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Planned Comparison Protocol

Andhra Pradesh Community-based Natural Farming (APCNF)

Acknowledgements

RySS and ICRAF would like to thank the farmers from across Andhra Pradesh (AP) for helping to innovate on the farms and implement the planned comparisons. The participation, extensive expertise and the input from a wide array of stakeholders is critical to the ambitions of the project and wider vision to work at landscape scale to achieve intended impacts from Andhra Pradesh Community Managed Natural Farming (APCNF).

Planned Comparison Report compiled by CIFOR-ICRAF and RySS Team

September 2023

Authors

Christine Magaju, Sonia Sharma, Zakir Hussain and Leigh Winowiecki

Contact

Leigh Winowiecki, CIFOR-ICRAF

L.A.Winowiecki@cifor-icraf.org

Zakir Hussain, RySS

ZAKIR HUSSAIN zakiradvisor71@gmail.com

Compilation and Layout

Sabrina Trautman and Debra-Jean Harte

Additional project resources

This planned comparison protocol report forms part of the project outputs - From Fields to Landscapes - Establishing the Resilient Productivity of APCNF.

Project Website

Illustrated Workshop Report (2019)

Exemplar Landscape Report

Stakeholder Mapping Report

Blog on the first engagement landscape workshop in November 2019

Blog on the concept of Engagement Landscapes

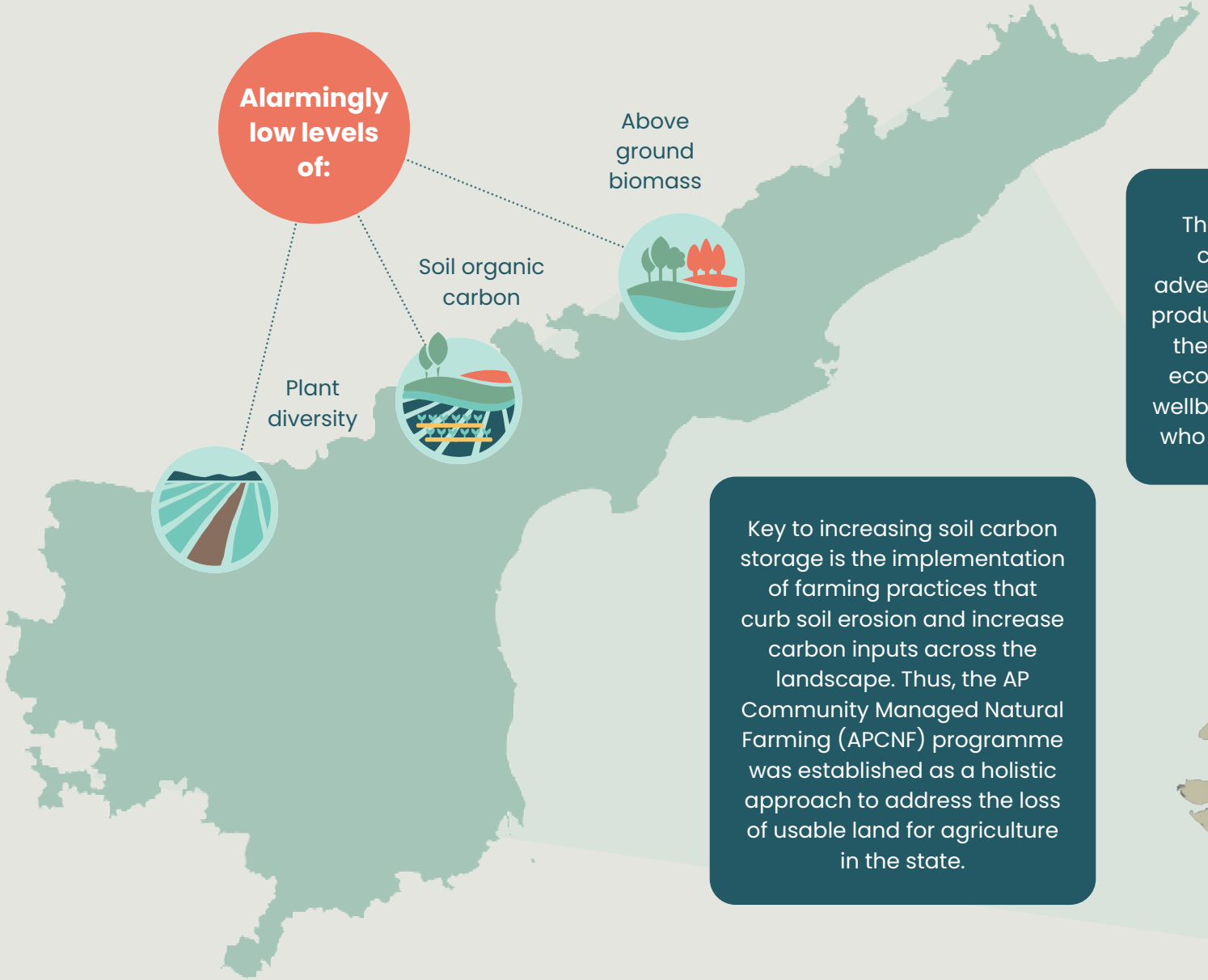
Restoring soil and land health in Andhra Pradesh with a landscape approach

Contents

Why we need to build resilience in Andhra Pradesh (AP)

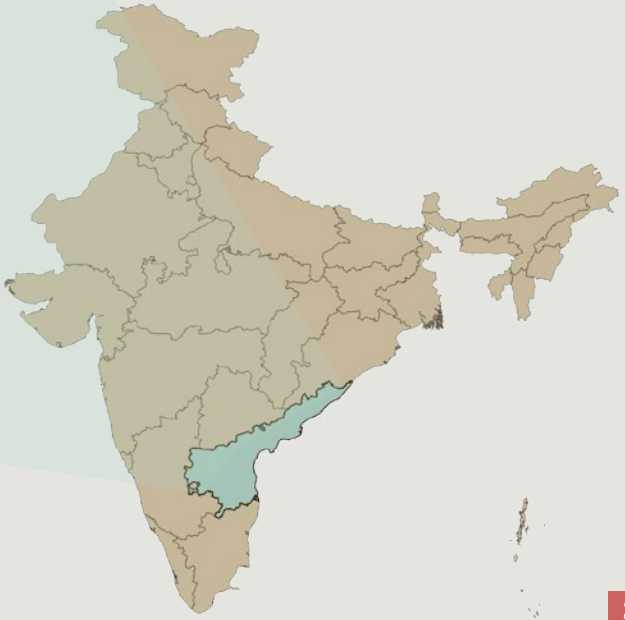
Like many other states, AP has been losing soil organic carbon, plant diversity and above ground biomass at a rapid rate. Vast areas of the state are lying bare. A holistic approach was therefore required to address the root causes of the biophysical constraints for agricultural systems.

Why we need to build resilience in AP



These biophysical constraints are adversely affecting the productivity of the land, the resilience of the ecosystems and the wellbeing of the people who depend on them.

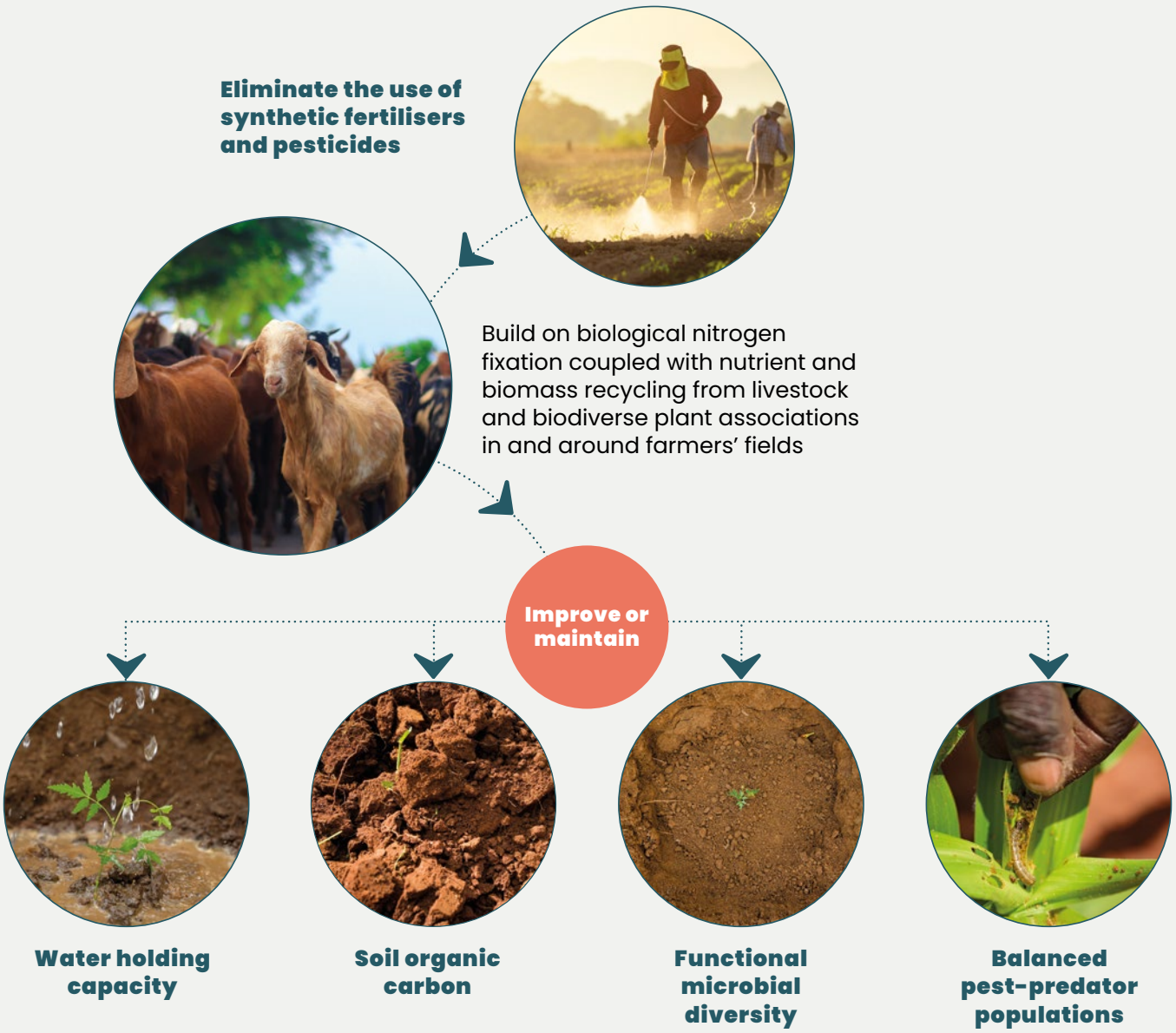
Key to increasing soil carbon storage is the implementation of farming practices that curb soil erosion and increase carbon inputs across the landscape. Thus, the AP Community Managed Natural Farming (APCNF) programme was established as a holistic approach to address the loss of usable land for agriculture in the state.



An approach based on agro-ecological principles

Agro-ecological principles aim to minimise the use of synthetic fertilisers and pesticides. This is done by building on biological nitrogen fixation coupled with nutrient and biomass recycling from livestock and biodiverse plant associations in and around farmers' fields. The intended outcomes of using agro-ecological principles is to improve or maintain the water holding capacity of soils, increase soil organic carbon and functional microbial diversity and balance pest-predator populations.

The use of natural farming principles to enhance soil biology has far reaching benefits for farmers. Having green cover all year round means income generation through the year, improving the livelihoods of the farmers and their families. Using these natural farming principles also encourages agriculture graduates and other young people to engage in farming practices. Enhanced soil biology results in improved yield and nutritional content of food contributing to sustainable food systems that enhance food security and nutrition.



APCNF practices and principles

1.

Beejamrutham
Microbial seed coating using cow urine and a dung-based formulation.

2.

Jeevamrutham
Enhance soil microbiome through an 'inoculum' of fermented cow dung, cow urine and other local ingredients.

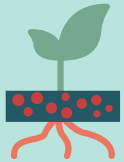
3.

Achhadana
Ground is kept covered with crops and crop residues.

4.

Waaphasa
Fast buildup of soil humus leading to better soil aeration, soil structure, and water harnessing.

Principles of natural farming



365-day coverage of soil with crops.

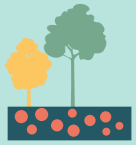
Pest management through botanical extracts.

Minimal disturbance of soil.

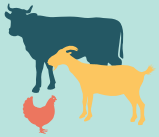
No synthetic fertilizers, pesticides or herbicides.

Biostimulants as necessary catalysts.

Diverse Crops, trees 15 -20 crops.



Increase organic residues on the soil.



Integrate livestock.

Use indigenous seed.

Background to what APCNF is and why it is so important

Like many other states, AP has been losing soil organic carbon, plant diversity and above ground biomass at a rapid rate. Vast areas of the state are lying bare.

Key to increasing soil carbon storage is the implementation of farming practices that curb soil erosion and increase carbon inputs across the landscape.

The APCNF programme was established as a holistic approach to address the loss of usable land for agriculture in the state.

"Our focus is on assessing and strengthening the resilience of the system to climate and other shocks through taking a broader landscape scale and organ-isation frame for our work"

Mr T Vijay Kumar

The role of farmers in restoring degraded land

Smallholder farming is a critical contributor to global food security but it is also threatened by land degradation, loss of soil function and fertility and corresponding low agricultural yields. Addressing land degradation requires the active engagement of farmers to integrate restorative agricultural practices on their farms.

Achieving the targets set out by the **United Nations Sustainable Development Goals (SDGs)** requires successful restoration efforts to reach large numbers of farmers and hectares over the coming decade.

A key constraint to scaling restoration and natural farming practices is that the ecological, economic, sociological and institutional context varies from household to household, as well as from village to village and that no one technology will suit all contexts. Locally relevant restoration options that work for different farmers in different places are urgently needed.

Matching natural farming options to the farmer context

Consequently, there is a significant need to compare and test the performance of natural farming options under different contexts to better understand **what works for different people in different places and how to match options to local conditions and farmer circumstances**.

“Planned comparisons’ are an innovative approach whereby farmers and local communities compare the performance of promising practices across differing contexts, placing farmers at the centre of the research and scaling process.”

Large scale impact requires evidence-based innovations to be widely adopted across multiple contexts. The innovation of planned comparisons generates this information, by testing and validating options using a farmer-centered approach to understand what works best where and for whom. This is essentially integrating research design into implementation while providing real-time feedback from and with farmers.

Farmer-centred action research

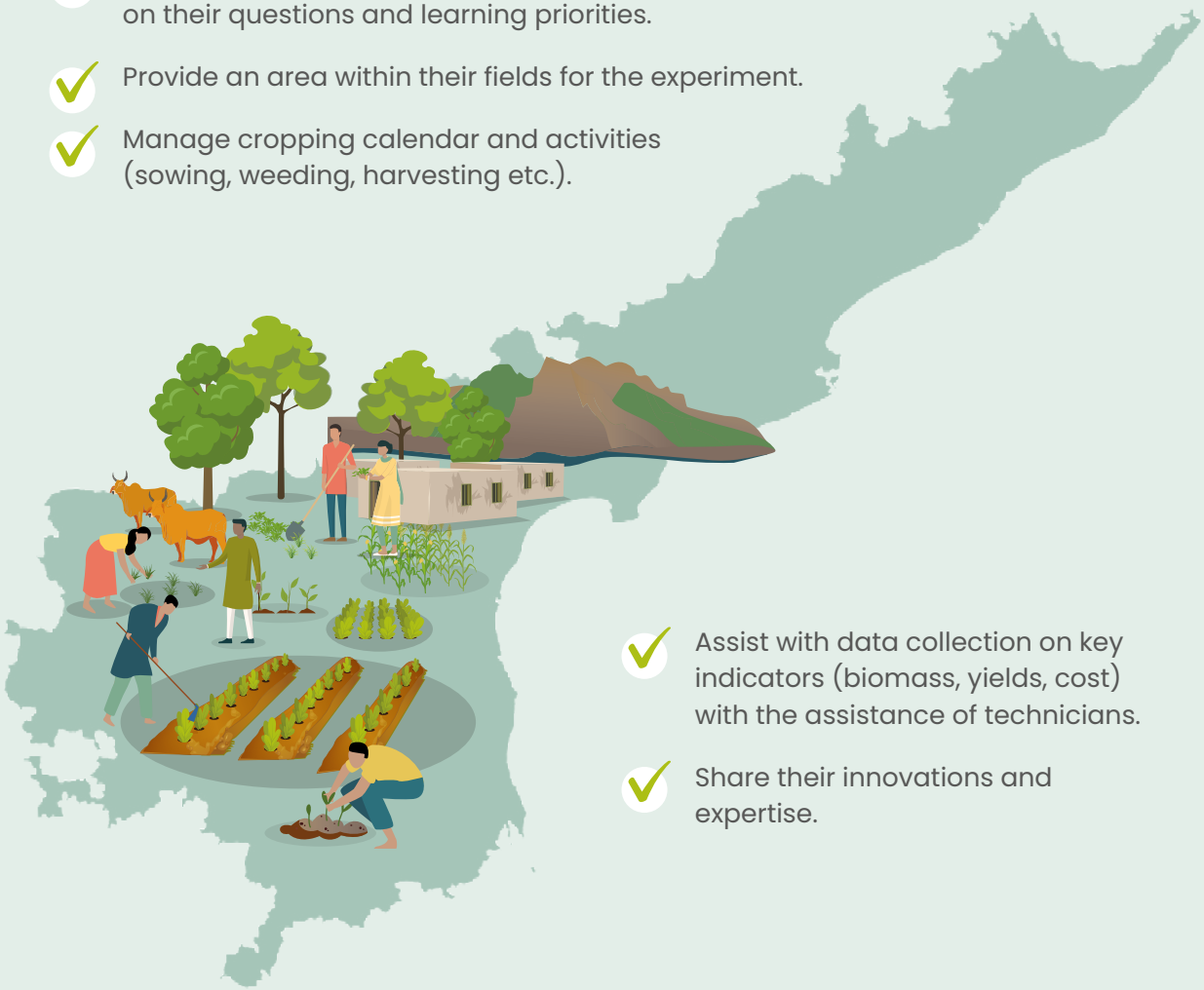
The **planned comparison** illustrates a fundamental farmer-centered approach. Farmers implement the planned comparisons on their farms with technical support. They experiment and innovate with various natural farming options to see what works best for their context and specific needs. Restoration approaches, natural farming options and technologies must therefore be adapted for each of the varying contexts.

The planned comparison approach allows farmers to experiment and innovate on their farms, which in addition to increasing farmer learning has also led to scaling of land restoration.

The farmer chooses which options he or she would like to implement and compare on their farm. They are also encouraged to innovate around the option to meet their needs. These planned comparisons applied in multiple contexts across the three exemplar landscapes allows for confident targeting and scaling of natural farming options to the engagement landscape level and beyond.

The role of farmers in implementing a planned comparison

- Identify which natural farming options they want to test based on their questions and learning priorities.
- Provide an area within their fields for the experiment.
- Manage cropping calendar and activities (sowing, weeding, harvesting etc.).



- Assist with data collection on key indicators (biomass, yields, cost) with the assistance of technicians.
- Share their innovations and expertise.

What is a planned comparison?

Planned comparisons are the **testing of various farming practices (options)** on a farmer's field or within a farming community. This includes testing of the variations of the farming practices. In the context of AP, the planned comparison methodology will be used for testing different natural farming practices.

Planned comparisons allow for the **rigorous assessment of options** across different conditions and locations to identify what works where and for whom.

Planned comparisons allow for **understanding the performance** of the options at multiple scales, from farmers' fields and communities, to different agroecological zones.

The performance of the different natural farming options will be **compared across varying contexts**, taking the specific socioeconomic, biophysical, and cultural characteristics of the landscape into account.

Key aspects of the planned comparison approach

- High farmer participation.
- Participatory identification of the current challenges farmers are facing.
- Participatory identification of an initial set of potentially promising farming practices as well as addressing any uncertainty on the viability of the options.
- Development of a planned comparison protocol that aims to answer any research and implementation gaps.
- Continual review and refinement of the options and protocols together with farmers to address the locally relevant challenges and contexts.
- Monitoring of the performance of each of the options to produce rigorous evidence on the constraints and conditions for implementation and the variables of success.
- Aims to scale relevant management/restoration innovations to a large number of farmers by demonstrating the performance and impact of the innovations in specific contexts.
- Facilitates a ‘deep’ participatory process with farmers, as well as partners and additional stakeholders, to encourage co-learning, knowledge sharing and innovation.
- An innovative way to embed research into development, by reaching large numbers of farmers and having high farmer participation.

Establishing the APCNF planned comparison

AP is characterised by low levels of soil organic carbon, water stress, loss of above ground biomass, and low plant diversity. This degradation, in conjunction with a worsening climate crisis, has adversely affected productivity and the resilience of the ecosystems and the wellbeing of the people who depend on them. This necessitated a rethink of the type of agriculture practiced in AP. In response, the Government of AP introduced the Zero Budget Natural Farming (ZBNF), a way of farming in harmony with nature through the use of agroecological approaches that focus on revitalising organic pathways to soil fertility regeneration, reduction of water uses and increase in on-farm species diversity.

The natural farming practice is led by farmers and follows farmer-to-farmer extension and as a result was renamed to Andhra Pradesh Community Managed Natural Farming to reflect the central role that farmers play. APCNF follows the principles of natural farming such as minimal soil disturbance, use of bio-stimulants, crop diversification, use of organic residues, pest management with botanical extracts, and 365-day soil cover.

Currently, over 600,000 farmers across the state are practising APCNF and are experiencing a reduced production costs, increased yields across different contexts and improved soil quality for example, softening of the hard pan. These results are however largely anecdotal and where evidence is available, it is at a smaller scale and the factors for success still poorly understood.

The planned comparison approach allows for the measuring, tracking and assessing of the impact and performance of APCNF practices across different farming contexts within the State. This generates rigorous evidence on the impact and performance of the different natural farming practices and the variation thereof. The approach also allows for the tracking of innovations that farmers are implementing for example, which aspects of APCNF they are innovating on and track their performance.

Objective of doing planned comparisons for APCNF

Understand and document farmers innovations within APCNF to suit their context.

- Specifically, innovation around the 365-day cover and other natural farming practices including the potential for different cropping intensity and different crop combinations.

Assess performance of these innovations on key indicators such as yield, soil health (soil biodiversity), household economics, livelihoods, pollinators, pests, and disease prevalence.

Identify which aspects of APCNF are working best for which farmers within the landscape.

Hypothesis for the planned comparison

Natural farming practices have the potential to maintain crop yields while reducing climate and health impacts

Timing

Rabi season 2021

Kharif season 2022

Rabi season 2022-2023

Recording famer innovation

Farmers were given extensive training on record keeping of key observations related to crop yield and other indicators under each option they selected to test. Farmers were critical in both testing and recording their innovations.

Testing and tracking performance of natural farming options

To determine the effectiveness of the natural farming practices, the crop performance is assessed in terms of:

YIELD

Monitor the harvest of the crops planted under each option.

SOIL HEALTH INDICATORS

For example, monitor soil health indicators such as erosion status, soil carbon, infiltration, compaction.

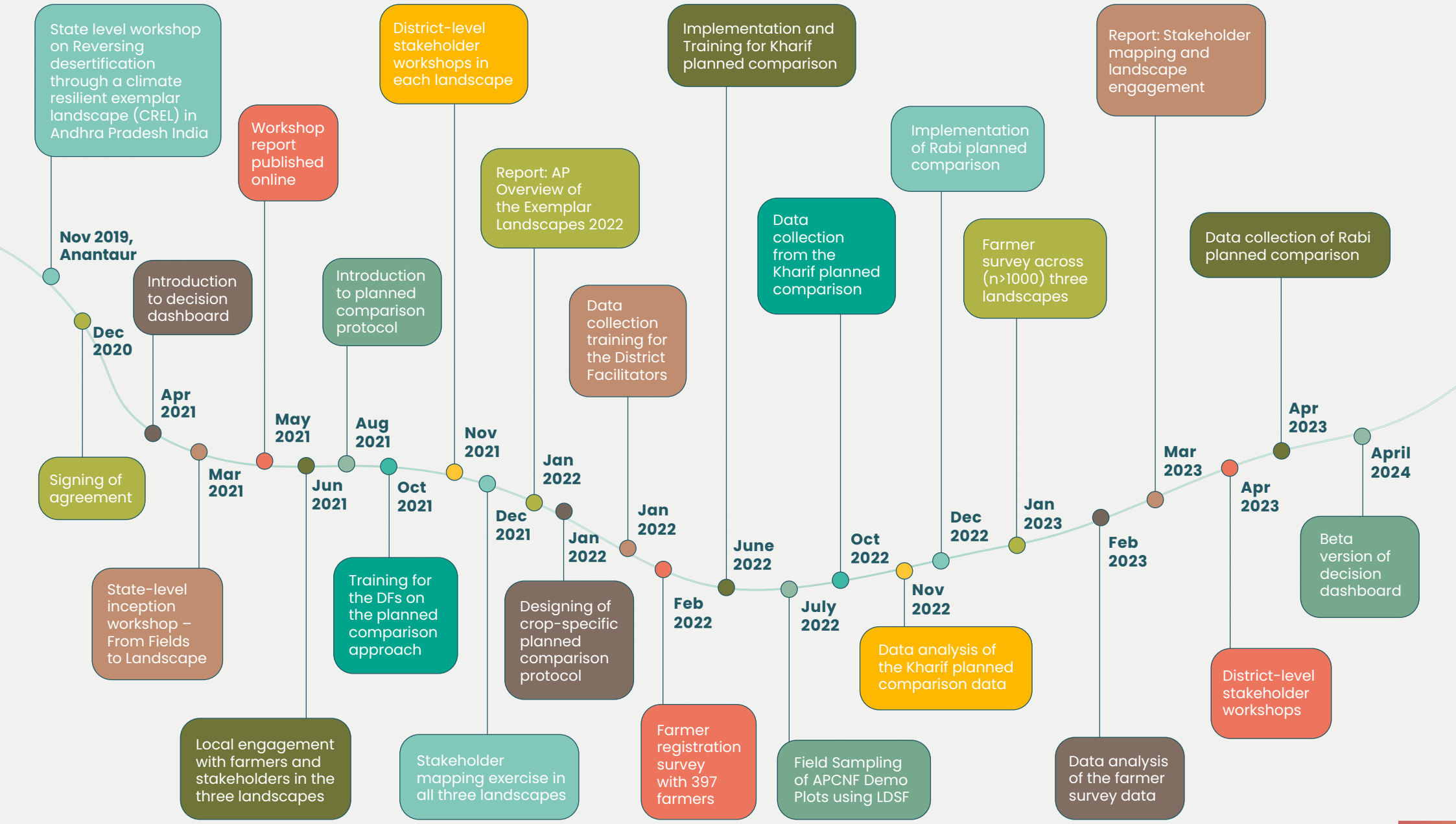
Equipment used by farmers

Mulching materials

Ruler or tape measure

Natural farming inputs such as Jeevamrutham and Ghanajeevamrutham

Project activity timeline



Key steps for setting up the planned comparison

Co-learning between farmers, researchers, practitioners and policy

Step 1
Establish farmer engagement plan

Discussions and brainstorm with farmers to identify learning priorities around natural farming

Willing farmers volunteer to test one or more options on their farms and are enrolled

Choose a location on the farm to test the options

Step 3
Collect data and evidence

Step 1.1

Step 1.2

Step 1.3

Step 1.4

Step 1.5

Step 1.6

Step 1.7

Research and consultations to determine existing farmer engagement and training within the landscapes

Implementation of planned comparisons in AP will build up on the farmer field school approach being implemented within APCNF to encourage scaling of natural farming practices and farmer innovation.

Prioritised options are explained to farmers

Options to be compared during the season

Select crop varieties to be planted during the season

Set up demonstration plots

Step 2
Collect contextual data

Co-learning between farmers, researchers and practitioners

The demonstration plots will act as training sites where farmers can meet regularly for training and to discuss different thematic observations.

Farmer observation and monitoring of trials with technical support

Volunteer farmers will assess crop performance under each practice implemented and keep records of their observations and importantly their own innovations.

Farmer observation will be complimented with monitoring by lead farmers, **Community Resource Persons (CRPs)**, Internal Community Resource Persons (ICRPs) and data collectors to systematically document the farmer innovation and observation data on the selected practices over the season.

Step 1

Establish a farmer engagement plan

Step 1.1

Research and consultations to determine existing farmer engagement and training within the landscapes

Analysis and validation to build the evidence base

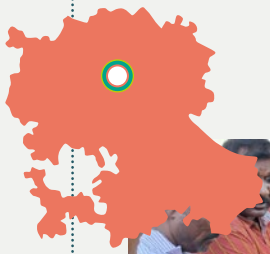
ICRAF, RySS and CRPs meet to analyze, validate and summarize key findings from specific contexts (at the farmer's field level) to scale up across multiple villages and learning at the landscape level.

Evidence validation and stakeholder workshops'

Results and lessons learned are shared through structured, and documented co-learning amongst nested communities of practice that bring farmers, community facilitators, NGO and government extension staff, private sector actors and researchers together.

Step 1.2

Discussions and brainstorm with farmers to identify learning priorities around natural farming



Korrakodu village, Ananthapuramu district

Meeting 1

Date: 27 September 2022
Number of participants: 25
(19M, 6F, 10Y)*

Key points:

- The majority of enrolled farmers were implementing basic natural farming practices such as Dhravajeevamrutham and Neemastram. The farmers said that their natural farming fields performed well in terms of yield and crop health. However, farmers highlighted that the inputs were slow in showing positive results in comparison to the application of chemicals which yielded more immediate results.
- Non-enrolled farmers understood the basic natural farming practices but said they take too much time to implement. They showed interest in using Dhravajeevamrutham in the next season as it would be produced by the community.

Meeting 2

Date: 30 October 2022
Number of participants: 25
(20M, 5F, 18Y)

Key points:

- The majority of enrolled farmers were implementing Dhravajeevamrutham and Neemastram and were seeing positive results such as improved groundnut production and an observed increase in earthworms.
- Non-enrolled farmers found the preparation for applying the inputs too intensive, so they used chemical inputs from the nearby market which they said demonstrated immediate results.

Meeting 3

Date: 7 November 2022
Number of participants: 23
(14M, 9F, 10Y)

Key points:

- Groundnut production practices were discussed with the farmers for the Rabi season, this included the concept of growth promoter to increase yields.
- Farmers were concerned about the timely preparation of the Dhravajeevamrutham and Neemastram inputs as they did not have access to the raw materials.
- Non-enrolled farmers said that filtering every input to not block the nozzles of their sprayers was too time consuming.

*M – male; F – female; Y – youth (<35 years)

Jayapuram village, Ananthapuramu district

Meeting 1

Date: 17 September 2022
Number of participants: 30
(23M, 7F, 15Y)

Key points:

- Demonstration farmers shared that their tomato crops flowered well, were healthy, the fruit was of good quality, and they had a good shelf life. The quality of the tomatoes from the natural farming plot was better than from the chemical plot. The farmers said that mulching improved the health of the plants.
- Most of the enrolled farmers were implementing basic natural farming practices such as Dhravajeevamrutham and Neemastram.
- Non-enrolled farmers were not interested in using the natural farming inputs because they considered the preparation process too time consuming and they were not interested in improving soil health.

Meeting 2

Date: 13 October 2022
Number of participants: 20
(14M, 6F, 6Y)

Key points:

- The majority of enrolled farmers were implementing basic natural farming practices such as Dhravajeevamrutham and Neemastram but were also interested in the preparation of Bheejamrutham.
- Non-enrolled farmers found the weed intensity of the natural farming plots to be higher.
- The farmers mentioned that the natural farming inputs for pest control do not work as quickly as the chemical pesticides. It was suggested that they continuously monitor their fields and implement pest control measures at an earlier stage.

Meeting 3

Date: 15 November 2022
Number of participants: 20
(13M, 7F, 7Y)

Key points:

- As the Rabi season started some of the enrolled farmers prepared Dhravajeevamrutham which is an initial input for groundnut cultivation.
- Most of the enrolled farmers prepared jeevamrutham for application every 15 days.
- Non-enrolled farmers were not interested in the natural farming practices as they said they did not have the time to ferment and filter inputs.

*M – male; F – female; Y – youth (<35 years)

Step 1.3

Prioritised options are explained to farmers

Choose at least two options to compare in addition to the current farming method

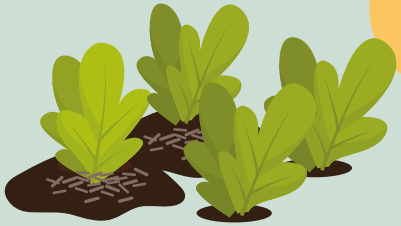
- For example, compare no mulch with 1-inch mulch thickness in addition to at least 4 crop varieties.
- If mulching material is inaccessible, choose to only compare the number of crop varieties planted and the number of plants (cropping intensity).
- For each option a minimum of four crop varieties should be planted and the number of plants for each option should be equal.

Examples of options that can be compared in non-paddy fields

MULCH + Other natural farming practices

Option 1	No Mulch
Option 2	1-inch mulch thickness
Option 3	3-inch mulch thickness
Option 4	5-inch mulch thickness

At least 4 crop varieties



MULCH

Option 5	No Mulch
Option 6	1-inch mulch thickness
Option 7	3-inch mulch thickness
Option 8	5-inch mulch thickness

At least 4 crop varieties

Step 1.4

Willing farmers volunteer to test one or more options on their farms and are enrolled

Scale learning from the demonstration plot to individual volunteer farmers

Willing farmers are enrolled and implement what they are learning at the demonstration plots on their farms. They will select at least two areas on their farms where they will be comparing the selected options e.g., with and without mulch, different mulch thickness, crop diversity or cropping intensity.

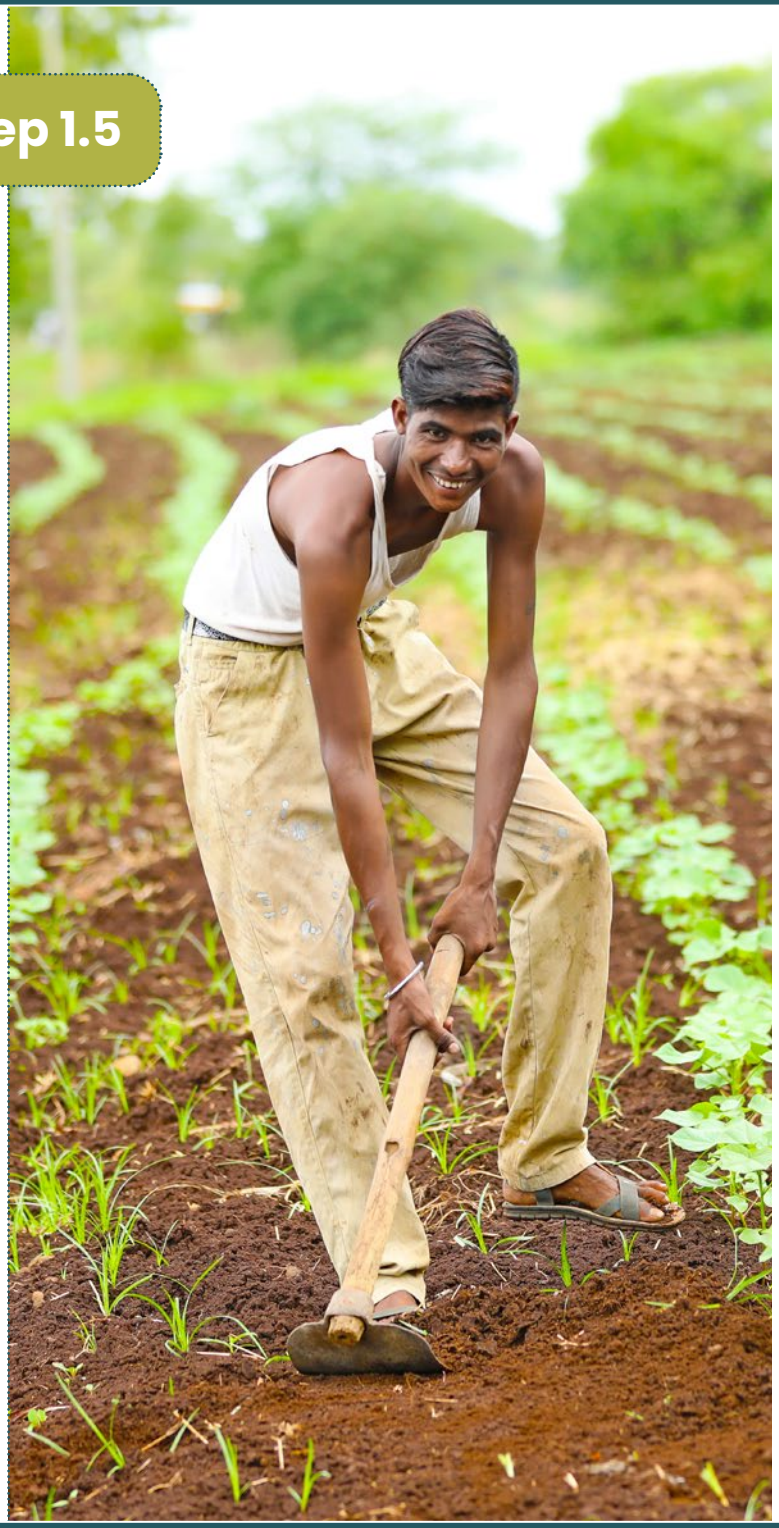
Willing farmers will try one or more option on one portion of their farm and compare with (or without) another portion of the farm. For the paddy systems, one farmer will try one option on their farm while another farmer will try a different option making sure that each option is replicated across different contexts.

Farmers will then implement, on their own farms, what they are learning at the demonstration plots. Farmers will meet regularly at the demonstration plots to discuss different thematic observations including experiences from the planned comparisons on their own farms.

Establish randomized plots on volunteer farms

The planned comparison is based on a completely randomized design in each farmer's field with farmers allowed flexibility on the options to compare, how much land they allocate and which practices they will select. The 'comparison' within the design is between the different plots across the farmer's fields.

Step 1.5



Select crop varieties to be planted during the season

Mustard

Oat

Coriander

Potato

Gram

Wheat

For the Rabi season, four crop varieties will be planted in the demonstration plots comparing different mulching thickness, cropping diversity, and cropping intensity.

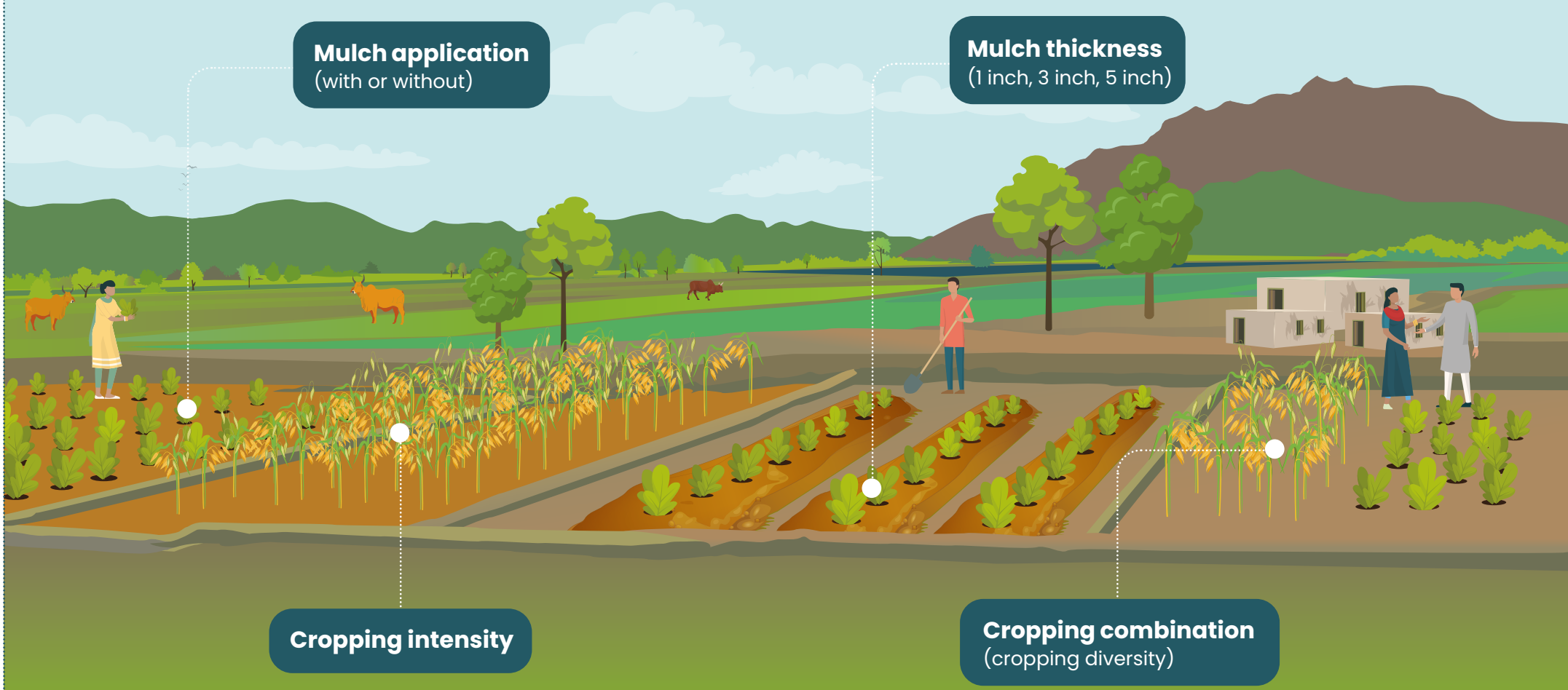
The 365-day green cover refers to the practice of keeping rainfed agricultural lands covered with live crops all year long. The aim of the 365-day green cover is for farmers to cultivate eight to ten different crop types throughout the year.

Farmers will however be encouraged to plant as many crop varieties as they prefer on their farms. The type of crops to be planted will vary in each district and will be determined by the prevalent farmer innovation around the 365-day green cover and other natural farming practices.

Step 1.6

Choose a location on the farm to test the options

1. Select an area of the farm to compare the different options. Choose an area large enough to test all the options that have been selected.
2. Divide this area equally between the different test options.
3. Minimum test plot is 1m x 1m, a larger area is recommended.



Step 1.7

Set up demonstration plots

Other natural farming practices of interest to farmers should also be established on the demonstration plots and monitored.

One demonstration plot is to be set up for every 30 farmers. If the number of farmers in a village is less than 30, one demonstration plot can be set up to support two or more villages.

Step 2

Collection of contextual data

Farmer profile data is combined with the planned comparison monitoring data to assess socio-economic factors influencing natural farming success

- APCNF farms and non-APCNF (conventional farming) farms
- Household socioeconomic characteristics (household size, gender of household head, land ownership and tenure)
- Biophysical characteristics of the farm (erosion status, soil carbon, compaction, infiltration)
- Fallow months (number of months in a year the land is left fallow)
- Crop geometry
- Water logging
- Crop lodging
- Level of APCNF saturation on farms:
  - Extent of APCNF on the farm;
  - APCNF farmers using only natural farming practices across their entire farm;
  - Partial APCNF farmers using natural farming practices on only one portion of their farm;
  - Partial APCNF farmers using some natural farming practices on their farm complemented by chemical inputs; and
  - Non-APCNF farmers only using conventional farming practices on their farms.

Step 3

Collect data and evidence

Document farmer profiles

Household surveys using electronic data capture, i.e., **open data kit (ODK)** to provide the context of the farmer in order to conduct an analysis of what works where, for how much and for whom.

Regular tracking of progress and results

Track the following:

- Input added.
- Any changes or innovation - one of the most critical aspects is to scale up the farmers' expertise to other farms - such as the ideas and changes to a technique based on the local context - to achieve this a field team will conduct regular interviews.
- Make note of any seed treatment applied e.g. Beejamrutham for the planted seeds ensuring that if seed treatment is applied in one plot, the same is replicated in the other plots under comparison.
- In the case of live mulch, make note of the cover crops planted.

Measuring yield

Field teams will map the locations of the farms and the plots. They will also conduct surveys to gather background information.

Key data and responses to be captured

- Crop yield
- Number and types of crops planted
- Biomass
- Labor cost (hired), man-days (family)
- Amount and cost of inputs (biostimulants/ innoculants/mulch)
- Amount of water used
- Sowing type
- Planting method
- Erosion status on farm
- Soil carbon
- Compaction
- Infiltration
- Farmer's assessment of each natural farming practice in terms of cost, labour, effectiveness.
- Farmer's perception of productivity under each natural farming practice
- Earthworm count
- Pest incidence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