECTS TO BE CONSIDERED IN CROP AND LIVESTOCK INTEGRATION

- **Suitability of the farm for Integrating Crop & Livestock**-Before engaging in any crop and livestock integration, there is need to assess farm suitability in terms of space for animal shedding and grazing, sufficient fodder or by-products to feed, sufficient know-how on keeping, feeding, and treating the specific kind of animals.
- **Benefit of the Integration**-Assess whether the integration allows the livestock to fulfil its input and output functions (utilization of animal manure, use of animal products for own consumption or sales).
- **Access to Livestock inputs**-It is important to have sufficient labor available inside and outside the farming system, enough fodder and water of good quality, veterinary support, and suitable breeds of animals.
- **Animal Population**-When defining the number of farm animals, keep in mind that the economic benefit will be higher when fewer animals are kept, and fed well.
- **Animal Selection**-The criteria of animal selection include feeding requirements, growth duration, production potential, adaptability to local conditions, use of livestock outputs for food and non food benefits.

## **AGRO-ECOLOGICAL PRINCIPLES FOR CROP AND LIVESTOCK INTEGRATION**

- **Adapt Livestock Production to the Local Ecosystem**-Livestock productions whose requirements are suitable for the resources available locally, breeding of suitable local species, respectful of local agro-ecological and social conditions.
- **Promote Livestock System that uses Local Resources**-Production and use of animal feeds on the farming system, production of organic matters on the farm, possibility of livestock and crop diversification
- **Integrate Forage Crops and Trees in The Farming Systems**-Promote crop rotation, crop association and agroforestry that include production of animal feeds and forage crops and trees.

**Crop and livestock integration presents the following agronomic, social, economic and ecologic advantages**

- ✓ It improves space utilization and increases productivity per unit area
- ✓ It provides diversified products, thus enhancing food security and nutrition
- ✓ It provides coping and risk management strategies (animals as “banks on hooves” allow to raise money in times of need)
- ✓ It improves soil fertility and soil physical structure from appropriate crop rotation and using cover crop and organic compost
- ✓ It reduce weeds, insect pests and diseases through animal grazing and crop rotation
- ✓ It recycles and utilizes crop residues and livestock wastes
- ✓ It strengthens farmer’s autonomy (less reliance to external inputs – fertilizers, agrochemicals, feeds, energy, etc.)
- ✓ It allows higher net returns to land and labour resources of the farming family

### **Conclusion:**

Livestock have been integrated into crop production systems for much of agriculture’s history, providing fertility, weed and pest control, and residue breakdown. Livestock can also provide an additional revenue stream for farmers, creating cash flow year round or providing income in the years before a perennial crop starts producing. Livestock, however, can also introduce sources of contamination, creating food safety concerns, especially for farmers growing crops that are eaten fresh, like many fruits and vegetables.

### **References:**

1. <https://www.actioncontrelafaim.org/wp-content/uploads/2022/01/1.-Crop-and-livestock-integration-VF.pdf>

\*\*\*\*\*

## 10. Health and Nutrition

### Overview

Consuming a healthy diet throughout the life-course helps to prevent malnutrition in all its forms as well as a range of non-communicable diseases (NCDs) and conditions. However, increased production of processed foods, rapid urbanization and changing lifestyles have led to a shift in dietary patterns. People are now consuming more foods high in energy, fats, free sugars and salt/sodium, and many people do not eat enough fruit, vegetables and other dietary fibre such as whole grains.

The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. However, the basic principles of what constitutes a healthy diet remain the same.

#### **Dietary Diversity:-**

Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods, and is also an estimation of nutrient adequacy of the diet of individuals.

#### **Objective of dietary diversity:**

- ✓ The household dietary diversity reflects the economic ability of a household to access a variety of foods. Studies have shown that an increase in dietary diversity is associated with socio-economic status and household food security.
- ✓ Individual dietary diversity aims to reflect nutrient adequacy. Studies in different age groups have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy of the diet.
- ✓ Dietary diversity scores have been validated for several age/sex groups as estimation measures for macro and/ or micronutrient adequacy of the diet.

#### **Healthy Diet Plan:**

For adults, a healthy diet includes the following:-

- ✓ Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice).
- ✓ At least 400 g (i.e. five portions) of fruit and vegetables per day, excluding potatoes, sweet potatoes, cassava and other starchy roots with less than 10% of total energy intake from free sugars which is equivalent to 50 g (or about 12 level teaspoons) for a person of healthy body weight consuming about 2000 calories per day, but ideally is less than 5% of total energy intake for additional health benefits. Free sugars are all sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates. Similarly, less than 30% of total energy intake from fats. Unsaturated fats (found in fish, avocado and nuts, and in

sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard).

### Promoting healthy diets through establishment of nutri-gardens

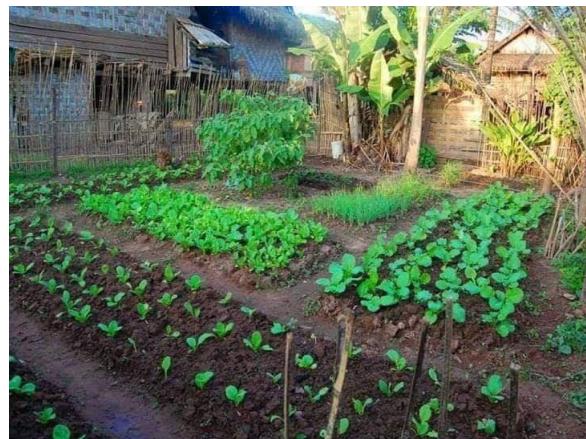
Vegetable based nutri-garden is the richest source of nutrition and can play an active role in eradicating under-nutrition. Nutri-garden is advanced form of kitchen garden in which vegetables are grown as a source of food and income in a more scientific way. For small and marginal farmers, nutri-garden can contribute to the family diet and provide several other benefits, particularly for women. According to Indian Council of Medical Research (ICMR, 2010) recommendation for vegetable consumption includes consumption of 300 gm of vegetable per person per day which comprises 50 g leafy vegetables; 50 g root vegetables and 200 g other vegetables.



### Setting up a nutri-garden

Usually a nutri-garden can be established in the backyard of house where there is enough water availability. In hills, nutri-gardens should be maintained near house so that it can be protected from animal damage which plays havoc in the region. A rectangular garden is preferred to a square plot. Nearly 200 m<sup>2</sup> land is sufficient to provide vegetables throughout the year for a family consisting of five members. Layout and crop allotment in nutri-garden can be modified depending on climatic and seasonal changes.

- Perennial vegetables should be allotted to one side of the garden so that they may neither create shade for the remaining plot nor they interfere with intercultural operations. Shade loving vegetables may be planted in perennial plots. Compost pits can be provided on the corner of nutri-garden for effective utilization of kitchen waste.
- After allotting areas for perennial crops, remaining portions can be divided into 6-8 equal plots for growing annual vegetable crops.



- By following scientific practices and crop rotation, two to three annual crops can be raised in the same plot. For effective utilization of plot accession cropping, inter cropping and mixed cropping can be followed.
- Walking path should be provided at the center as well as along four sides. Since fresh vegetables from garden are directly utilized for consumption, organic manure should be used which is abundant in villages. However, in order to harvest good crop free from pest and diseases, neem based formulations can be utilized in limited amount.
- It is important that preference should be given to long duration and steady yielding crop varieties than high yielding ones.
- A bee-hive may also be used for a plot of 200 m<sup>2</sup> for ensuring adequate pollination in crops besides obtaining honey.

## **Conclusion**

Nutri-gardens are cornerstone in traditional farming systems, since time immemorial but with time, it has lost its importance. Myriad coloured vegetables into the daily diet will enhance the individual's ability to fight diseases and improve immunity. Also innumerable phytochemicals in a range of fresh fruits and vegetables act as anti-oxidant, anti-allergic, anti-carcinogenic, anti-inflammatory, anti-viral and anti-proliferative. Nutri-gardens are also very much essential in places and villages which are isolated and far from the local market. Awareness campaign regarding the proper nutrition, nutri-gardening, dietary habits, should be demonstrated in the rural and remote areas. Nutri-gardening is one of the advantageous ways to improve nutrition level in women with minimum investment.

## **References:**

<https://www.fao.org/3/i1983e/i1983e00.pdf>

<https://www.who.int/news-room/fact-sheets/detail/healthy-diet>

<https://leisaindia.org/nutri-gardens-a-rich-source-of-nutrition-for-farm-women/>

\*\*\*\*\*

## **11.Extension Methods**

### **Functions of extension methods:**

- To provide communication so that the learner may see, hear and do the things to be learnt;
- To provide stimulation that causes the desired mental and / or physical action on the part of the learner;
- To take the learner through one or more steps of the teaching-learning process, viz., attention, interest, desire, conviction, action and satisfaction.

### **Individual Methods**

- Some of the Individual Extension Teaching Methods which can be effectively used by trained KrishiSakhi/ExtensionAgent are explained here.

#### **Farmandhomevisits:**

- FarmandHomeVisit is a direct, face-to-face contact by the extension agent/KrishiSakhi with the farmer at his farm or home for extension work.

#### **Objectives**

- To get acquainted with and gain confidence of farmers/farm women.
- To obtain and/or give first-hand information on matters relating to farmandhome.
- To advise and assist in solving specific problems, and teach skills.
- To sustain interest.

**Farmer's calls:** Farmer's call is a call made by a farmer or farm women at the working place of the extension agent/KrishiSakhi for obtaining information and assistance.

#### **Objectives:**

- To get quick solution of problems relating to farmandhome.
- To enable the farmer and farm women to bring specimens for proper identification of the problem.
- To ensure timely supply of inputs and services.
- To act as a reminder to the extension agent/KrishiSakhi.

### **Group Methods**

Some of the Group Extension Teaching Methods which can be effectively used by trained KrishiSakhi/ExtensionAgent are explained here with.

#### **Method Demonstration**

It is relatively short-time demonstration given before a group to show how to carry out an entirely new practice or an old practice in a better way

#### **Objectives**

- To enable the people to acquire new skills.
- To enable people to improve upon their old skills.
- To make the learners do things more efficiently, by getting rid of defective practices.
- To save time, labour and to increase satisfaction of learners.
- To give confidence to the people that a particular recommended practice is a practicable proposition in

their own situation.

### Steps

- Analyze the situation and determine the need
- Determine that the subject-matter practice involves skills which need to be demonstrated to many people.
- Is the demonstration for new skills developed through research, or for old skills not being performed successfully?
- Is it suitable for visual presentation to a group?
- Can the demonstration be repeated satisfactorily by local leaders
- Is the practice really important for the farmers' viewpoint?
- Can people afford to follow the practice?
- Are supplies and equipment available in sufficient quantities to permit wide-spread use of the practice

### Advantages:

- Particularly suited for teaching skills to many people
- Seeing, hearing, discussing and practicing in a group stimulates interest and action
- The costly 'trial and error' procedure is eliminated
- Acquiring skills is speeded up
- Builds confidence of extension workers in himself, and also confidence of the people in the krishi sakhi, if the demonstration is performed skillfully
- Simple demonstrations readily lend themselves to repeated use by local leaders
- Introduces changes of practices at a low cost.
- Provides publicity material

### Limitations

- Suitable only for practices involving skills.
- Needs good deal of preparation, equipment and skill on the part of extension worker
- May require considerable equipment to be transported to the workplace.
- Requires a certain amount of showmanship not possessed by some extension workers.

**Result Demonstration:** it is a method of motivating the people for adaption of new practice by showing its distinctly superior results.

### Objectives

- To show the advantages and applicability of a newly recommended practice in farmer's own situation.
- To motivate groups of people in a community to adopt a new practice by showing its result.
- To build up confidence of the farmers and extension agents/Krishi Sakhi.
- To develop innovation leadership.

### Basis for Demonstration

- Most people retain 10-15% of what they READ
- The majority remember about 20-25% of what they HEAR
- About 30-35% of what they have SEEN is kept in mind by the majority
- The majority remember 50% and more of what they have SEEN and HEARD at the same time

- Up to 90% of what is taught is kept in mind by the majority of people, if they participate actively and if ALL THE SENSE are involved.

**Training:** It is a technique of imparting specific skills to a group of people to enable them by creating an appropriate learning situation. This is an effective method for technology transfer.

### **Objectives**

- To impart the needed skills to a small group of people.
- To motivate people to adopt new practices through skill training.

### **Planning and preparation**

- Identify technology for which there is a need in the community.
- Decide on the time and duration of the training programme.
- Select trainers having both theoretical knowledge and practical experience about the technology. They should have the ability to speak well and at the level of the trainees.
- Prepare a written programme allocating topics to different trainers.
- Collect relevant materials, publications and audio-visual aids.
- Inform all concerned in time.
- Make arrangements for food, accommodation and other facilities.
- Allocate responsibilities to suitable persons.
- Make arrangement for registration of the participants.

### **Implementation**

- Start the training programme on the scheduled date and time.
- Distribute publications and materials for taking notes.
- Keep the inauguration function and other formalities to a minimum.
- Invite the trainers as per programme. Given enough time for discussion and the trainees to react.
- Explain the relevant technology and state clearly why and how it should be done.
- Use visual aids like chalkboard, models, slide/LCD projector etc.
- Arrange practical demonstration and give enough time to each trainee for practicing the skill.
- Clarify doubts and answer their queries.
- Arrange a film show on the topic and/or take the group to a near-by place where they can see successful demonstration of the practice.

### **Limitations**

- A small number of people may be trained at a time.
- Follow-up requires more staff and time.

### **FIELD DAY:**

Field day is a method of motivating the people to adopt a new practice by showing what has actually been achieved by applying the practice under field conditions. A field day may be held in a research farm or in a farmer's field or home. If the number of participants is

large, they should be divided into small groups of about 20 to 25 persons each, who shall visit the spots in rotation.

### **Focused Group discussions (FGD)**

This is a group discussion of approximately 6-12 people guided by a facilitator. Group members speak freely and spontaneously about a certain topic among themselves guided by a facilitator. It is a qualitative method to get in-depth information on a certain topic.

When conducting FGD one needs to determine the purpose, do a situation analysis; select Participants; prepare a discussion guide; nominate a facilitator or moderator and also a recorder. Focus may not be on more than one or two topics.

### **What is Farmer Field School (FFS)?**

Farmer Field School (FFS) is an agricultural school of farmer which is conducted by the farmers on their own fields. This is research based learning through non formal education. FFS provide opportunities for learning by doing. Because,

**“If I hear it, I forget it. If I see it I remember it. If I discover it, I own it for life.”**

### **Objectives**

- Empowering farmers with knowledge and skills.
- Making farmers experts in their own fields.
- Empowering farmers to solve their field problems by themselves.
- Helping farmers how to organize themselves and their communities to become sound socially and economically.

### **Essential Elements of FFS**

#### **a) The Group**

The group consist of individuals (50-100 farmers) with common interests, forms the core of farmer field school.

#### **b) The Field**

The field is the trainer which has facilities of training materials like seed, on farm resources like cow dung, cow urine, pests and natural enemies, raw materials required for demonstration. In most cases, the groups provide a study site with a shaded area for follow-up discussion.

#### **c) The Facilitator**

The facilitator is a technically competent person who leads group members through the hands-on exercise. The facilitator can be an extension officer of ATMA, KV, champion farmer, master trainer trained by MANAGE and NCONF. The facilitator facilitates the activities to arrive on conclusion.

#### **d) The curriculum**

The curriculum developed by NCONF consists the natural cycle of the Natural Farming, be it habitat, crop, animal, soil, on farm formulations, pest and disease etc. This allows all aspects of Natural Farming to be covered in parallel with what is happening in the FFS field.

**e) Programme Leader**

The programme leader is essential to support the training of facilitators, get materials organized in local language for the field, and solve problems in participatory ways and nurture facilitators. The programme leader should be good leader who empowers others.

**Steps in Conducting FFS**

**a) Ground Working Activities:**

- Identify priority problems
- Identify solutions to identified problems
- Establish Farmers Practices
- Identify Field School participants
- Identify Field School Sites

**b) Training of Facilitators (by MANAGE & NCONF):**

- Crop / Livestock production and protection technologies in Natural Farming
- Preparation and application of different formulations and concoctions.
- Certification, Branding, Packaging and Marketing of produce.

**c) Establishment and running FFS:**

- With the guidance of facilitators, the group meets regularly throughout the season.
- Carries out experiments and field trials related to Natural Farming.
- And validates the test and trials carried by them.

**d) Field Days:**

- During the period of FFS, 1-2 field days are organized where the rest of the farming community is invited to share what the group has learned in the FFS. Farmers themselves facilitate during this day.

**e) Graduations:**

- This marks the end of the season-long FFS. It is organized by the farmers, facilitators and the coordinating office. Farmers are awarded certificates after 6-12 months.

**f) Farmer run FFS:**

- FFS farmer graduates now have the knowledge and confidence to run their own FFS.

**g) Follow up by facilitators:**

- The core facilitators will take follow up of FFS run by farmers.

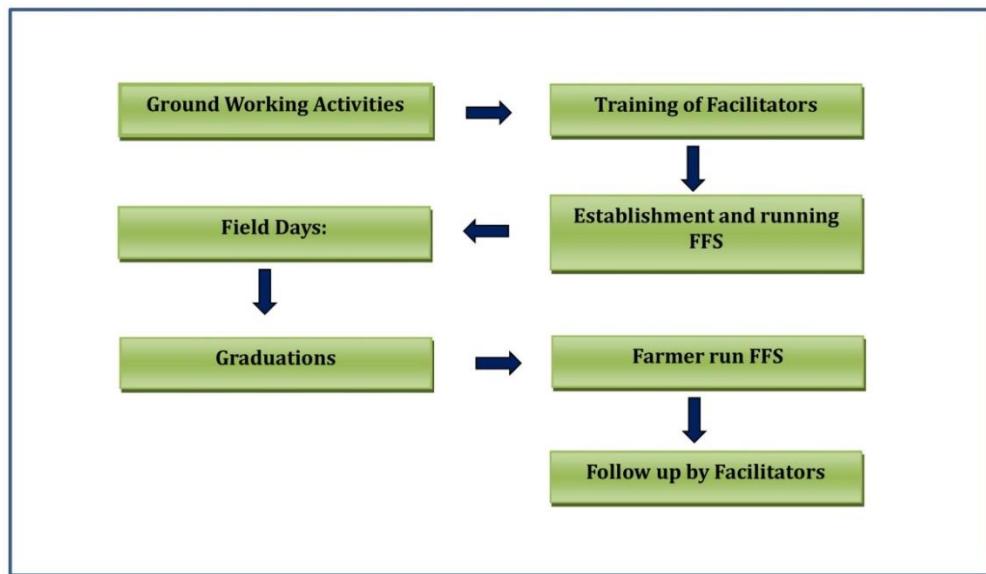


Fig. Steps in Conducting FFS

### First visit

- It is expected that the FFS facilitators will be establishing FFS in their own area of posting and hence they should be familiar with the villages profile based on the information that may have already, select potential villages for visiting

### Criteria and steps for village selection

- All approachable location/villages should be selected.
- Fairly easy access should be preferred
- Comfortable rapport between facilitators and farmers.
- Aware with the purpose of visit by the village leader.
- Request him to invite all growers (depending upon the crop chosen) for general meeting.
- Collect village profile.
- Area under crop cultivation.
- Number of farmers.
- Problems in previous crops.
- Request the village head to organize meeting in the following week.
- Women farmers' participation is also required.
- The date, time should be fixed in consultation with village leader or gram pradhan.
- Social and economic status of the farmers.

### To identify potential farmers site selection during second visit:

- This visit should be one week prior to the first visit.
- Organize the general meeting as planned.
- Ensure participation from farmers, women farmers.
- Discuss the important problems related to crop management.
- Discuss about FFS structure.
- Outline of FFS.
- Nature of training.

- No provision of honorarium for attending the FFS.
- There will be refreshment in each session.
- The facilitator should announce the interested farmers to work as farmer facilitator.

#### **Criteria and steps for farmer's selection:**

- The farmers should be typical of that area in terms of crop cultivation.
- Active farmers should be preferred.
- Should be energetic and physically fit.
- SC/ST /Women farmers should be given preference.
- Willing to learn at their own.
- The village head or gram pradhan will help in choosing right farmers.
- Finalize the list of farmers.
- Request the selected farmers to attend the next meeting.
- Conduct this meeting at least two week before commencement of FFS.
- Conduct meeting with selected farmers.
- Hold participatory discussion to identify local problems related to total crop management.
- Identify local needs
- Explain FFS activities in detail.
- Discuss farmers practice.
- Ask the farmers for their own practices to follow in farmers practice plot.
- Explain the farmers about Natural Farming practices are to be followed in the plot.
- With the consensus of the farmers, select suitable FFS field and training site.
- Finalize the inaugural day for FFS and check out programme.

#### **Criteria and steps for field selection**

- Select 1 acre to 1 ha. Area.
- The field should be belonging to one farmer.
- It should be easily accessible and should not be too far from FFS village.
- The field should be close to the meeting place (gathering place).
- Some shady areas should be nearer to the field.
- No water stagnation in the field.
- No abnormalities in the field.
- Identify farmer who is willing to give the land for conducting field experiments.
- He should agree to follow the schedule of farming operations as finalized by the farmers.
- He should agree to meet all the expenditure involved for the fields planned for Natural Farming.
- He should agree to allow the farmer participants to work in that field to organize field day.
- At the planning meeting through participatory discussion with all selected farmers the facilitators should make verbal contact with FFS farmers.

## **Exposure Visit**

It is very difficult to convince the farmers with oral explanation and they will not believe unless they see and interact with the farmers those who have adopted the recommended practices. It is well said that SEEING IS BELIEVING. This method satisfies and motivates the farmers who are not convinced and believe in the said concept.

### **Purposes:**

- To stimulate interest, conviction and action in respect of a specific practice, e.g., preparing rural compost. The cumulative influence of several ideal compost pits is more likely to provide such stimulation than a single illustration.
- To impress the group about the feasibility and utility of a series of related practices, e.g., proper preservation of farm yard manure, rural composting, urban composting and green manuring which are all included under the item “development of local manorial resources”.
- To induce a spirit of healthy competition by showing the accomplishments in other villages.
- In short, to help people to recognize problems, to develop interest, generate discussion and to promote action.

## **Mass Methods**

**Farm Publication:** It is a class of publications prepared by the extension agency in printed form, containing information relating to the improvement of farmland and home. Farm publications are of various types such as Leaflets, folders, bulletin, newsletters, journals and Magazines. The KrishiSakhi may collect the farm publications from Research Stations, Agriculture Universities and Department of Agriculture and Allied Sector and use them either singly or in combination with other extension methods.

**Exhibition:** It is a systematic display of Models, Specimens, Charts, Photographs, Pictures, Posters and Information etc. in a sequence around the theme to create awareness and interest in the community. This method is suitable for reaching all type of people. It is conducted at village, block, subdivision, district, State, National and International level. It may be organized by taking advantage of Local fairs and festivals. The KrishiSakhi may organize exhibitions or participate in the exhibition organized by other institutes such as research stations, agriculture universities and department of agriculture.

### **Objectives**

- To promote visual literacy.
- To acquaint people with better standards.
- To create interest in a wider range of people.
- To motivate people to adopt better practice

## **Planning and preparation**

- Decide on the theme and the organizations to be involved.
- Prepare a budget estimate and mobilize funds.
- Decide on the venue, time and duration.
- Prepare a written programme and communicate to all concerned in time. Keep some cultural and recreational programmes in the evening.
- Get the site ready within the scheduled date. Make provision for essential facilities.
- Earmark stalls for display of exhibits to be brought by the farmers.

- Arrange a pandal for holding meeting, training and entertainment programmes.
- Display posters at important places. Publicize about the exhibition through mass media.
- Decorate the stalls simply and tastefully. Make adequate arrangements for lighting. Use special-effect lights where necessary.
- Prepare good quality and colourful exhibits which shall convey the desired message to the visitors. Use local materials as far as possible. Label the exhibits in local language with bold letters.
- Display exhibits about 50 to 60 cm. above the floor of the stall, up to a height of about 2 meters. Maintain proper sequence. Avoid overcrowding of exhibits. Take precaution against display of insignificant and unrelated exhibits.
- If possible, arrange action and live exhibits.

Train up interpreters and allot specific duties. For a long duration exhibition, arrange rotation and replacement of personnel

### **Implementation**

- Organize formal opening of the exhibition by a local leader or a prominent person.
- Arranges smooth flow of visitors.
- Let the interpreter briefly explain the exhibits to the visitors so that the intended message is clearly communicated. Distribute publications during visit.
- Organize a panel of experts to be present nearby, so that the visitors who would like to know more or discuss some problems could get the desired information.
- Conduct meetings, training programmes etc. as per scheduled during the daytime. Use of panda 1 at night for entertainment programmes.
- Arrange judging of exhibits brought by the farmers and give away prizes and certificates.
- Keep the exhibits and the premises clean. Replace exhibits as and when necessary.
- If desired, judge and stallson the basis of their quality of display, ability to draw visitors and effectiveness in communicating message, and award certificates.
- Conclude the exhibition as scheduled by thanking the participants and those who have helped.

### **Follow-up**

- Meets some visitors personally to maintain visitors' book for comments during the exhibition to get feedback information.
- Talk to the local leaders and assess success of the exhibition.
- Ensure availability of critical inputs and facilities emphasized during the evaluation.
- Look for changes in practice in the community in the coming years

### **KisanMela**

KisanMela is an organized educational activity for involving and educating farmers by bringing together the farmers, scientists, extension workers, input agencies, developmental departments and non-governmental agencies on agriculture or allied aspects at a Research Station or an agriculturally important educational centre, where the farmers can see, interact and gain first-hand knowledge about the latest technologies and developments in agriculture and allied aspects. It integrates several educational activities specifically directed to the farmers of a region, state or country

### **Objectives:**

- To provide an opportunity for the farmers to practically witness the new production technologies demonstrated on the Agricultural Research Station and also to inform them about the on-going research in different aspects.
- To enable the farmers to discuss with the University Scientists about the problems relating to agriculture and allied aspects directly.
- To provide an opportunity for the farmers to directly come in contact with input manufacturers, dealer in agricultural machinery and implements to help the farmers know about the latest agricultural inputs, machinery, equipment etc. available in the market.
- To help scientists to get feedback on recommended technologies as well as to sensitize them about the farmer's current problems on agriculture and allied aspects.
- To develop a habit among farmers to visit Research Stations frequently to learn about latest technologies.
- To convince the participants about the applicability of the practice in their own situation
- To motivate them to adopt the practice by showing its performance and profitability under field conditions.
- To remove doubts, superstitions and unfavorable attitude about the new practices
- To reinforce previous learning about the practice.

### **Radio**

Radio is an electronic audio medium for broadcasting programme to the audience. Radio is a system of wireless communication. It is a medium for mass communication, a tool for giving information and entertainment. It is an electronic medium for broadcasting to the audience. This medium is cosmopolite in approach and is suitable for communication to millions of people widely dispersed and situated in remote areas. Sound broadcasting started in India in 1927 with the proliferation of private radio clubs. The operations of All India Radio began formally in 1936, as a government organization.

### **Purposes:**

- To create general awareness amongst the people
- To help change their attitude
- To reinforce learning
- To stimulate participation in extension through all other media.
- To build enthusiasm and maintain interest.

### **Advantages:**

- Can reach more people more quickly than any other means of communication
- Especially suited to give emergency and timely information (e.g.weather, pest out - break etc.)
- Relatively cheap
- Reaches many who read little or none at all
- Reaches people who are unable to attend extension meetings
- A means of informing non-farm people (tax payers, about agricultural matters
- Builds interest in other extension media 8. Possible to do other things while listening

### **Television**

Television is one of the most important mass media for dissemination of information in rural areas. Television has unique advantages over other mass media. While it provides words with

pictures and sound effects like the movies, it scores over the latter by its high intimacy and reaches the largest number of people at the shortest possible time. People learn through the eye, and will remember things better if they see them.

### **Social Media Usage**

- "Social media are web-based tools of electronic communication that allow users to exchange information individually or in groups, share ideas and opinions, make decisions and create, store, retrieve and exchange information -Allows to provide the facility of providing (text, images, videos, etc.), by anyone in the virtual world.

#### **a) Facebook**

- Facebook is the most used social media platform in the world, with active users on its site and this means a huge potential for extension professionals.
- Post updates about activity on farm, share pictures, and see what friends, organizations, and groups are up to.

#### **b) WhatsApp**

- A messenger app for smartphones, it is an internet-based messaging platform that supports text, audio, video, and various other forms of files.
- Agricultural professionals and practitioners are using to share information, which is aided by the group messaging related to agricultural extension and advisory and marketing services.

### **ICT Applications**

#### **Use of ICTs in Agricultural Extension: Options and Opportunities**

Information and Communication Technologies (ICTs) have opened whole new set of options for the Agricultural Extension scientists, Extension officers in the research and extension system to improve the speed, accuracy of the communications at relatively lower costs. The ICT tools like Internet, e-mail, on-line Expert Systems, Short Message Service (SMS) and information portals on Agricultural marketing information, packages of practices and subject specific discussion groupson InternethaveenhancedaccessofExtensionpersonneltothelatestinformationwithinand outside the country.

Communication is the central mechanism of Extension process. These include:

- Access to Information resources of the whole world, beyond state and national boundaries(improved reach).
- Most of the time access is free(less cost).
- Instant access to the important resources—people and literature. Extension journals, Newsletters (less time).
- Facilitates two-way communication—e-mails, Chat Groups, discussion forums.
- Information is available anytime.
- Little or virtually no chance for Information-distortion, as the communication is between the user and communicator directly.
- Easy documentation as all the communication is in digital form, including e-mails, Audio and video exchange.

## **Mobile based applications**

### **PusaKrishi**

Government app launched in 2016 by the Union Agriculture Minister and aims to help farmers to get information about technologies developed by Indian Agriculture Research Institute (IARI), which will help in increasing returns to farmers. The app also provides farmers with information related to new varieties of crops developed by the Indian Council of Agriculture Research (ICAR), resource-conserving cultivation practices as well as farm machinery and its implementation will help in increasing returns to farmers.

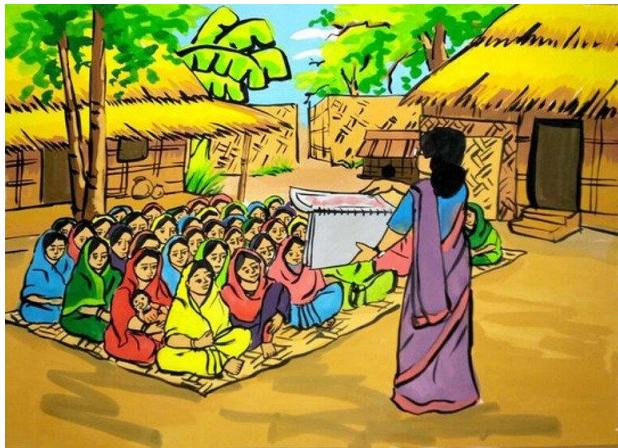
### **KisanSuvidha**

It was launched during 2016 to work towards the empowerment of farmers and the development of villages. The app design is neat and offers a user-friendly interface and provides information on current weather and also the forecast for the next five days, market prices of commodities/crops in the nearest town, knowledge on fertilizers, seeds, machinery, etc.

\*\*\*\*\*

## 12. Extension services & Qualities of Para Extension Professionals

Extension services play a crucial role in providing advice and information to rural communities to help them solve their problems, improve agricultural productivity, and enhance their standard of living. The key features of extension services include empowering Self-Help Groups (SHGs) with knowledge, fostering a better understanding of natural farming issues, and guiding farmers in their development.



### Objectives of extension sessions are:-

- ✓ To spread awareness
- ✓ To provide training and capacity building
- ✓ To motivate farmers
- ✓ To demonstrate practical techniques in the field
- ✓ To offer technological support for natural farming, and transfer relevant knowledge.

Extension is a delivery mechanism across agriculture and allied sectors, in addition to its role in dissemination of conventional knowledge. Meanwhile, the extension system has undergone changes with increasing participation of the private sector (dealing with agro-inputs, agribusiness, and financial services), non-governmental organisations (international as well as local); producer groups, cooperatives and associations; consultants (independent and those associated with or employed by agri-business/producer associations) and ICT-based services. All these have brought additional manpower and resources to the Extension and Advisory Service (EAS) along with new knowledge, skills, and expertise. Yet, the cumulative number of extension professionals has not kept pace with the increasing number of farmer households or they have not come together to coordinate their efforts and achieve a more universal coverage of area & farmers and realise outcome of extension services. Changing role of Extension in this context, goes beyond transfer of technologies, to perform activities which empower farmers to adopt latest technologies resulting in enhanced productivity, production, resource use efficiency and thereby profitability, uplifting the living standards of farming families. At every stage in the agricultural value system, technological interventions in the form of inputs, infrastructure and other developmental initiatives need to be ensured through extension. Hence, in the changing times, the role of extension is to be redefined for efficient and effective delivery of information, knowledge and skill considering the extension services provided to the farmer. Today, extension has to become an integral part of agricultural value system. In order to bring co-ordination and achieve effective convergence, the extension service provider may have to function as an enabler and facilitator, which will go a long way in enhancing farmer's income. Towards this, KrishiSakhi may have to proactively embrace the following roles:

## **Roles under Agricultural Extension**

<ul style="list-style-type: none"><li>○ Serving as friend, philosopher and guide to farmers</li><li>○ Providing information on ongoing schemes and programs in agriculture &amp; allied sectors.</li><li>○ Capacity building and skilling in emerging areas</li><li>○ Advocacy on farmers' interests.</li><li>○ Counselling for farmers' well-being.</li><li>○ Credit facilitation.</li><li>○ Critical assistance in risk management including climate change, crop insurance etc.</li><li>○ Documentation and reporting roles</li><li>○ Enforcement of Farmers' Charters</li><li>○ Issuing advisories on soil health management, water conservation, pest management etc.</li><li>○ Facilitation &amp; feedback</li></ul>	<ul style="list-style-type: none"><li>○ Promoting projective mode of extension delivery</li><li>○ ICT enabled services</li><li>○ Intermediation</li><li>○ Linking farmers to markets</li><li>○ Building managerial competence.</li><li>○ Linking various support &amp; service networks</li><li>○ Organizing user/producer group</li><li>○ Planning, Monitoring and Evaluation</li><li>○ Promotion of PPP models</li><li>○ Promotion of farmer led innovations</li><li>○ Technology selection, etc.</li><li>○ Feedback to research system</li></ul>
--	---

## **Steps for Community Mobilization through F2F Approach**

To achieve community mobilization through the Farmer to Farmer (F2F) Extension approach, certain steps are followed.

- ✓ **Identification of community needs**:-First, an institution takes the initiative to understand the community's issues related to natural farming.
- ✓ **Selection of lead farmers/Community Resource Persons**:-Next, lead farmers are selected from the community based on criteria such as their interest in natural farming, agricultural background, and communication skills.
- ✓ **Training of Lead Farmers**-These lead farmers are then trained by the institution in various extension methods and technologies.
- ✓ **Model Demonstrations on Lead farmer Fields**-Lead farmers will adopt natural farming on their farms and become model demonstration farms for the community.
- ✓ **Dissemination of information to other farmers**:-Lead farmers/CRPs will disseminate information through practical demonstrations, trainings, and other means, to other farmers in the community.

The F2F Extension model offers several benefits, including increased accountability to the community, better understanding of local needs and practices, cost-effectiveness, enhanced social networking, and more effective addressing of local problems. Overall, extension services and the F2F approach are powerful tools in promoting sustainable agriculture, disseminating knowledge, and empowering rural communities to thrive in their farming practices.

## **Public Speaking and Communication skills**

Everyday, everywhere, people converse with each other and exchange ideas and information. It is more common among KrishiSakhi as they keep exchanging the ideas and information with farmers' on a regular basis.

Most of the Farmers' consider KrishiSakhi as Key Communicator or Opinion leader for seeking information and advice on technologies related to Agriculture. These KrishiSakhi many a time influence adoption behavior of farmers'

### **Expected Roles of KrishiSakhi's as Key communicators**

- Communication of the new technologytofarmers.
- Keepingin touch withthe scientists,mediaandotherr relatedsource of informationto update the knowledge.
- Coordinating thefunctionsof thevillage organizations and the institutions,channelizing them towardstheadoption oftechnologies forgreaterproduction
- Assistingthefarmers insecurringthesuppliesandservicesrequiredbythem
- Guidingandhelpingfarmers inaccessing benefits government schemes, programs
- Helpingthefellowvillagers/extensionfunctionariesinthe preparationoftheactionplans
- Givingconstantguidanceandacting asthelocalconsultants
- Focusingonthe problemsoffarmers;and
- Servingasthedemonstrator/paraextensionfunctionariesinthe caseofagricultural innovations.

### **Problem Solving Skills**

People respond to problems differently. Also there exists a wide variation with regard to problem solving skills or behavior. It will be foolish to think that every single problem in our life can be solved. However, our success in finding solutions to problems will largely depend upon our attitude towards the problem, as well as the extent of use of creativity in dealing with them. Problem solving skill is essential for extension professionals.

### **Steps in Problem Solving**

Problem solving is a process which consists of following steps:

- **Identify and Recognize Problems**  
The first step in the process of problem solving is to identify and recognize the problem. A problem can be defined as the gap between the desired and actual condition. Any obstacle in reaching goal can also be considered as a problem.
- **Define the Problems and Find out Their Causes**  
Often we are unable to solve the problem because we have not identified or defined it correctly. You might have come across situations where people keep on discussing about the problem for hours yet at the end fail to define the problem, let alone the solutions.
- **State the desired state you want to have**  
The third step in problem solving is the desired state one wants to reach. The expected state may reflect your values, goals and priorities related to work.

- **Work-Out Solutions**

The fourth step in problem solving is to work out solutions. Finding out the solutions to the problems is the most crucial component of problem solving process. You are likely to come across different types of problems. As a para extension worker, you may have to solve different problems related to issues like lack of competencies, lower productivity, breakdown of equipment's etc.

- **Ideational fluency exercise**

It refers to thinking in terms of alternatives which has the ability to generate as many alternatives as possible as a solution for a particular problem. It may be mentioned here that finding of alternatives using lateral or divergent thinking goes beyond ordinary way of finding alternatives

- **Evaluation of alternatives**

The fifth step in problem solving is evaluation of alternatives. You have generated a number of alternative solutions for a given problem. Now the task before you is to evaluate each alternative in terms of pros and cons and make a choice about the solution to be chosen for implementation.

- **Implementation of solution**

The sixth step in problem solving cycle is implementing of solution. Implementation of the chosen solution starts with getting it approved by the concerned authority or members of organization.

- **Evaluation of solutions**

The following questions are to be answered in this regard:

- a) Are there any problems in implementation of solution?
- b) What are the results of implementation?
- c) Did the solution work and if yes, to what extent?
- d) Did you face any new problems due to implementation of solution?
- e) What are the overall gains from implementation of solution? Are the gains greater than that of cost involved and the negative consequences if any?
- f) What lessons we learn from the failure of solutions?
- g) What lessons we learn from success of the solution?
- h) What will be the future courses of action?
- i) Is there any need for changes in the plan of implementation?
- j) Do you have to go for improvements in the solution?

### **Providing information on ongoing schemes and programs in agriculture and allied sectors**

KrishiSakhi need to provide regular updates regarding the ongoing Governmental schemes to farmers. Some Programs are detailed out here some of the programs are detailed...

#### **A. Soil Health Card Scheme (SHC)**

“National Mission for Sustainable Agriculture (NMSA) will be implemented during 12th Plan with the following objectives → To make agriculture more productive, sustainable and climate resilient; → To conserve natural resources; → To adopt comprehensive soil health management practices → To optimize utilization of water resources; etc. “Soil Health Management (SHM) is one of the most important interventions under NMSA, SHM aims at promoting Integrated Nutrient Management (INM) through judicious use of chemical fertilizers including secondary and micro nutrients in conjunction with organic manures and bio-fertilizers for improving soil

health and its productivity; strengthening of soil and fertilizer testing facilities to provide soil test based recommendation.

### **B. Farm Mechanization**

Mechanization of agriculture will help in increasing the productivity and reduce the cost of cultivation and also enable the farmer to complete farming operations in time. The Farm Mechanization Scheme is being implemented for encouraging mechanization of farming by supplying various farm implements i.e. animal drawn implements, tractor drawn implements, high cost machinery, mini tractors, post-harvest equipment, plant protection equipment, intercultivation equipment tarpaulins and establishment of Custom Hiring Centers (CHC) for land preparation package, CHC for cotton, maize, paddy harvesting & mini sugarcane package.

### **C. RashtriyaKrishiVikasYojana (RKVY)**

Introduce a new Additional Central Assistance scheme to incentivize States to draw up plans for their agriculture sector more comprehensively, taking agro-climatic conditions, natural resource issues and technology into account and integrating livestock, poultry and fisheries more fully.

### **D. Rainfed Area Development Scheme (RAD) under National Mission for Sustainable Agriculture:**

Rain fed agriculture is complex, diverse and risk prone activity. Activities proposed under RAD will act as a catalyst to accomplish the ultimate objective of enhanced productivity, minimizing the risk of crop losses due to uncertainties of weather conditions, Harnessing efficiency of resources , assuring foods and livelihood / income security at farm level and strengthen the farmers capacity to adapt to climatic changes.

#### **Objectives:**

- Increasing agricultural productivity of rain fed areas in a sustainable manner by adopting appropriate farming system based approaches.
- To minimize the adverse impact of possible crop failure due to drought, flood or uneven rainfall distribution through diversified and composite farming systems.
- Restoration of confidence in rainfed agriculture by creating sustained employment opportunities through improved on-farm technologies and cultivation practices.
- Enhancement of farmer's income and livelihood support for reduction of poverty in rainfed areas.

### **E. National Food Security Mission (NFSM):**

National Food Security Mission (NFSM) was launched in October 2007. With an aim to Increasing production of rice, pulses and coarse cereals through area expansion and productivity enhancement in a sustainable manner and also Restoring Soil fertility and productivity at the individual farm level. Enhancing farm level economy to restore confidence among the farmers.

### **F. Pradhan MantriKisanMaanDhanYojana (PM-KMY)**

The Government of India has introduced an Old Age Pension Scheme for all holding Small and Marginal Farmers (SMFs) in the country, namely, the "Pradhan MantriKisanMaan-DhanYojana(PM-KMY)", as a voluntary and contributory pension scheme for the entry age group of 18 to 40 years. The Scheme is effective from the 9th August, 2019.

- There have been a series of interventions for income and price support by the Government for farmers. However, there is a felt need to create a social security net for the farmers as old age may result in loss of livelihood for many of them.
- Farming requires hard work in fields which becomes difficult at an advanced age. The problem is compounded in respect of small and marginal farmers as they have minimal or no savings to provide for old age.
- The Pradhan MantriKisanMaan-DhanYojana (PM-KMY) provides for an assured monthly pension of Rs. 3000/- to all land holding Small and Marginal Farmers (SMFs), whether male or female, on their attaining the age of 60 years

## **Critical Assistance in Risk Management Including Climate Change**

There are several ways that KrishiSakhi can help farmers deal with climate change and crop insurance. These include adaptation and contingency measures for what cannot be prevented. KrishiSakhi help farmers prepare for greater climate variability and uncertainty, create contingency measures to deal with exponentially increasing risk, and alleviate the consequences of climate change by providing advice on how to deal with droughts, floods, and so forth. KrishiSakhi can also help with mitigation of climate change. This assistance may include providing links to new markets, information about new regulatory structures, and new government priorities and policies. Help with adaptation and mitigation by technologies and management information; capacity development; and facilitating, implementing policies and programs.

- **Climate Change Knowledge:** A deep understanding of climate change, its local impacts, and how it affects agriculture is crucial. This includes knowledge of climate trends, extreme weather events, and their implications for farming.
- **Crop Insurance Expertise:** Familiarity with various crop insurance schemes, their eligibility criteria, and the application process is essential for helping farmers' access financial protection.
- **Risk Assessment:** The ability to assess the specific risks faced by farmers in their region, such as droughts, floods, pests, and disease outbreaks, and to develop strategies for risk mitigation.
- **Data Analysis:** Analysing historical climate data, crop yields, and insurance policies to make informed recommendations for risk management.
- **Financial Literacy:** A good understanding of financial principles and how insurance works is important for assisting farmers in selecting appropriate coverage.
- **Local Knowledge:** Familiarity with local farming practices, crop varieties, and agricultural systems is crucial for tailoring risk management advice to the specific needs of the community.
- **Education and Training:** Conducting workshops and training sessions to build farmers' capacity to manage risks and understand insurance policies.
- **Community Engagement:** Facilitating discussions and community-level initiatives for collective risk reduction, such as community-based disaster preparedness plans.
- **Monitoring and Evaluation:** Developing systems to track the effectiveness of risk management strategies and insurance coverage among farmers.
- **Technology Proficiency:** Using technology and digital tools for weather forecasting, risk modelling, and insurance application processes.
- **Crisis Response:** Being prepared to provide immediate assistance and guidance to farmers in the event of climate-related disasters or crop losses.

- **Resilience Building:** Helping farmers adopt practices that enhance the resilience of their farming systems, such as diversification, soil conservation, and water management.

## **Issuing advisories in soil health management, water management and pest management**

- **Local Agricultural Understanding:** Familiarity with the specific soil types, climate conditions, crops, and farming practices in their region is vital for providing context-specific advice.
- **Analytical Skills:** The ability to understand soil test results and interpret data is essential for making informed recommendations.
- **Sustainability Awareness:** Promoting sustainable soil management practices that protect the environment, conserve resources, and reduce negative impacts on soil health.
- **Resourcefulness:** Finding cost-effective and sustainable solutions to soil health challenges, considering the available resources and budget constraints of farmers.

## **Facilitating production and post production inputs and data**

KrishiSakhi need to be aware of and understand the risks that farmers are likely to face so that farmers making farm management decisions can reduce the negative effects of the risks associated with their decisions and farming practices. Understanding how markets operate allows one to understand the main source risk they face, typically production risk, marketing risk, financial risk, legal risk and human resources risk. Some forces influencing these risks include climate change, price volatility and the global financial crisis

## **How to develop market-driven extension**

**Collection of data:** KrishiSakhi should collect data on what others in the project area as well as in nearby areas are growing. Efforts should include observation for shifts in cropping patterns. KrishiSakhi also need to be on top of information concerning market demand and supply to be able to properly support and assess decisions proposed by the farmers.

**Information dissemination:** The market information collected by extension workers should be shared with farmers so they can make good management decisions. When the supply exceeds demand, the prices that farmers receive fall. A KrishiSakhi who understands such trends can advise farmers about the risks about some crops the following year to protect them from low market prices.

**Learn about all phases of the value chain:** Farmers produce crops for markets that in many ways are connected to markets that feed people located far away, even on a different continent. It is thus imperative to understand all parts of the food supply system.

**Input supply:** Use of new inputs such as seeds and pesticides is growing. In addition to knowing what inputs are best, extension services providers need to be aware of the impact of prices and encourage collaboration between farmers and input suppliers to promote quality assurance?

**Technology investment decisions:** The KrishiSakhi can serve as a source of information and an unbiased sounding board for farmers making investment decisions.

**Facilitating farmer entrepreneurship:** This requires farmers to organize themselves into produce groups or cooperatives. Similar groups can help build capacity among small farmers, who can then use various methods such as advocacy or lobbying to assert their position.

### **Ability to transfer skills and knowledge**

The ability to transfer skills and knowledge effectively is a fundamental aspect of being a successful agriculture extension professional. Extension professionals play a crucial role in helping farmers adopt new practices, technologies, and knowledge to improve their agricultural productivity and sustainability. Here are some key skills and strategies for effectively transferring skills and knowledge to farmers:

#### **a) Effective Communication:**

- Use clear and simple language that is easily understood by the target audience.
- Adapt your communication style to the farmers' cultural background and literacy level.
- Actively listen to farmers' questions and concerns to tailor your communication accordingly.

#### **b) Demonstration:**

- Show farmers how to perform new techniques or use new tools through practical demonstrations.
- Use visual aids, models, or hands-on activities to make learning more engaging and memorable.

#### **c) Participatory Learning:**

- Encourage active participation and involvement of farmers in the learning process.
- Foster group discussions and peer-to-peer learning.

#### **d) Feedback and Assessment:**

- Continuously seek feedback from farmers to assess their understanding and progress.
- Use feedback to adjust your teaching methods and content as needed.

#### **e) Time Management:**

- Use farmers' time efficiently during training sessions, respecting their busy schedules.
- Plan and organize training events to minimize disruptions to their work.

#### **f) Empowerment:**

- Empower farmers to take ownership of their learning and decision-making in their farming activities.
- Encourage them to set goals and action plans for implementing new practices.

#### **g) Follow-Up and Support:**

- Provide ongoing support and follow-up visits to ensure that farmers are successfully implementing what they've learned.
- Address any challenges or obstacles that arise during the adoption process.

#### **h) Record Keeping:**

- Teach farmers the importance of keeping records related to their farming activities, including inputs, yields, and expenses.
- Help them develop record-keeping systems that are manageable and useful.

### **i) Adaptability**

- Be adaptable in your teaching approach, recognizing that different farmers may have varying learning styles and preferences.
- Stay up to date with the latest agricultural practices and technologies to provide relevant information.

### **j) Cultural Sensitivity**

- Respect cultural norms and traditions while introducing new practices or technologies.
- Collaborate with local community leaders and elders to build trust and acceptance.

## **Steps for organizing effective and productive meetings for Self-Help Groups (SHGs):-**

**Define Objectives:** Clearly define the purpose of the meeting and the specific information or decisions to be discussed.

**Prepare the Meeting Agenda:** Create a detailed agenda that includes the meeting title, date, time, location, discussion items, and roles of participants.

**Decide on Participants:** Determine who should participate in the meeting based on their relevance to the topics being discussed and how the meeting might affect them.

**Assign Roles and Responsibilities:** Designate specific roles to ensure the meeting runs smoothly. Roles may include a leader (usually the Lead Farmer), a facilitator, a recorder to take notes, a timekeeper to manage the schedule, and invited technical experts from ATMA, if required.

**Select the Location and Time:** Choose a suitable location that accommodates all participants comfortably and has the necessary equipment for presentations if needed. Schedule the meeting at a time convenient for the SHG members.

**Distribute Materials in Advance:** Send the meeting agenda and any relevant documents to SHG members a few days before the meeting so they can come prepared for the discussions.

**Conduct the Meeting:** Follow the agenda and facilitate productive discussions. Ensure that all topics are covered and decisions are made if needed. Encourage active participation from all members.

**Collect Feedback:** After the meeting, gather feedback from participants to assess the effectiveness of the meeting and identify areas for improvement.

By following these steps, SHGs can organize well-structured and efficient meetings that promote collaboration, decision-making, and progress towards their objectives in natural farming practices.

## **Commitment to Social Justice**

A commitment to social justice for agriculture extension professionals involves applying principles of social justice within the field of agriculture and rural development. Agriculture extension professionals play a critical role in supporting farmers and rural communities, and they can contribute to greater equity and fairness in the agricultural sector. Here are ways in which agriculture extension professionals can demonstrate a commitment to social justice:

- **Equitable Access to Information:** Ensure that all farmers, regardless of their socio-economic status, gender, ethnicity, or location, have equal access to agricultural information, training, and resources. Use inclusive communication methods and materials to reach marginalized groups.
- **Addressing Disparities:** Recognize and actively work to address disparities in access to agricultural resources such as land, credit, inputs, and markets.
- **Empowerment and Participation:** Encourage the active participation of marginalized and underrepresented groups in decision-making processes related to agriculture and rural development.
- **Gender Equality:** Promote gender equality in agriculture by providing tailored support to female farmers, addressing gender-based constraints, and advocating for women's rights and representation in agricultural leadership roles.
- **Inclusive Technology Adoption:** Advocate for the development and dissemination of agricultural technologies that are accessible and suitable for smallholder farmers, including those with limited resources or education.
- **Environmental Sustainability:** Promote sustainable farming practices that consider the long-term well-being of both the environment and local communities. This includes practices that protect natural resources and mitigate climate change impacts.
- **Collaboration:** Collaborate with NGOs, community-based organizations, and other stakeholders working towards social justice in agriculture. Sharing knowledge and resources can amplify the impact of your efforts.

## **Documenting and reporting roles**

The krishisakhis must keep taking field notes regularly. These field notes will come handy to prepare the documentation and report writing related to project works. Basic writing skills and techniques must be acquired with the help of experts. The krishisakhi must be able to document success stories from the field to share among the learners. The report must contain, background, introduction, purpose of intervention and report, methods adopted and impact in the field along with way forward.

\*\*\*\*\*

## **13.Certification and Marketing of Natural Produce**

Certification in the context of natural produce, is a process that validates and recognizes farmers who follow specific principles and practices of Natural Farming. The certification ensures that farmers are adhering to the standards and regulations of Natural Farming, and it allows them to gain recognition and market advantage for their produce.

### **Why Certification is Needed for Natural Produce:**

Certification is essential for natural produce, such as products grown through Natural Farming, for several reasons: -

- ✓ **Quality Assurance:** Certification ensures that the produce meets certain quality standards and follows specific practices to maintain the natural integrity of the products.
- ✓ **Consumer Trust:** Certified natural produce helps build consumer trust, as consumers can rely on the certification mark to identify genuinely natural and chemical-free products.
- ✓ **Fraud Prevention:** Certification helps prevent fraud and misrepresentation in the market by distinguishing genuine natural produce from conventional products.
- ✓ **Market Advantage:** Certified natural produce gains a competitive advantage in the market due to the increased demand for natural and organic products.

### **Types of Certifications for Natural Farming in India:**

- ✓ **Third-Party Certification (NPOP):** The NPOP (National Programme for Organic Production) system is governed by APEDA (Agricultural and Processed Food Products Export Development Authority), Ministry of Commerce, and is primarily focused on organic agriculture produce for export purposes.
- ✓ **PGS-India Certification System:** Participatory Guarantee System for India (PGS-India) is a group-based organic certification system that involves farmers' participation and is mainly used for domestic organic produce.
- ✓ **Self-Certification:** Some states, like Himachal Pradesh, have developed innovative self-certification systems for natural produce. These systems enable farmers to evaluate and certify their practices based on defined parameters and guidelines.

### **About PGS-India Certification:**

- ✓ Launched in 2011 by the Ministry of Agriculture and Farmers Welfare, it is an alternative to third-party certification.
- ✓ PGS-India is a farmer group-centric certification system meant for domestic purposes.
- ✓ The certification process is simpler and more cost-effective compared to NPOP. It involves a participatory approach, where farmers in a group verify each other's adherence to organic standards through peer appraisals and documentation.

- ✓ PGS-India-certified products can only be traded in the domestic market.
- ✓ PGS-India covers standards for crop production, animal production, food processing, handling, and storage.
- ✓ The certification process is facilitated by Regional Councils (RCs), legally registered organizations with experience in organic farming and certification. The RCs play a role in registration, training, documentation, inspection, residue analysis, and verification of certification.

### **Key Differences between NPOP and PGS Certification:**

- ✓ NPOP is a third-party certification system, while PGS-India is based on a participatory guarantee system where farmers verify each other.
- ✓ NPOP-certified products can be traded both in domestic and international markets, whereas PGS-India-certified products are restricted to the domestic market only.
- ✓ NPOP is more suitable for large-scale operations and export-oriented organic producers, while PGS-India is more accessible and affordable for small farmers and local markets.

### **Steps in PGS India Certification:-**

- Under the programme, farmers are aggregated into groups of minimum 5 farmers belonging to the same or nearby villages.
- Farmer group takes pledge for adopting standards and register the group on PGS portal with selection of Regional Council
- Endorsement by already existing Local Groups or State Govt. for scheme
- Regional Council accepts the registration after due diligence and endorsement by some authority or by any other PGS group.
- Training and Meetings
- Group starts farming as per PGS standards
- Every season, peers from the group undertake peer appraisal/ inspection of each and every member and submit peer appraisal summary report with recommendations to Regional Council through the portal
- Regional Council verifies the authenticity of claims and declarations made in peer appraisal report
- On being satisfied grants certification status.
- Group can generate the certificate from the portal
- Updating yield (actual)

### **Marketing of natural produce**

Marketing natural fresh produce and products can be a rewarding endeavor for farmers and producer organizations. Implementing different marketing strategies and focusing on value addition can help enhance their market reach and profitability. Some of the ways for marketing of natural produce:

- ✓ **Individual Marketing (Family Doctor Vs Family Farmer):** Forming consumer groups through platforms like WhatsApp or local telephone networks can facilitate on-demand supply of fresh produce directly from farmers to consumers.
- ✓ **Innovative Marketing Platforms (Canopies):** Setting up portable canopies at common places, road sides, offices, and transportation hubs can attract consumers and increase sales.
- ✓ **Captive Outlets:** Establishing dedicated outlets at district or block headquarters, road sides, etc., can help sell surplus produce collected from various farmers or producer organizations.
- ✓ **Online Marketing (E-commerce):** Creating an e-commerce platform for marketing fresh produce directly to consumers can widen the market reach and facilitate direct sales.
- ✓ **Offline Marketing (Canopies, Shops):** Utilizing canopies, captive outlets, and shops at strategic locations can directly connect with consumers and promote the uniqueness of the produce.

For successful marketing, farmers and producer organizations should focus on aggregation, managing the supply chain efficiently, and value addition. Some important steps include:

- ✓ **Aggregation of Fresh Produce and Products:** Identify farmer interest groups (FIGs) and collection centers, catalog the produce, ensure quality assessment, arrange logistics, storage, packaging, labeling, establish market access, and promote the produce.
- ✓ **Supply Chain Management:** Focus on demand forecasting, effective communication and coordination, quality control, proper logistics, storage, inventory management, transparent financial management, compliance, and continuous improvement.
- ✓ **Value Addition:** Enhance the value of produce by processing and preserving, investing in packaging and branding, obtaining certifications, diversifying markets, differentiating products, adding convenience, offering value-added services, and exploring collaborations and export opportunities.

By following these strategies and steps, farmers and producer organizations can build sustainable businesses, connect with consumers, and promote environmentally conscious and socially responsible practices. Marketing natural fresh produce and products can lead to better economic opportunities while benefiting both farmers and consumers alike.

\*\*\*\*\*

## **14. Linkages**

### **Public and Private Organizations**

#### **Indian Council of Agricultural Research (ICAR)**

- Generates agricultural technologies.
- Provides extension support through its research institutes and KVks
- Develops innovative extension strategies.
- Provides technical knowledge to line departments.
- Organizes front line demonstration of their technologies.
- Disseminate technologies through public-private partnerships.

#### **State Agriculture University Extension System**

- Maintains supportive extension service to line departments.
- Supplements efforts of line departments for service through their extension units, research stations and through teaching campuses.
- Develop innovative extension strategies.
- Provide technical knowledge to line departments.
- Organize front line demonstration of their technologies.
- Disseminate technologies through public- private partnerships.

#### **KrishiVigyan Kendra (KVK)**

KVK, aims at assessment of location specific technology modules in agriculture and allied enterprises, through technology assessment, refinement and demonstrations. KVks have been functioning as Knowledge and Resource Centre of agricultural technology supporting initiatives of public, private and voluntary sector for improving the agricultural economy of the district and are linking the NARS with extension system and farmers.

#### **KVK System: Mandate and Activities**

The mandate of KVK is Technology Assessment and Demonstration for its Application and Capacity Development.

To implement the mandate effectively, the following activities are envisaged for each KVK

- On-farm testing to assess the location specificity of agricultural technologies under various farming systems.
- Frontline demonstrations to establish production potential of technologies on the farmers' fields.
- Capacity development of farmers and extension personnel to update their knowledge and skills on modern agricultural technologies.
- To work as Knowledge and Resource Centre of agricultural technologies for supporting initiatives of public, private and voluntary sector in improving the agricultural economy of the district.

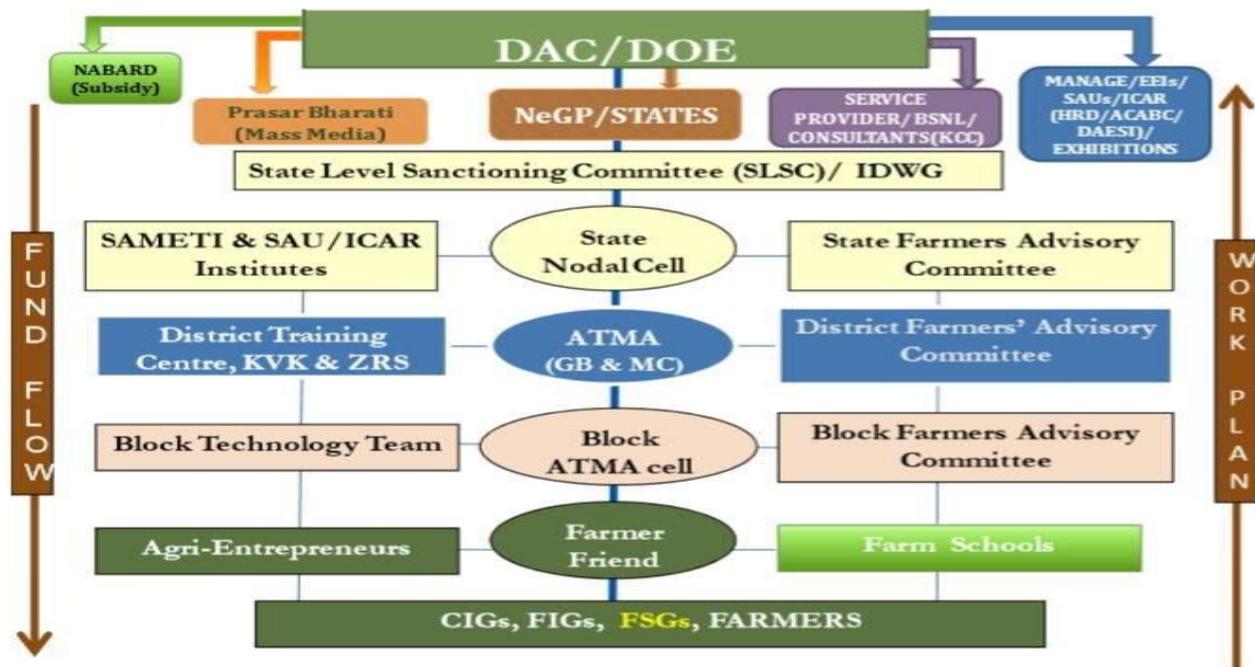
- Provide farm advisories using ICT and other media means on varied subjects of interest to farmers

In addition, KVks produce quality technological products (seed, planting material, bio-agents, and livestock) and make it available to farmers, organize frontline extension activities, identify and document selected farm innovations and converge with ongoing schemes and programs within the mandate of KVk

### **Roles and Responsibilities of ATMA**

An agency undertaking agricultural development programmes at district level in which agriculture and allied departments along with private sectors work together. At village level farmer friend, at block level Block Technology Manager and Subject Matter Specialists provide agricultural information and benefits of schemes/ programmes to the farmers. ATMA organize various extension activities like field visits, trainings, demonstrations, field days, farmers – Scientists interactions, exhibitions, exposure visits, campaign, etc. Publish extension information through print and electronic media, Provide alerts to farmers on agriculture operations and precautions.

### **Organization structure of ATMA**



### **Key functions of Farmer friend**

- Mobilization of farmers / constitution of Farmer Interest Groups.
- Conducting field demonstrations, KisanGoshties and facilitating preparation of Village Research Extension Action Plan
- Liaison with ATM at Block level for exchange of information related to agri. and allied activities at field level
- Attending meetings of Gram Sabha, maintaining a daily diary of activities
- Ensuring dissemination of information through multi media
- Any other work assigned by BTT

### **Kisan Call Centers (KCCs)**

To harness the potential of ICT in Agriculture, Ministry of Agriculture took anew initiative by launching the scheme "Kisan Call Centres (KCCs)" on January 21, 2004 aimed at answering farmers' queries on a telephone call in farmers' own dialect. These call Centres are working in 14 different locations covering all the States and UTs. This Scheme provides agriculture related information to the farming community through toll free telephonelines. A countrywide common eleven digit number 1800-180-1551 has been allotted for Kisan Call Centre. The number is accessible through all mobile phones and landlines of all telecom networks including private service providers. Replies to the farmers' queries are given in 22 local languages. Calls are attended from 6.00 am to 10.00 pm on all seven days of the week at each KCC location.

The KCC call escalation process has been restructured during April 2011 with an emphasis to involve (i) State Agricultural Department right from Block to state level, (ii) State Agricultural Universities and KVKS as well in facilitating KCC agents to answer farmer's queries by way of call conferencing with the experts from these organizations in the event of the Call Centre Agent not being able to answer the farmers' queries. Active involvement of Common Service Centres and other Stakeholders has also been envisaged.

### **Credit institutions (primary agriculture credit society)**

Primary Agricultural Credit Societies are the grass root level arms of the short-term co-operative credit structure. PACS deals directly with the rural (agricultural) borrowers, give those loans and collect repayments of loans given and also undertake distribution and marketing functions. They occupy a predominant position in the co-operative credit structure and form its base. It serves as the final link between the ultimate borrowers on the one hand and the higher financing agencies, namely the Scheduled Commercial Banks, and the RBI/NABARD on the other hand.

### **Significance of Primary Agriculture Credit Society**

- PACS can play important role, by providing farmer communities credit, inputs, market and value addition..
- PACS can also play a major role by integrating its warehouse with the physical and financial supply chain of agro-commodities in the upcoming Garin Agriculture Markets (GrAMs) or large warehouses in the private sector.

### **Kisan Credit Card Scheme**

Kisan Credit Card Scheme aims at providing adequate and timely support from the banking system to the farmers for their short-term credit needs for cultivation of crops. This mainly helps farmers for purchase of inputs during the cropping season. Credit card scheme proposed to introduce flexibility to the system and improve cost efficiency.

### **Benefits of Kisan Credit Card Scheme**

Simplifies disbursement procedures.

- Removes rigidity regarding cash and kind
- No need to apply for a loan for every crop and every season.
- Assured availability of credit at any time enabling reduced interest burden for the farmer.
- Helps to buy seeds, fertilizers at farmer's convenience and choice.
- Helps to buy on cash-avail discount from dealers.
- Credit facility for 3 years – no need for seasonal appraisal.
- Maximum credit limit based on agriculture income.

- Any number of withdrawals permitted subject to credit limit.
- Repayment only after harvest.
- Rate of interest as applicable to agriculture advance.
- Security, margin and documentation norms as applicable to agricultural advance

### **Agricultural Insurance**

Insurance coverage is given to farmers mainly by Agricultural Insurance Corporation Ltd (AIC) and many other private agencies. All loanee farmers automatically eligible for agricultural insurance coverage. Non loanee farmers can also avail this benefit by payment of nominal premium. Some of the important agricultural insurance schemes available at present are as follows.

#### **a) Pradhan MantriFasalBimaYojana (PMFBY)**

- Providing financial support to farmers suffering crop loss/damage arising out of unforeseen events
- Stabilizing the income of farmers to ensure their continuance in farming
- Encouraging farmers to adopt innovative and modern agricultural practices
- Ensuring flow of credit to the agriculture sector which will contribute to food security, crop diversification and enhancing growth and competitiveness of agriculture sector besides protecting farmers from production risks.

#### **b) Restructured Weather Based Crop Insurance Scheme**

- Aims to provide insurance protection to farmers based on weather based indices of high/low rainfall, high/low temperature, humidity, wind speed etc. deemed to impact crop production adversely.
- The scheme has the advantage to settle the claims within shortest possible time and is suitable for crops where past yield data is not available like perennial horticultural crops, vegetables etc.
- Premium rates under Weather Based Crop Insurance Scheme (WBCIS) have also been reduced and brought at par with the new scheme of PMFBY.
- Scheme is available for all food crops, oilseeds, horticultural/commercial crops for which demonstrated co-relation with yield loss due to adverse weather indices is established.

### **Agri-Clinics and Agri-Business Centres**

- The Ministry of Agriculture and farmers welfare, Government of India, in association with NABARD has launched a unique programme to take better methods of farming to each and every farmer across the country.
- This programme aims to tap the expertise available in the large pool of Agriculture Graduates. Irrespective of whether you are a fresh graduate or not, or whether you are currently employed or not, you can set up your own Agri-Clinic or Agri-Business Centre and offer professional extension services to innumerable farmers.
- Committed to this programme, the Government is now also providing start-up training to graduates in Agriculture, or any subject allied to Agriculture like Horticulture, Sericulture, Veterinary Sciences, Forestry, Dairy, Poultry Farming, and Fisheries, etc.

Those completing the training can apply for special start-up loans for venture.

- Agri-Clinics and Agri-Business Centres are advisory and business centres managed by agricultural professionals in rural areas where they provide client specific advisory services free/payment basis.

### **Free Training to set up your Agri-Clinic or Agribusiness Centre**

As an integral part of this nationwide initiative, specialised training will be provided to Agriculture Graduates interested in setting up such a centre. Being provided free of cost, 45 days training course will be offered by select institutes across the country. Initiated by SFAC, and co-ordinated by MANAGE, the course comprises Entrepreneurship and Business Management, as well as skill improvement modules in your chosen areas of activity.

### **Non-Governmental Organization (NGOs)**

Many NGOs are working in various aspects of agricultural development such as farm advisory, input supply, infrastructures, processing, marketing, community mobilization, micro finance, livelihood development, etc. Farmers can take the advantages of such NGOs wherever available

### **Skills required among krishisakhis to facilitate linkages**

- Clear communication with officer bearers and members of organizations
- Understanding about the mandate and objectives of organizations
- Compilation of contact information of key office bearers of institutes
- Data on institute programs, websites and regular follow up of social media handles of institutes.

\*\*\*\*\*

## Annexure

### Observations by KrishiSakhis

#### **1. Land Preparation (Refer Training Manual on Natural Farming developed by NCONF)**

- i. Date of Land Preparation \_\_\_\_\_
- ii. Operations performed for land preparation \_\_\_\_\_  
\_\_\_\_\_
- iii. Green Manuring used? \_\_\_\_\_
- iv. Ghanjivamrit Prepared? \_\_\_\_\_
- v. Quantity and Date of application \_\_\_\_\_
- vi. Any Other Information \_\_\_\_\_

#### **2. Seed Selection and Treatment (Refer Training Manual on Natural Farming developed by NCONF)**

- i. Seeds of which crops selected for sowing? \_\_\_\_\_
- ii. Cropping pattern followed  
(Mono cropping / Multiple Cropping / Mixed Cropping) \_\_\_\_\_
- iii. Local Seeds Used? \_\_\_\_\_
- iv. Source of Seeds \_\_\_\_\_
- v. Seed treatment done with \_\_\_\_\_
- vi. Date of Sowing \_\_\_\_\_
- vii. Bejamrit prepared? \_\_\_\_\_
- viii. Date of Bijamrit application \_\_\_\_\_
- ix. Any Other Information \_\_\_\_\_

#### **3. Mulching (Refer Training Manual on Natural Farming developed by NCONF)**

- i. Mulching material used \_\_\_\_\_

ii. Date of Mulching \_\_\_\_\_

iii. Any Other Information on local Natural Farming Practices \_\_\_\_\_  
\_\_\_\_\_

**4. Nutrient Management (Refer Training Manual on Natural Farming developed by NCONF)**

i. Jeevamrit Prepared? \_\_\_\_\_

ii. Date and Quantity      a) \_\_\_\_\_  
                                  b) \_\_\_\_\_  
                                  c) \_\_\_\_\_

iii. Whether Green Manuring used? \_\_\_\_\_

iv. Crops / Leaves used for Green Manuring? \_\_\_\_\_

v. Is there any leguminous crops sown? \_\_\_\_\_

vi. Name of leguminous crops sown \_\_\_\_\_

iv. Any Other Information on local Natural Farming Practices \_\_\_\_\_  
\_\_\_\_\_

**5. Weed Management (Refer Training Manual on Natural Farming developed by NCONF)**

i. Is there any weed problem? \_\_\_\_\_

ii. How it was controlled? \_\_\_\_\_

iii. Whether cover crops grown? \_\_\_\_\_

iv. Whether mulching is applied? \_\_\_\_\_

v. Mulching material used \_\_\_\_\_

vi. Any Other Information \_\_\_\_\_

**6. Pest & Disease Management (Refer Training Manual on Natural Farming developed by NCONF)**

**❖ Insect Pest**

i. Is there any attack of insect pest on crops \_\_\_\_\_

- ii. Name of insect pests \_\_\_\_\_  
\_\_\_\_\_
- iii. Concoctions Prepared? (Neemastra, Agnistra, Brahmastra, Dashparni etc.)  
\_\_\_\_\_
- iv. Control Measures used (Neemastra, Agnistra, Brahmastra, Dashparni etc.)  
\_\_\_\_\_  
\_\_\_\_\_
- v. Any Other Information \_\_\_\_\_

❖ **Disease**

- i. Is there any attack of disease on crops \_\_\_\_\_
- ii. Name of disease \_\_\_\_\_  
\_\_\_\_\_
- vi. Concoctions Prepared? (Sonthastra ,Chhach, Cow urine based concoctions etc.)  
\_\_\_\_\_
- iii. Control Measures used (Sonthastra ,Chhach, Cow urine based concoctions etc.)  
\_\_\_\_\_  
\_\_\_\_\_
- iv. Any Other Information \_\_\_\_\_

**7. Harvesting (Refer Training Manual on Natural Farming developed by NCONF)**

- i. Name of crops harvested in the month \_\_\_\_\_  
\_\_\_\_\_
- ii. Crop wise Yield per acre \_\_\_\_\_  
\_\_\_\_\_
- iii. Any Other Information \_\_\_\_\_

**8. Post Harvest Handling and Storage(Refer Training Manual on Natural Farming developed by NCONF)**

- i. Operations performed after the harvesting of crops (Curing, Cleaning, Winnowing etc.) \_\_\_\_\_  
\_\_\_\_\_
- ii. Packing Materials Used \_\_\_\_\_
- iii. Whether stored in Proper Container? \_\_\_\_\_
- iv. Whether stored away from conventional produce? \_\_\_\_\_
- v. Any other traditional or natural Farming Practices followed \_\_\_\_\_  
\_\_\_\_\_

**9. Certification**

- i. Whether registered for Certification? \_\_\_\_\_
- ii. Date of registration \_\_\_\_\_
- iii. Date of Approval from competent authority \_\_\_\_\_

**10. Marketing (Refer Training Manual on Natural Farming developed by NCONF)**

- i. Whether any brand developed? \_\_\_\_\_
- ii. If yes name of brand \_\_\_\_\_
- iii. Marketing Strategy used \_\_\_\_\_
- iv. Whether premium price received? \_\_\_\_\_



## राष्ट्रीय जैविक एवं प्राकृतिक खेती केंद्र

हापुड़ रोड, सीबीआई अकादमी के पास, सेक्टर 19, कमला नेहरू नगर, गाजियाबाद, उत्तर प्रदेश 201002

फोन : 0120-2764212 , 0120- 2764906

ईमेल : [nbdc@nic.in](mailto:nbdc@nic.in) फैक्स :0120-2764901