UNDP–Data for Policy

Technical Compendium of Climate Smart Agriculture Practices from Telangana

2022

Data on the various climate resilient practices were collected by RICH for UNDP

TABLE OF CONTENTS

PAGE NO.

SEED BASKETS–METHOD TO CONSERVE LANDRACES AND TRADITIONAL VARIETIES 01

DRY LEAF MULCHING–A PROCEDURE TO MAINTAIN SOIL MOISTURE AND IMPROVE SOIL CONDITION 03

INTEGRATED FARMING SYSTEM–PRODUCTION SYSTEM TO ENSURE MULTIPLE SOURCES OF INCOME 04

PITCHER IRRIGATION–A NATURAL METHOD OF IRRIGATION 05

MULTIPLE CROPPING–A SYSTEM TO BRING IN CROP DIVERSITY 07

COMMUNITY SEED STORAGE SYSTEM– A SELF-SUSTAINING SEED STORAGE SYSTEM 09

GROUP CROP INSURANCE–A METHODOLOGY TO OFFSET THE RISK OF CROP LOSS AND MINIMISE DEBT 10

INTEGRATED FARMING SYSTEM 2–A JUDICIOUS RESOURCE MANAGEMENT ARRANGEMENT 12

TRADITIONAL METHODS TO CONTROL PESTS 14

SUB-SOIL SPRAYING–A NATURAL ALTERNATIVE TO PESTICIDES AND FERTILISERS 15

SELF-SUSTAINING POLY HOUSES WITH FARM PONDS 17

JEEVAMRUTHAM AS AN ALTERNATIVE TO CHEMICAL FERTILISERS IN RICE PRODUCTION 18

SEED BASKETS–METHOD TO CONSERVE LANDRACES AND TRADITIONAL VARIETIES

Most of the currently cultivated hybrids and varieties are selected for their high yield and production, while varieties and hybrids that are resistant and resilient to climate change are very few. Over the years, landraces and traditional varieties have begun to go extinct.

Storing seeds of traditional varieties and landraces enables biodiversity conservation within the system and sustains crop production. Samamma, a traditional woman farmer of Bidekanne village, Zaheerabad mandal, Sangareddy district, has been practicing farming for over three decades. Samamma has been practicing unique seed storage methods, which have helped her and her fellow farmers in the village to store seeds effectively for a year without any reduction in their viability. She stores the seeds in a bamboo basket coated with a mixture of cow dung and neem leaves, following a unique method that avoids the incidence of storage pests.

Samamma winnowing seeds for seed basket storage
Image credits: UNDP–Data for Policy

STEPS TO MAKE A SEED BASKET

1. Wash the seeds in lukewarm water.
2. Sun dry the seeds (to a moisture level of less than 10%) with cow dung ash.
3. Select a good quality bamboo basket and coat it with cow dung slurry on the inner and outer sides. Dry the basket in the hot sun. If you find uncoated patches, coat the patches again with cow dung slurry and sun-dry the basket.
4. Prepare a mixture of ash and neem leaf powder and spread a thin layer followed by the first layer of seeds (approx. 5 centimetre thick).

5. Cover the seed layer with a thin layer of ash and neem powder mixture (as in Step 4).
6. Fill the second layer of seeds. The second layer could be the same crop/variety or a different crop/variety.
7. Fill the basket with seed layers and neem ash layers
8. Prepare a slurry of cow dung, cow urine, neem slurry, and clay. Cover the top layer with the slurry and seal it with clay.
9. Allow the clay layer to dry. If you find any cracks, fill them with clay.
10. Store the seed basket in a cool dry place. These seed baskets can be stored for more than half a year.
11. The seeds thus stored can be distributed among the farmers in the right season.

DRY LEAF MULCHING–A PROCEDURE TO MAINTAIN SOIL MOISTURE AND IMPROVE SOIL CONDITION

The effects of climate change are more evident during the cultivation of horticultural crops. High temperatures, erratic rainfall, and increased incidence of pests and diseases considerably reduce the yield of these crops.

Durgamma, a woman farmer from Bidekanne village of Sangareddy district follows dry leaf mulching on her horticultural farm.

BENEFITS

Mulching with dry leaves maintains soil moisture, reduces weed growth, mitigates soil erosion, and improves soil condition. Dried leaves decompose into nutrient-rich compost, which improves the soil organic carbon content and supplies essential nutrients to crops.

STEPS FOLLOWED FOR DRY LEAF MULCHING FOR HORTICULTURAL CROPS

1. Collect the fallen dry leaves from the farm.
2. Crush the collected brittle dry leaves into smaller fragments.
3. Mix the dry leaves with soil in a 2:1 ratio.
4. Sprinkle water around the ring basin of the tree.
5. Spread a layer of the mixture of dry leaves and soil around the ring basin.
6. Sprinkle water on the first layer of the mixture.
7. Spread the 2nd layer of the mixture of dry leaves and soil around the ring basin.
8. Sprinkle water above the layer.
9. Mix and blend the layers once a week
10. Sprinkle water once in 2–3 days to maintain minimum moisture level.

Durgamma spreading the dry leaves-soil mixture
Image credits: UNDP–Data for Policy

INTEGRATED FARMING SYSTEM– PRODUCTION SYSTEM TO ENSURE MULTIPLE SOURCES OF INCOME

In the drylands of Telangana, crop loss can lead farmers into unending debt traps for meeting their livelihood needs. Farmers are unable to figure out a way to realise income on the one hand and attenuate the effects of climate change on the other hand.

One of the ways to mitigate the complete loss of farm-based livelihood due to climate change is to adopt Integrated Farming System (IFS) models. IFS offers farmers a continuous income during all the cropping seasons. IFS is an inter-dependent, inter-related production system based on crops, animals, and related subsidiary enterprises in such a way that it maximises the utilisation of resources of each system, thereby minimising negative effects on the environment.

Kishtapa, a progressive farmer in the Sangareddy district of Telangana has been practicing IFS on his six-acre farm. On three acres of land, he grows Eucalyptus and Teak wood as part of the agro-forestry component and sells them to the timber and pulp industry. The remaining three acres are used for growing maize and millets during the Kharif season and vegetables in the Rabi season. He also rears buffaloes and goats in his farmyard. This system ensures an income throughout the year and, in Kishtapa's opinion, reduces the possibility of crop loss.

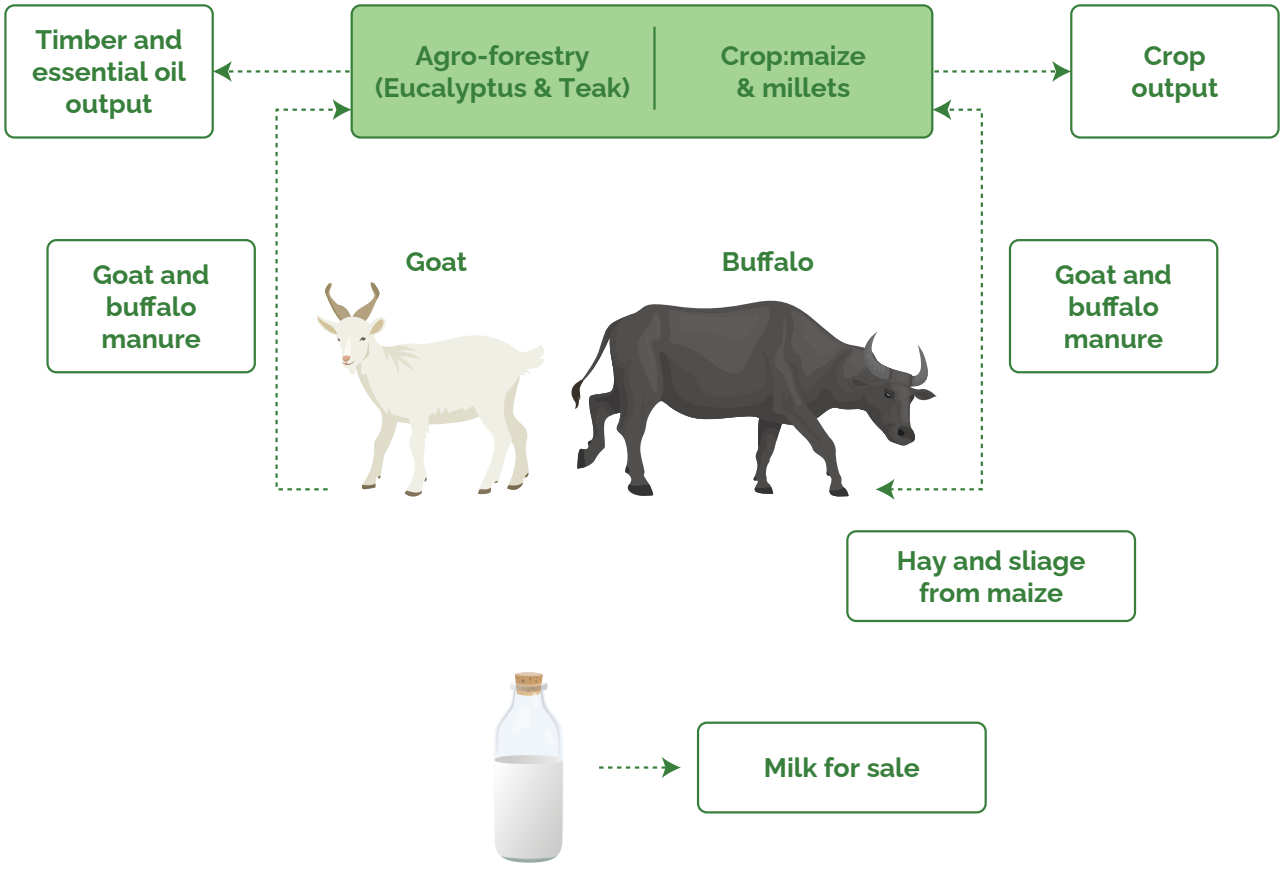


Illustration of the Integrated Farming System
Image credits: UNDP–Data for Policy

PITCHER IRRIGATION–A NATURAL METHOD OF IRRIGATION

Vegetable crops are sensitive to moisture stress, whose effect is further magnified by other weather parameters. Low rainfall and changing weather patterns reduce available soil moisture considerably. Under these circumstances, vegetable farmers in the Sangareddy district have adopted unique methods of irrigation such as pitcher irrigation, which has proven to be among the better methods to irrigate vegetable crops. The pitcher method of irrigation has proved itself to be the best method of irrigation in semi-arid regions and is highly suitable for gourds and other vegetables.

Anil and Suresh are young farmers and entrepreneurs from Venkatapur village in the Kohir mandal of the Sangareddy district in Telangana. They grow vegetables like bottle gourd, pumpkin, and coccinia on two acres of land by adopting pitcher irrigation technology, which efficiently stores and judiciously utilises water.

Pitcher irrigation is an effective, cost-friendly, and natural method of irrigation. This is especially effective for the irrigation of crops like gourds, melons, and pumpkins, which require only a few pitchers per unit area. Pitcher irrigation is similar to the drip irrigation technology but is less expensive.

Farmers installing Pitcher irrigation
Image credits: UNDP–Data for Policy

STEPS TO INSTALL PITCHER IRRIGATION

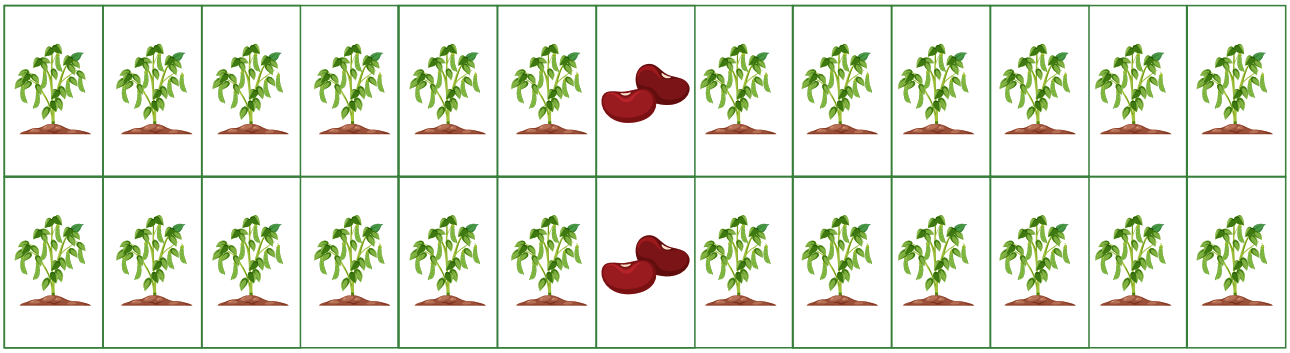
1. Select an unglazed clay pot with 10–20 litres capacity with a hole at the bottom to fix the wick.
2. Dig a pit deep enough to fit the pitcher.
3. Surround the pitcher with fine sand pressed against the walls.
4. Place the pitcher in the pit with the neck of the pitcher above the soil, in a way that it should be able to collect the rainfall run-off water.
5. Fill the pitcher with water and cover it with a net lid.
6. In 2–3 days, moisture would have spread into the surrounding soil zone.
7. Pitchers are generally placed at distances so that wet areas do not overlap.
8. Plant the seed in a moist area.
9. Refill the pitcher when the water level goes down.
10. The wick fixed at the bottom of the clay pot will increase the depth of irrigation.

MULTIPLE CROPPING–A SYSTEM TO BRING IN CROP DIVERSITY

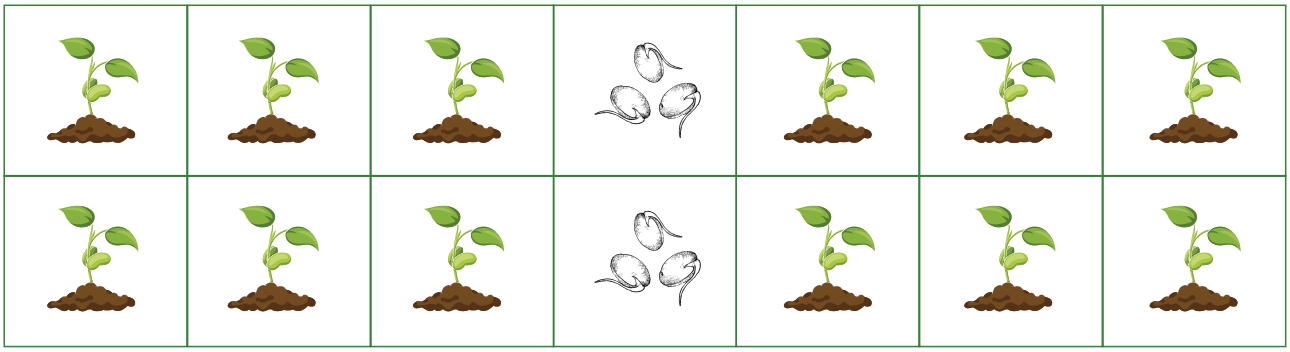
Over the years, there has been a rapid decline in the soil nutrient status in Telangana. Aberrations in weather on account of climate change have worsened this situation with increasing heat waves, droughts, and erratic rainfall. Monocropping is another system that has led to a rapid reduction in soil nutrient and soil productivity levels which has caused the indiscriminate use of fertilisers to compensate for nutrient loss and better yield. It has also led to an increased incidence and spread of more pests and diseases.

Discussions with farmers in the Zaheerabad district revealed that multiple cropping and crop selection are a few of the best climate-resilient practices that help farmers in multiple ways. Benefits include preventing crop failure and staggered sowing, and better use of resources. It also helps supplement the diverse food requirements and ensures price diversity in the market for different crops. In Zaheerabad district, the farmers cultivate crops like foxtail millet, sorghum, red gram, pearl millet, green gram, horse gram, safflower, and ground nut. Additionally, irrigated lands are underutilised for growing vegetables.

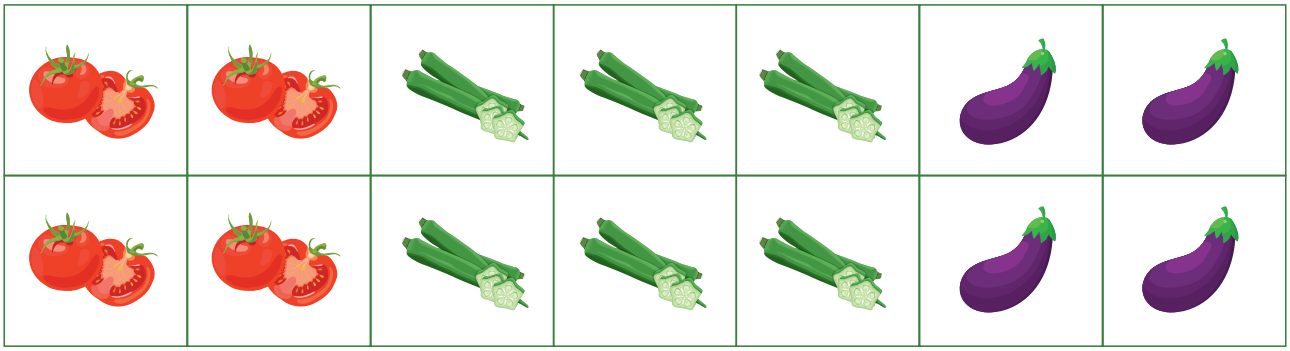
A few mixed cropping systems followed in the climate change-affected Zaheerabad district are presented below



Sorghum 6: Red gram 1
Image credits: UNDP–Data for Policy



Sorghum 3: Horse gram 1
Image credits: UNDP–Data for Policy



Tomato 2: Bhindi 3: Brinjal 2 (under irrigated conditions)
Image credits: UNDP–Data for Policy

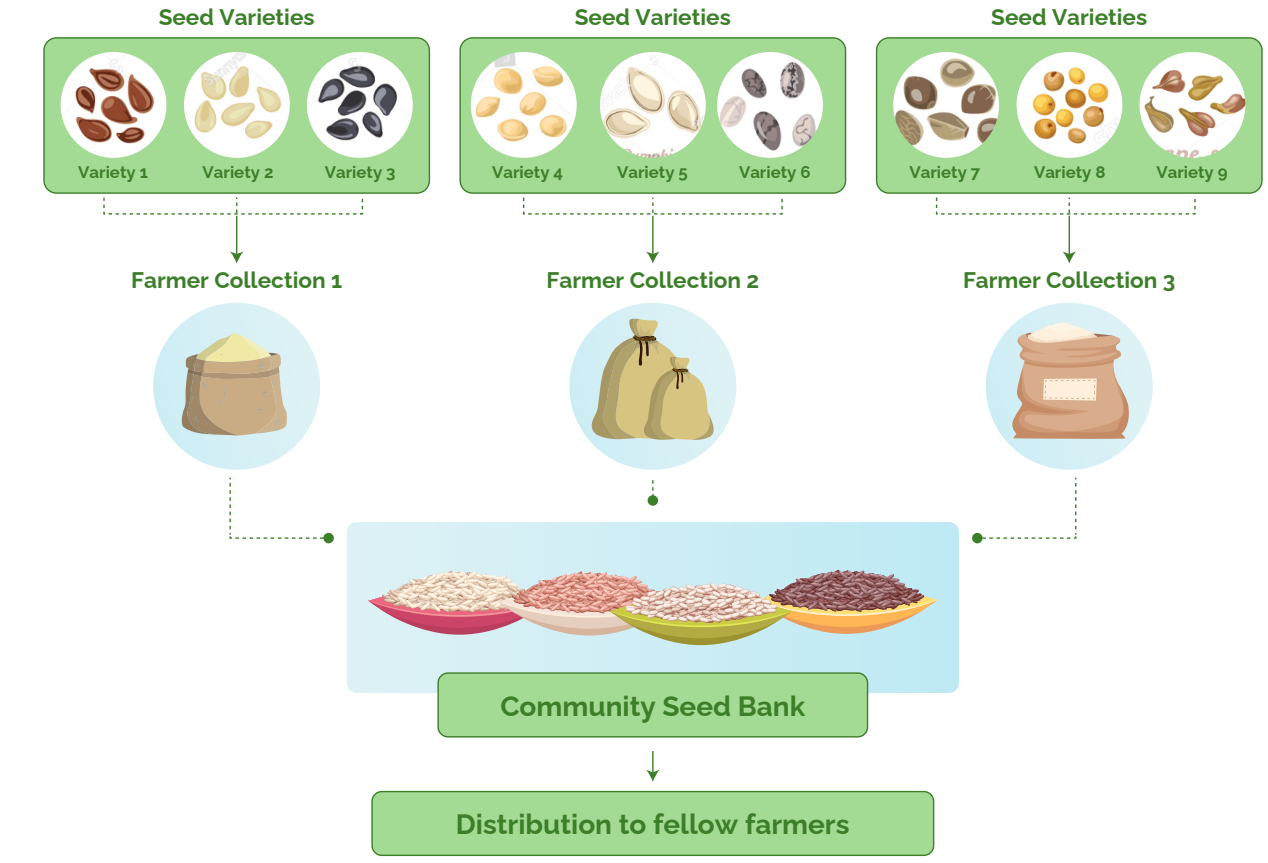
COMMUNITY SEED STORAGE SYSTEM–A SELF-SUSTAINING SEED STORAGE SYSTEM

Quality seed is a key input for agriculture and has a direct impact on agricultural production and productivity. Most farmers face the challenge of procuring quality seeds of improved varieties for a better yield. Hence, it is important to conserve seeds of local crop varieties through an integrated approach of a community seed storage system.

Kamalamma, a progressive farmer in Bidekanne village of the Sangareddy district, has been saving more than 15 varieties of seeds in her miniature seed bank following traditional methods over decades. Furthermore, progressive farmers like Kamalamma follow a collective seed storage system at a community level and support the procurement of quality seeds and sharing them with other fellow farmers.

STEPS FOLLOWED FOR COMMUNITY SEED STORAGE SYSTEM

1. Progressive farmers come forward to save seeds of traditional varieties of millets, pulses, and grains.
2. Priority seeds to be preserved are identified and allocated for preservation to farmers.
3. Farmers establish a community seed bank system with the available collection of multiple varieties.
4. Farmers support each other through this integrated approach in the availing of quality seeds.
5. During any unpredictable situations, farmers can depend on the seeds stored in the seed bank.



Community seed distribution system
Image credits: UNDP–Data for Policy

GROUP CROP INSURANCE–A METHODOLOGY TO OFFSET THE RISK OF CROP LOSS AND MINIMISE DEBT

Unpredictable crop loss has been among the toughest challenges faced by farmers for ages. Telangana has seen adverse conditions such as elevated temperatures and irregular rainfall patterns, which have impaired crop production and favoured the emergence of new pests and diseases.

Kishtanna from Bidekanne village shared his experience on the depletion of land quality due to increased usage of chemical fertilisers and incessant pesticide spraying in the region.

Aranya Agricultural Alternatives (Aranya), a Civil Society Organisation (CSO) operating in Bidekanne village in the Sangareddy district, has been educating the farmers on the benefits of Group Crop Insurance to offset the risk of crop loss and minimise debts. The CSO also conducts training programs for the farmers in their region on crop insurance and ways to carry it out and adopt better agricultural practices.

GROUP CROP INSURANCE STRATEGY

- Identify pockets of areas of more than 50 acres to promote the group crop insurance model.
- Farmers with lands in these pockets are categorised based on the proximity of their fields, sharecroppers, and tenant farmers, provided they are growing the notified crops in that area.
- These farmers are then grouped to take up insurance in the name of the farmer group.
- The effective premium and processing charge for insurance per farmer would be very little when compared to individual insurance.
- There are two scenarios under which the claim can be processed: widespread calamities or local calamities. In the first case, the insurance companies would work out the claim settlement once the government puts forth actual yield data. The companies would directly settle the claim with the insured group without any intimation from the policyholder. In case of a local mishap, the farmer group is required to intimate the insurance company. In this situation, the insurance claim amount would be distributed based on the extent of damage in each individual field.
- The CSO acts as a managing agency for these individual farmer claims.
- Farmer groups in climate-vulnerable regions could take up crop insurance collectively, which could attract insurance companies due to scale. It also helps farmers to cover their crops with small premiums.

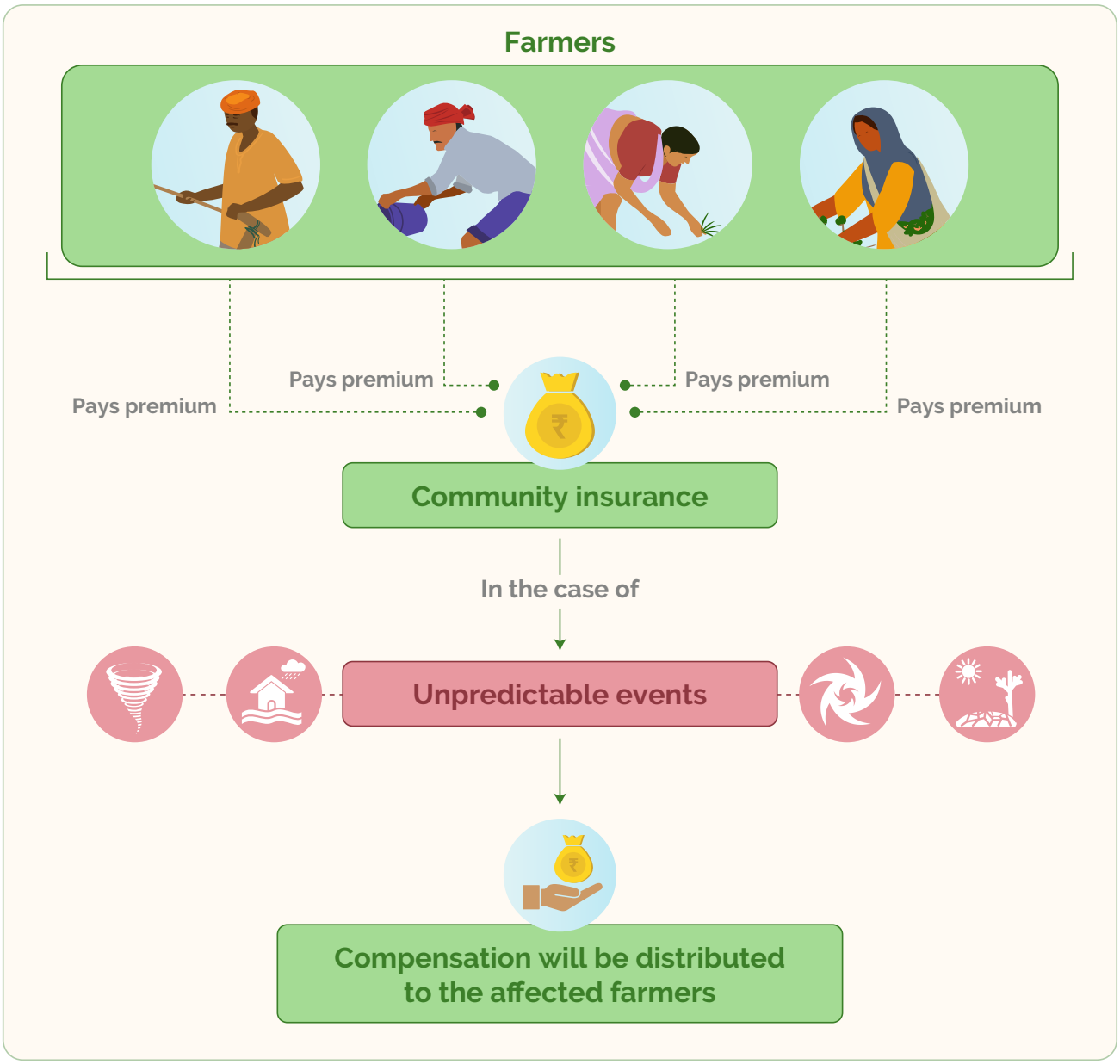


Image credits: UNDP–Data for Policy

INTEGRATED FARMING SYSTEM 2–A JUDICIOUS RESOURCE MANAGEMENT ARRANGEMENT

For many smallholder farmers in India, agriculture is the major livelihood source to support their families. Climate change poses a major challenge to them to sustain farming. An Integrated Farming System (IFS) approach could be a solution to maintain farm income during all cropping seasons, notwithstanding crop failures.

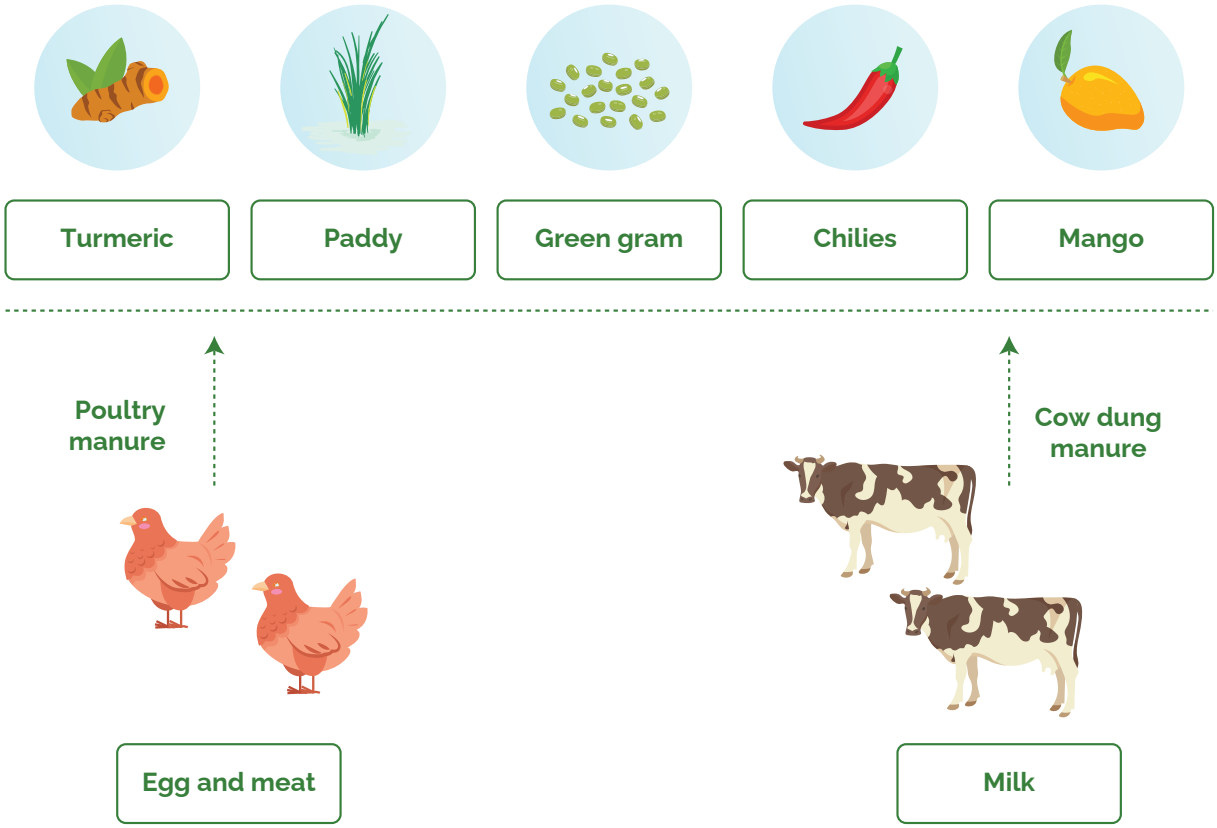
Bobbala Yakub Reddy, a progressive farmer from Aminapuram village in Kesamudram mandal of Mahabubabad district, has been practicing natural farming for over 40 years. He is also the recipient of the Best Farmer Award from the Department of Agriculture and the Professor Jayashankar Telangana State Agricultural University (PJTSAU).

Reddy maintains an integrated farm of 7.5 acres around his house, in which dairy, poultry, field crops, and horticultural crop components are included.

Bobbala Yakub Reddy explaining about the Integrated Farming System
Image credits: UNDP–Data for Policy

COMPONENTS OF IFS MAINTAINED BY REDDY

- In dairy, he raises milch cows and buffaloes, which provide milk and dung throughout the year. The dung is used for organic agriculture on his farm.
- He maintains around 1000 layer chickens, which provide eggs throughout the year. After 50 weeks of laying, the poultry birds are used for meat. Poultry manure is also used for crops.
- He grows turmeric, cotton, paddy, chilies, and green gram.
- He has a mango orchard as well, which is maintained with organic inputs.



Components of IFS
Image credits: UNDP–Data for Policy

TRADITIONAL METHODS TO CONTROL PESTS

When a single crop occupies a larger area, the pest associated with the crop will also increase exponentially in the ecosystem amid a declining natural predator population. Pest infestations reduce the yield and quality of produce. Climate change has added to these woes through the promotion of minor pests turning into a major threat as well as the emergence of new pests. Farmers have been trying out multiple methods for pest eradication. Pesticides help in the quick eradication of pests, but at the risk of wiping out beneficial insect populations and to the detriment of soil, humans, and the natural ecosystem.

An integrated pest management system needs to be adapted while monitoring the pest population. Bobbala Yakub Reddy from Aminapuram village in Kesamudram mandal in Mahabubabad district has been practicing natural farming for over four decades. He recalls using natural methods of pest control on his farm, which turned out to be effective in controlling the pest population.

FIELD SMOKING

Dry leaves collected from farms and green leaves are mixed and heaped for a week. When this heap is burnt at dusk, the pests that are attracted by light will move to the flame and perish. This practice is repeated every week to keep the pest population under control.

STICKY POTS

Old earthen pots with a layer of lime wash are coated with grease, engine oil, or castor oil. These pots are grounded and kept over a wooden log. The sucking pests in the field will get stuck to the grease or engine oil applied to the pots and die, thus keeping their population under control.

PHEROMONE TRAPS

Native technologies, when integrated with modern technologies like pheromone traps are effective in controlling crop pests. Reddy uses chemical pesticides on the field only if the pest population is more than the Economic Threshold Level (ETL) or uncontrollable.

NEEM LEAF EXTRACT SPRAYING

For this approach, 5 kg of fresh neem leaves is immersed in 6 litres of water, after which the leaves are chopped and made into a paste. This suspension is boiled and filtered in the morning. To the filtered solution, 150 g of soap powder is added. This is later mixed with water and sprayed on a field.

SUB-SOIL SPRAYING–A NATURAL ALTERNATIVE TO PESTICIDES AND FERTILISERS

The increasing incidence of pests and diseases tends to lead farmers to apply various insecticides that add more chemicals to the soil and disturb the natural soil health rejuvenation system.

Pradapanu Pullayya from Nallasangisa village, Kuruvi mandal in Mahabubabad has been practicing farming for over 40 years. He is very aware that the application of pesticides and fertilisers are detrimental to the soil and some of the residual chemicals can enter our food chain.

PEST CONTROL METHOD

1. Select a clean organic soil patch to collect sub-soil
2. 20 kg of sub-soil is sun-dried, mixed with 200 litres of water and 500 millilitres of castor oil, which is sufficient to spray over 1 acre.
3. This liquid formulation is sprayed on the leaves and stems of crops like cotton, chillies, etc.

The increasing incidence of pests and diseases tends to lead farmers to apply various insecticides that add more chemicals to the soil and disturb the natural soil health rejuvenation system.

Pradapanu Pullayya from Nallasangisa village, Kuruvi mandal in Mahabubabad has been practicing farming for over 40 years. He is very aware that the application of pesticides and fertilisers are detrimental to the soil and some of the residual chemicals can enter our food chain.

Pradapanu Pullayya at his field.
Image credits: UNDP–Data for Policy

SOIL NUTRIENT IMPROVEMENT METHOD

1. Select a clean organic soil patch and collect sub-soil. The soil should be devoid of any pesticide residue. The lake soil and the soil dug out from the well can also be used.
2. Grind 2 kg of sprouted wheat and mix it with 20 kg of the collected soil.
3. This mixture is applied to the crops near the root zone as an alternative for fertiliser.

The addition of new organic-rich soil will improve soil fertility.

PEST CONTROL METHOD

1. Select a clean organic soil patch to collect sub-soil.
2. Take around 20 kg of the organic soil and mix it with 500 millilitres of castor oil and 200 litres of water.
3. This mixture is sprayed on the crops to reduce the attack of pests in the crop.

This technique is known as the CVR technique; this technique was invented by renowned farmer Chintala Venkat Reddy who even received an international patent for this technique.

SELF-SUSTAINING POLYHOUSES WITH FARM PONDS

Flower production, like that of marigold, gladiolus, tuberose, and rose, in open field conditions has drastically reduced due to climate change. In floriculture, ambient temperature influences the production and volatility of floral fragrances. High temperatures can also affect floral pigmentation leading to dull shades. Changing patterns of photoperiodism and thermo-periodism also greatly alter the flowering pattern.

Irrigation water quality plays a critical role in high-quality flower production. Due to erratic rainfall, farmers depend on ground water for irrigation. For irrigation water, the usual criteria include salinity, sodicity, and ion toxicities. In most cases, the Electrical Conductivity (EC) value of ground water belongs to class C_2 (medium salinity) and C_3 (high salinity), which are not prescribed for flower crops.

Goguloth Ramesh is a floriculturist from Ammapuram village in Mahabubabad district and a recipient of the 2021 Innovative Farmer Award from the Government of Telangana. He received a subsidy from the Department of Agriculture to set up a polyhouse of 1 acre, in which he grows chrysanthemum and tuberose.

Using a polyhouse for floral production has many advantages. The external weather extremities do not affect the crops in the polyhouse. The side slits in the roof-top of the polyhouse help maintain the temperature. The incidence of pests and diseases is also considerably reduced. During off-season, Ramesh grows high-quality chillies and chrysanthemum nurseries in the polyhouse and supplies them to the nearby farmers in his village. This ensures him more income throughout the year.
For irrigating the crops, an effective rainwater harvesting system has been established and further routed to the farm pond near the polyhouse. The rain falling on the polyhouse is collected and routed to the farm pond. The rainwater stored in the farm pond has an EC value in C1 class (<1 dS/m^3), which is the best fit for floriculture crops. Water in the farm pond is supplied back to the crops inside the polyhouse through a drip irrigation system.

JEEVAMRUTHAM AS AN ALTERNATIVE TO CHEMICAL FERTILISERS IN RICE PRODUCTION

Climate change takes a toll on the soil, leading to soil erosion and changes in organic carbon, nutrients, and alkalinity level. Many soil properties are affected by changes in temperature and rainfall. To improve soil fertility and increase the yield, farmers apply chemical fertilisers at the cost of the environment.

Mangamma, a progressive woman farmer from Nirmalur mandal of Nalgonda district, has been using a low-cost improvised organic fertiliser preparation called Jeevamrutham in her rice fields. Jeevamrutham is a microbial culture, prepared from cow dung and cow urine, used in organic farming to meet the nutritional requirements of crops. She has been applying the Jeevamrutham formulation in her field for the past four years and found it to have significantly enhanced soil fertility and soil health.

Jeevamrutham is made in dhrava (liquid) and ghana (solid) forms.

For the ghana form,

- A mixture of 100 kg of desi cow dung (cow dung is good only for 21 day; store it by keeping it moist by sprinkling water and storing it in shade), 1 kg jaggery, and 1 kg pulse flour is mixed well and stored as a heap for 48 hours in shade.
- If the temperature drops below 12 degrees, the heap should be covered with a rug sack to maintain a constant and conducive temperature for micro-organisms.
- After 48 hours, the mixture is spread on a clean surface and sun-dried.
- The mixture is flipped regularly during the day to ensure that all particles get exposed to sunlight and quickly dry.
- Once the mixture is completely dried, the lumps are broken into powder form with a wooden bat and filled into sacks and stored in a cool and dry place.
- This powdered form is later drenched into the soil before planting seeds.

For preparing the dhrava form,

- Around 10 kg of fresh local cow dung and 5–10 litres of aged cow urine is added to 200 litres of water in a barrel.
- About 2 kg of jaggery and 2 kg of pulse flour and a handful of soil are added to the barrel.
- The solution is then stirred at regular intervals and allowed to ferment for 48 hours in the shade.
- After 48 hours, the aerobic and anaerobic bacteria present in the cow dung and cow urine multiply as they eat up organic ingredients (like pulse flour). This fermented solution can be applied with irrigation water or as a foliar spray.

United Nations Development Programme,
Post Box #3059, 55 Lodhi Estate, New Delhi - 110003

https://dicra.undp.org.in/

https://twitter.com/UNDP_India

https://www.linkedin.com/company/undp-in-india