



Food and Agriculture
Organization of the
United Nations



GLOBAL SOIL
PARTNERSHIP

12th Plenary Assembly

03-05 June 2024

Natural Farming Promotes Healthy Soils and Ecosystem Services: Case Study

Presenter: Dr. K S Varaprasad (In-person),
Mr. Vijay Kumar Thallam, Dr Tor-Gunnar Vagen, Dr Aparna Nunna (Online)
Moderator: Dr. Ramanjaneyulu G V





India's Soil Emergency



Deforestation

- Over 30 % (146.8 million ha) total land area- risk of soil erosion,
- Avg soil loss rate increased from 32.3 tons/ha/ yr in 1990 to nearly 62.7 tons/ha/ yr in 2020 (94 % rise)

Overuse of fertilizers and pesticides

- Nutrient imbalances , depleting Organic Matter and humus
- Decreased the beneficial soil microorganisms
- Altered soil pH, ultimately reducing soil fertility

Source: [Link 1](#), [Link 2](#), [Link 3](#)



Soil Partners' Day | 03-05 June 2024

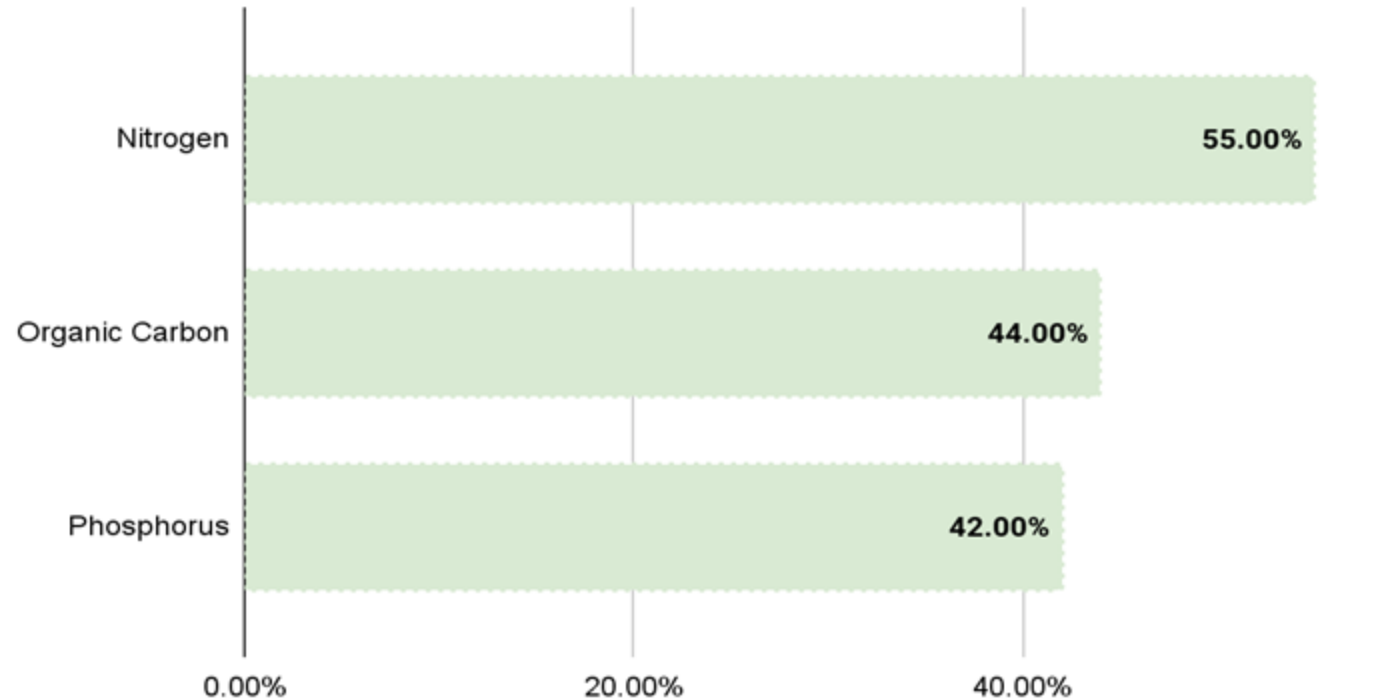




India's Soil Emergency



Soil Health Survey - 2019-20



- Est. 74 million tons of nutrients lost from the soil surface each year, (economic lost- about 68 billion rupees)
- Est. annual K losses - 20-40 kg/ha

Source: [Link](#)



Soil Partners' Day | 03-05 June 2024





India's Soil Emergency



Monocropping

Exacerbated soil degradation, - 52.8 million ha (47% of the total cropped area under monoculture) in 2015-16



Excessive water use

Waterlogging and salinization

India - 13th most water-stressed country – 256 - surpassed safe limit for groundwater extraction



Heavy Tillage

Disrupted soil structure and reduced water infiltration

Organic Carbon Content Fell From 1% To 0.3% in 70 Years



Overgrazing

Increased soil compaction & loss of natural nutrient



Source: [Link 1](#)

Soil Partners' Day | 03-05 June 2024





India's Soil Emergency



Nutrient	Decline in Concentration	Period	Impact on Crops
Zinc (Zn)	30-33%	1960s-2010s	Lower concentration in rice and wheat grains
Iron (Fe)	19-30%	1960s-2010s	Lower concentration in rice and wheat grains
Calcium (Ca)	30-45%	1960s-2010s	Lower concentration in rice and wheat grains
Protein	Significant decline	2000s-2020s	Reduced protein content in rice
Vitamins (B1, B2, B5, B9)	Significant decline	2000s-2020s	Reduced vitamin content in rice

Soil organic matter: In many regions, such as Punjab, Haryana, and Western Uttar Pradesh, is as low as 0.1% with increased soil salinity

Source: [Ranjan et 2015](#), [Pradeep and Pradeep, 2020](#), [SharmiLa 2023](#), [Shagun 2024](#)

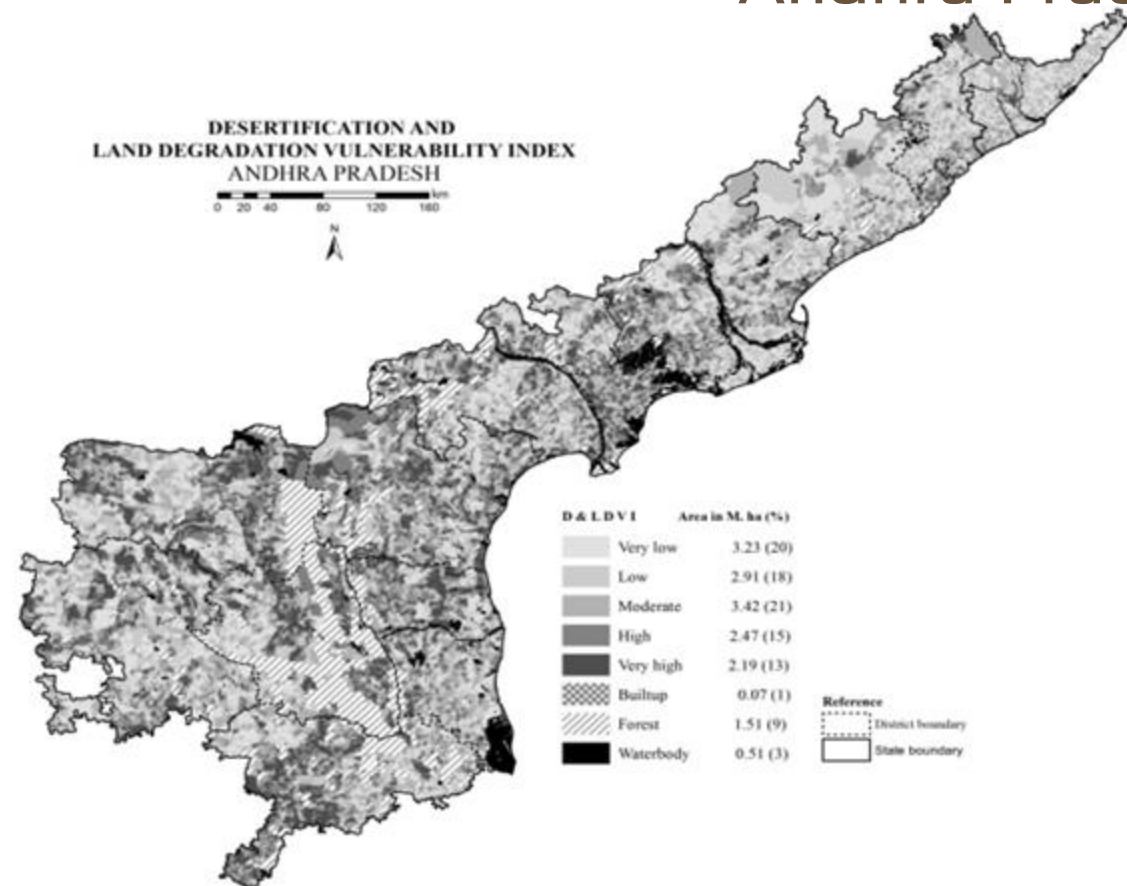


Soil Partners' Day | 03-05 June 2024





Desertification & Land degradation (DLD) Status in Andhra Pradesh



Severity of DLD vulnerability in AP	Area (M ha)	Area (%)
Very Low	3.23	19.7
Low	2.91	17.8
Modernate	3.42	20.0
High	2.47	15.1
Very High	2.19	13.4

Desertification and land degradation vulnerability index map of Andhra Pradesh

Source: [Link](#)

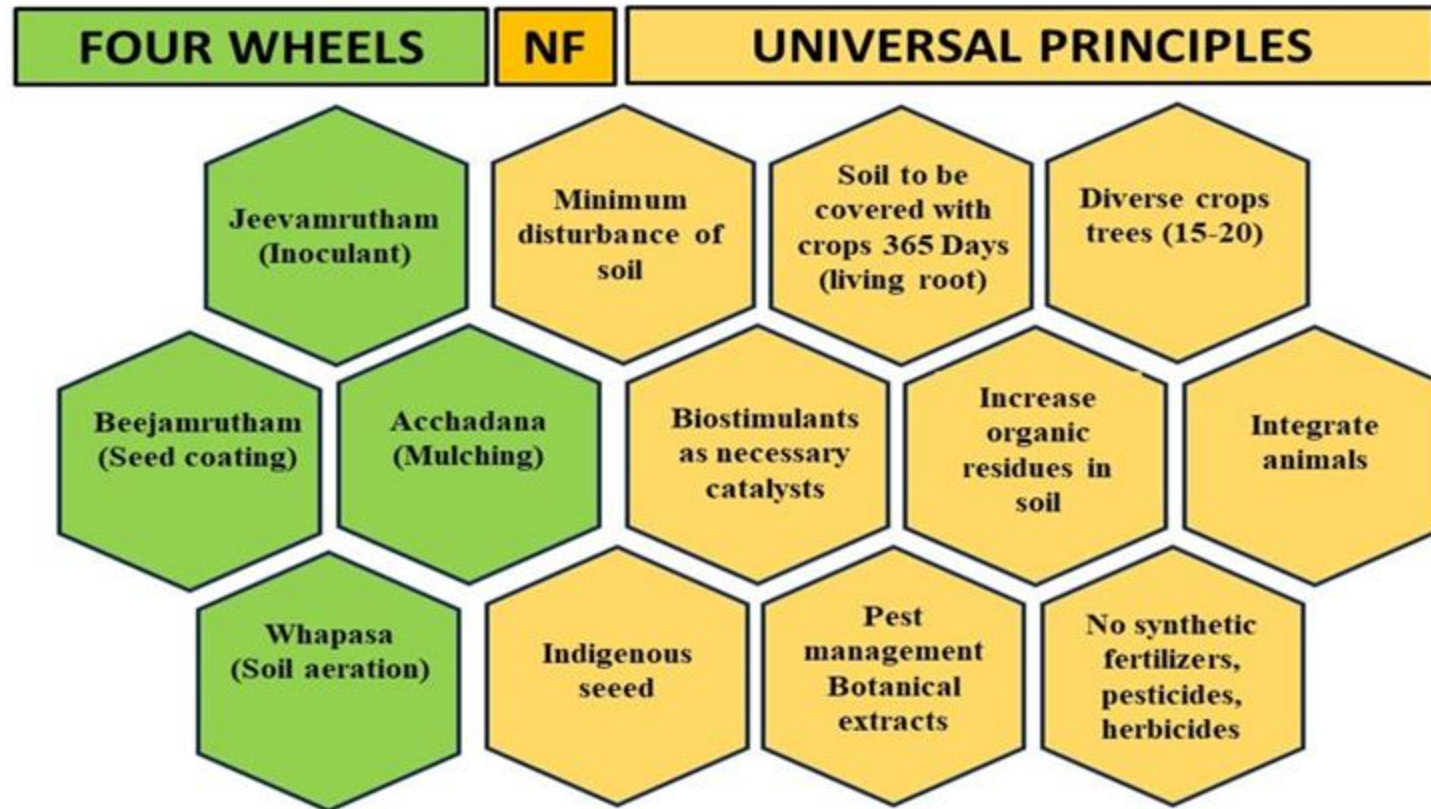


Soil Partners' Day | 03-05 June 2024





Natural Farming (NF) a viable alternative to overcome soil health emergency



PMDS/ Polycropping feeds the soil microbes

Soil Partners' Day | 03-05 June 2024





APCNF Programme – A People’s Movement



86% - small and marginal farmers.
1 ha per capita

Whole village concept – all farmers and all farms

27 % of villages
14 % of farmers
6.3 % of area

30 % villages
17 % of farmers
8.1% of area

32 % villages
21 % of farmers
10.3 % of area

40,656 farmers
704 villages
2016-17

480,000 farmers
3730 villages
220,000 Ha
2020-21

851,000 farmers
3730 villages
378,000 Ha
2022-23

10,37,000 farmers
4120 villages
486,000 Ha
2023-24

12,50,000 farmers
4400 villages
620,000 Ha
2024-25
Target

Largest Natural farming programme in the country, in terms of farmers enrolled.

The transition of a farmer – 3 to 5 years; No cash incentives during the transition, and no promises of market premia after the transition



Soil Partners' Day | 03-05 June 2024





NF Case Studies



Soil Partners' Day | 03-05 June 2024

Case Study on “Land Degradation Surveillance Framework” (LDSF) in the AP Engagement Landscape

- Provide a baseline of soil and ecosystem health across Andhra Pradesh.
- Produce landscape-level maps of soil health and land degradation measures for targeted management interventions.
- Assess the impact of APCNF and other agricultural practices on key indicators of soil and land health.

Districts:

- Guntur
- Anantapur
- Nellore
- West Godavari

What is an engagement landscape?
Engagement landscapes are geographical locations where we carry out concentrated, long-term work to support transformation and enhance resilience. Included in engagement landscapes are:

- Partners who are interested in collaboration and engagement, because they see themselves as benefiting from or contributing to generating opportunities for themselves, their organisations or their communities.
- Different types of land-uses, agroecological zone and climates.
- Multiple layers of governance.
- Diverse groups of stakeholders, from farmers to governmental and non-governmental partners to value chain actors etc.

There is the opportunity to establish engagement landscapes as **‘participatory living laboratories’** for agroecological transformation in the State to scale climate resilient forms of agriculture that result in natural carbon capture, improved resilience including enhanced soil health and greater water-use efficiency while having a positive impact on rural livelihoods.

What is an exemplar landscape?
Exemplar Landscapes are smaller geographic areas within the Engagement Landscape where focused work can take place

- Common land and landless people
- Linkages between urban and rural areas
- Differing socio-economic and cultural aspects, health and nutrition status
- Ecosystem services
- Varying value chains and collectives

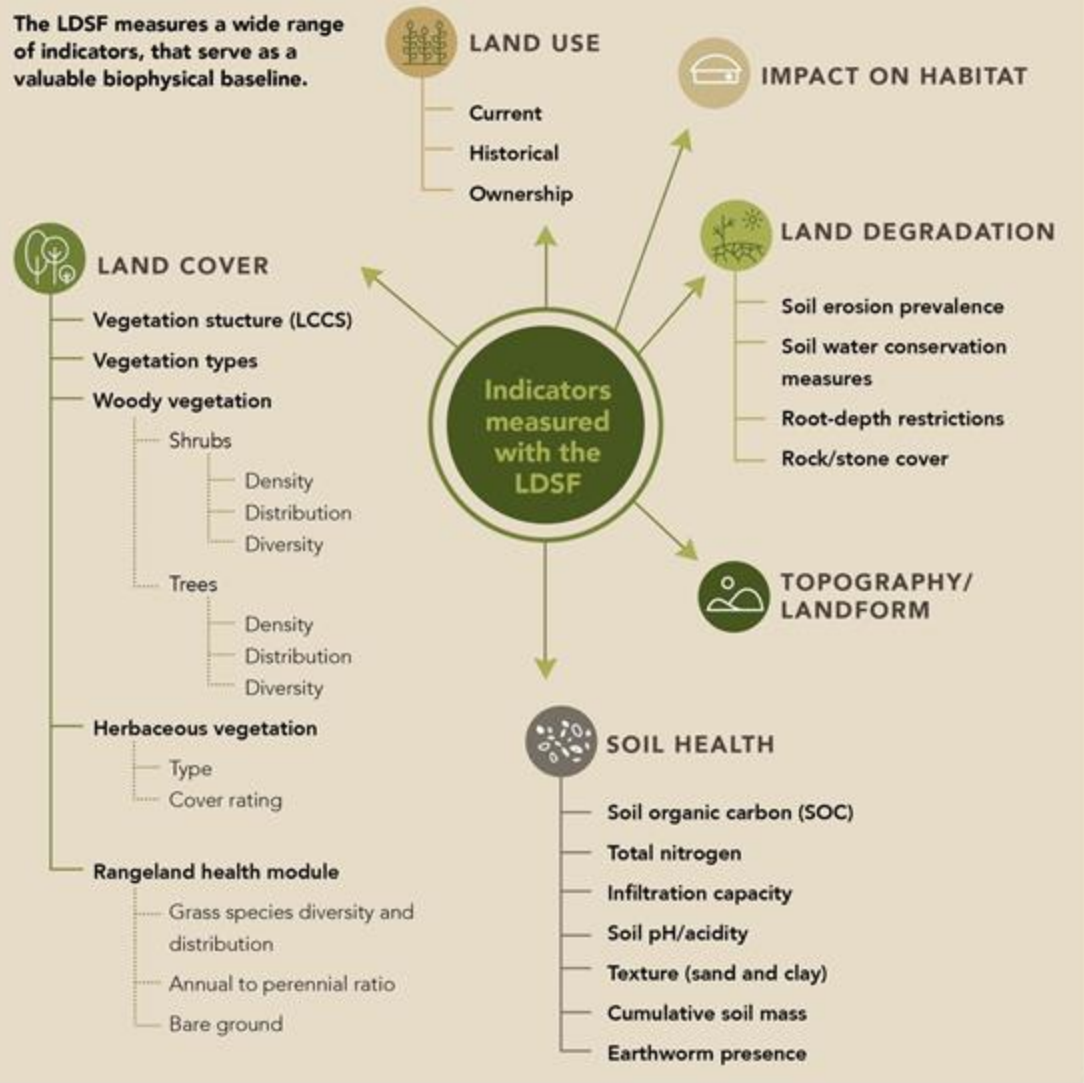
World Agroforestry



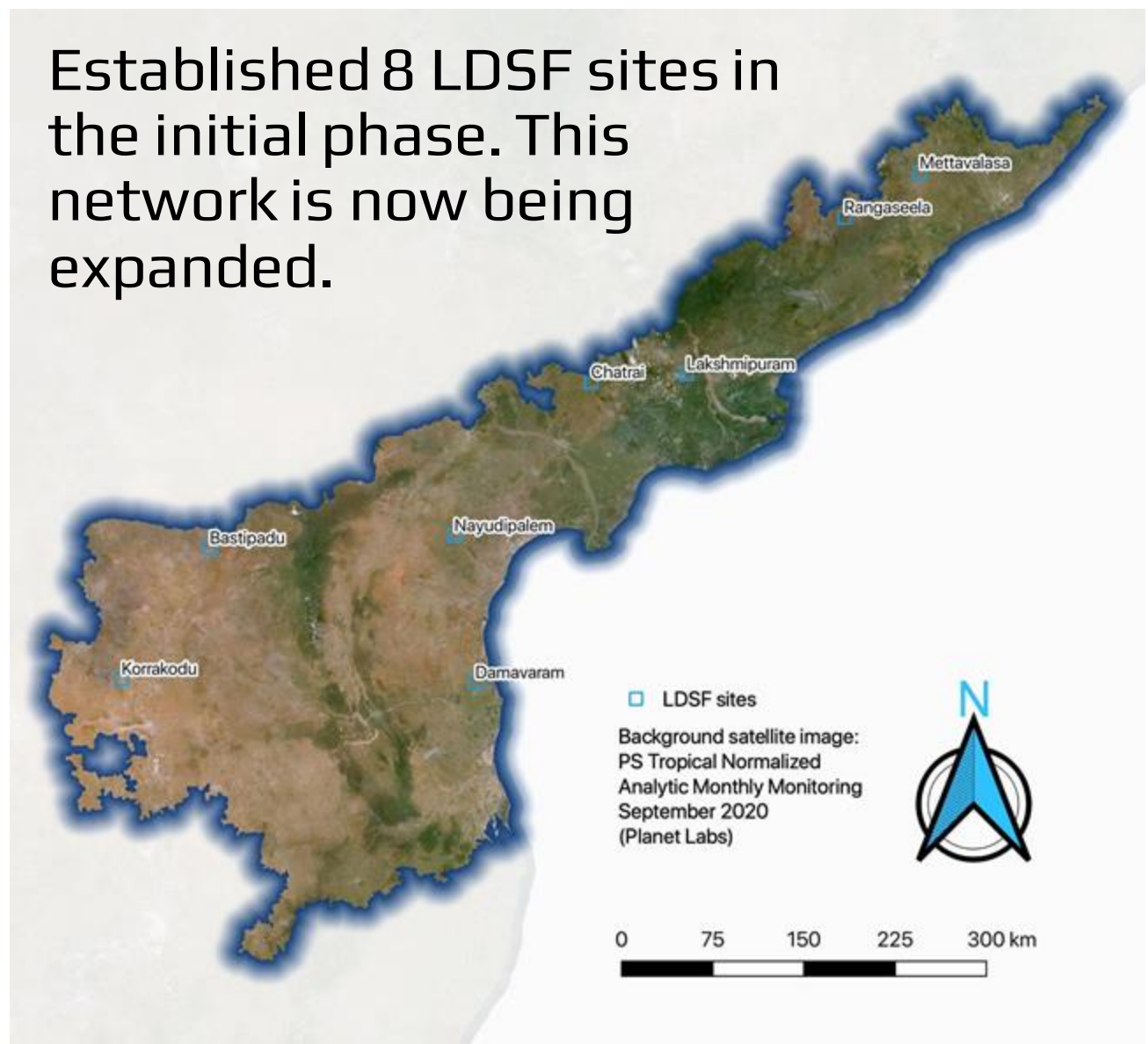
Soil Partners' Day | 03-05 June 2024



The LDSF measures a wide range of indicators, that serve as a valuable biophysical baseline.



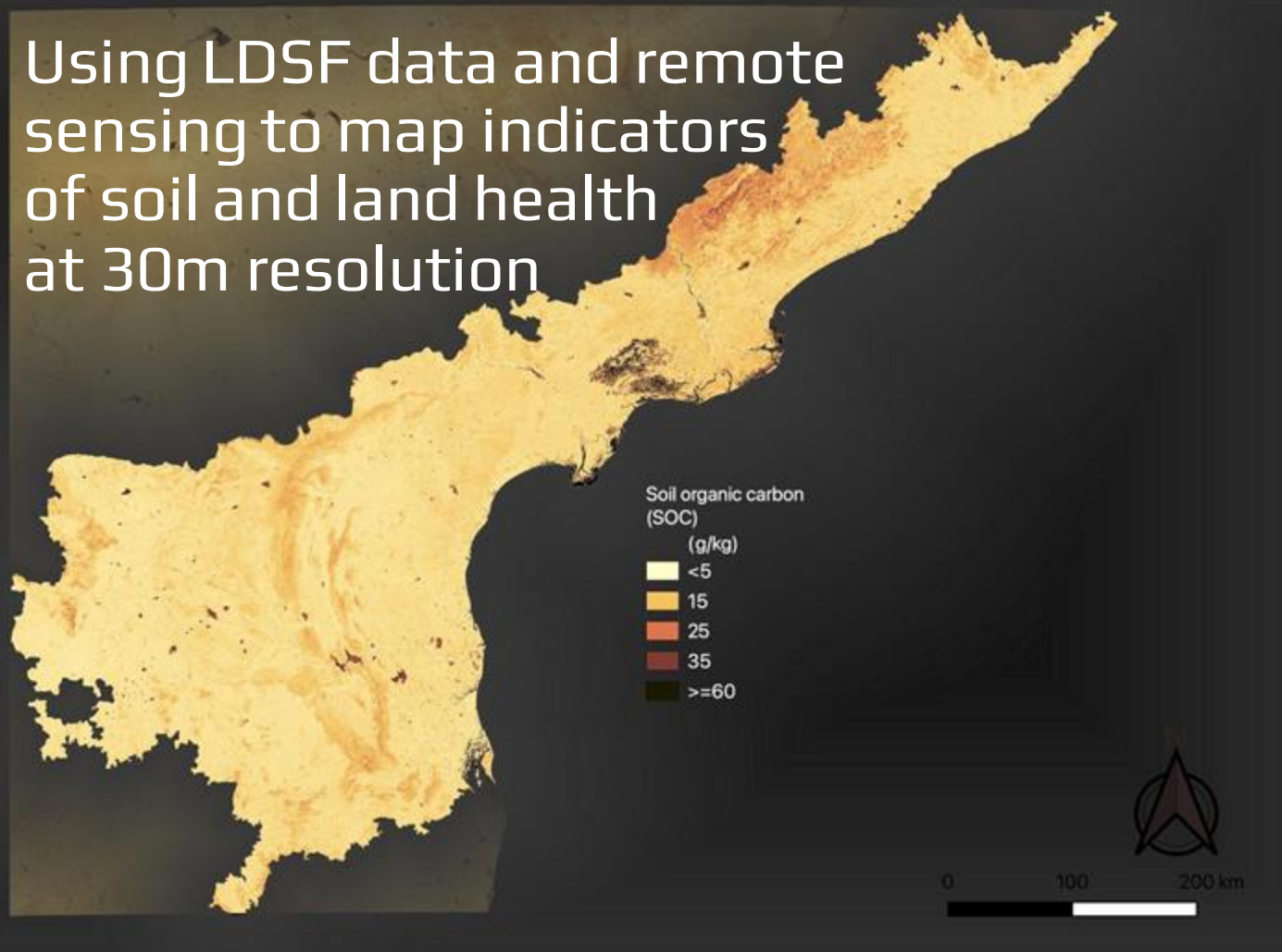
Established 8 LDSF sites in the initial phase. This network is now being expanded.



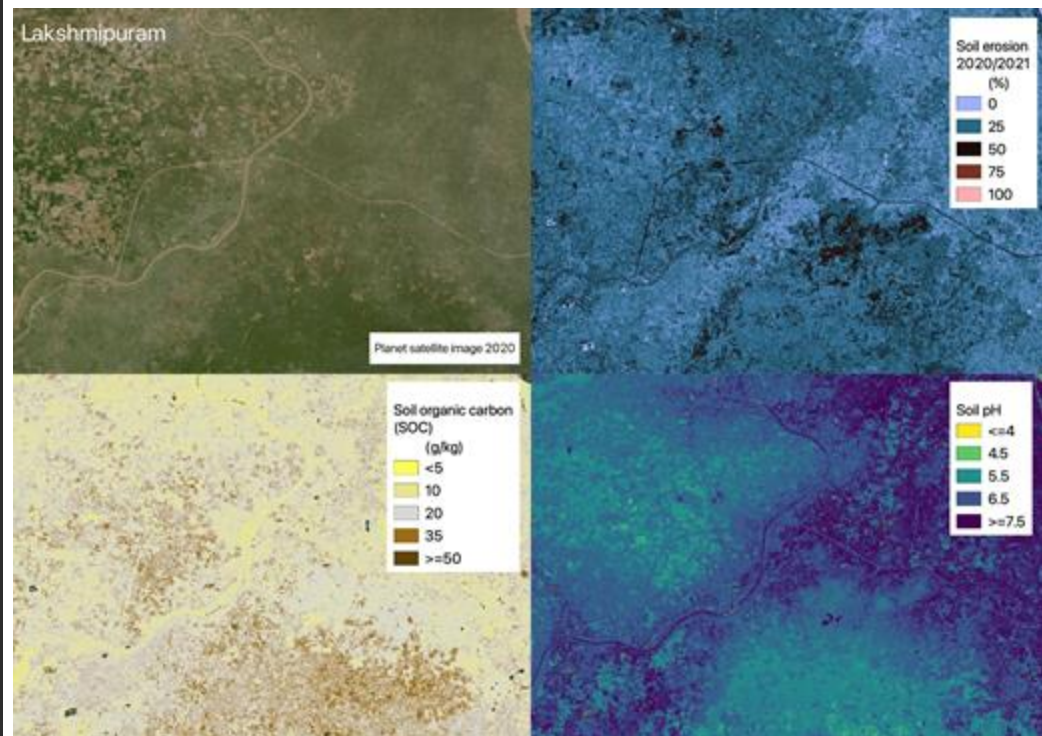
Soil Partners' Day | 03-05 June 2024



Using LDSF data and remote sensing to map indicators of soil and land health at 30m resolution



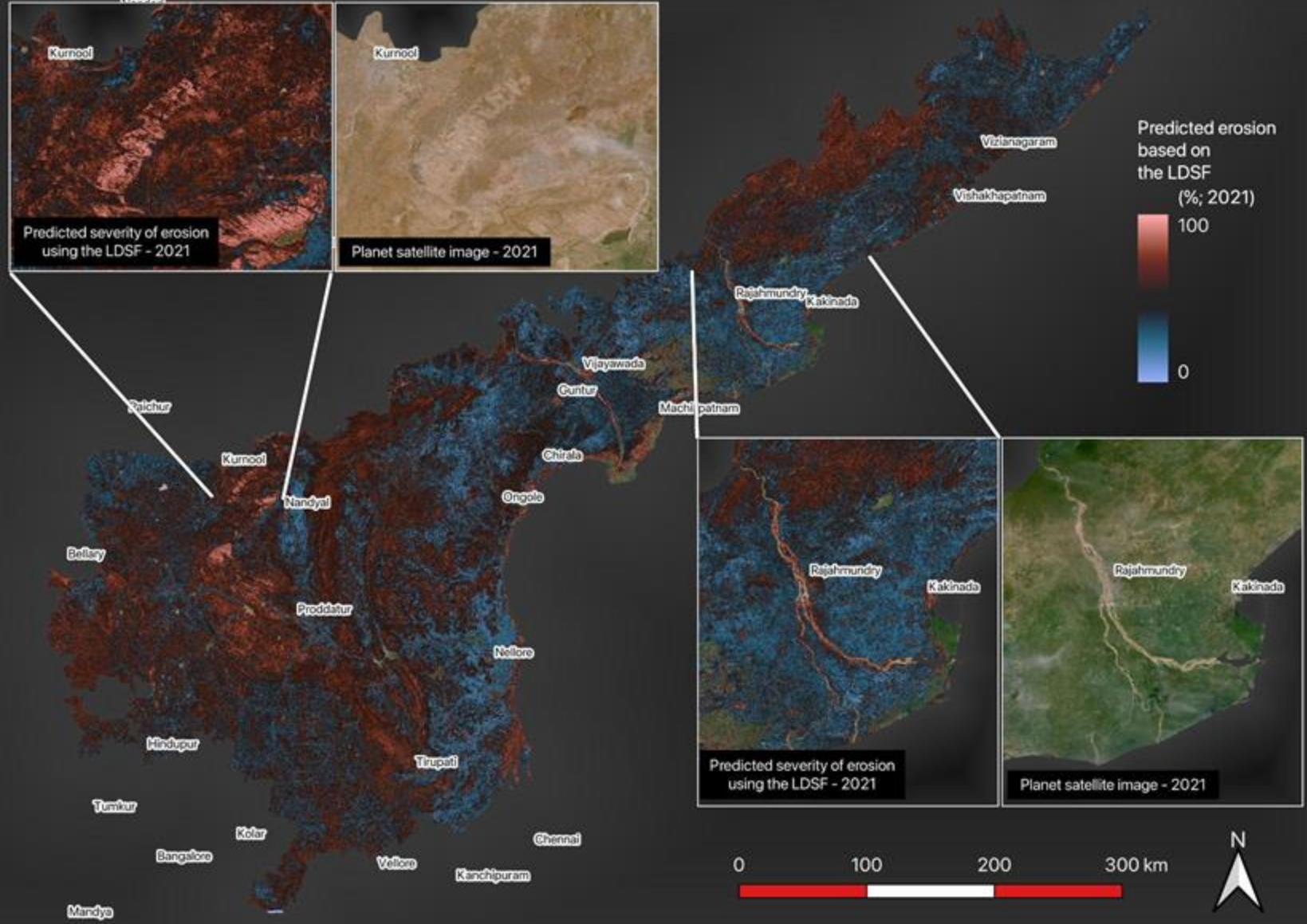
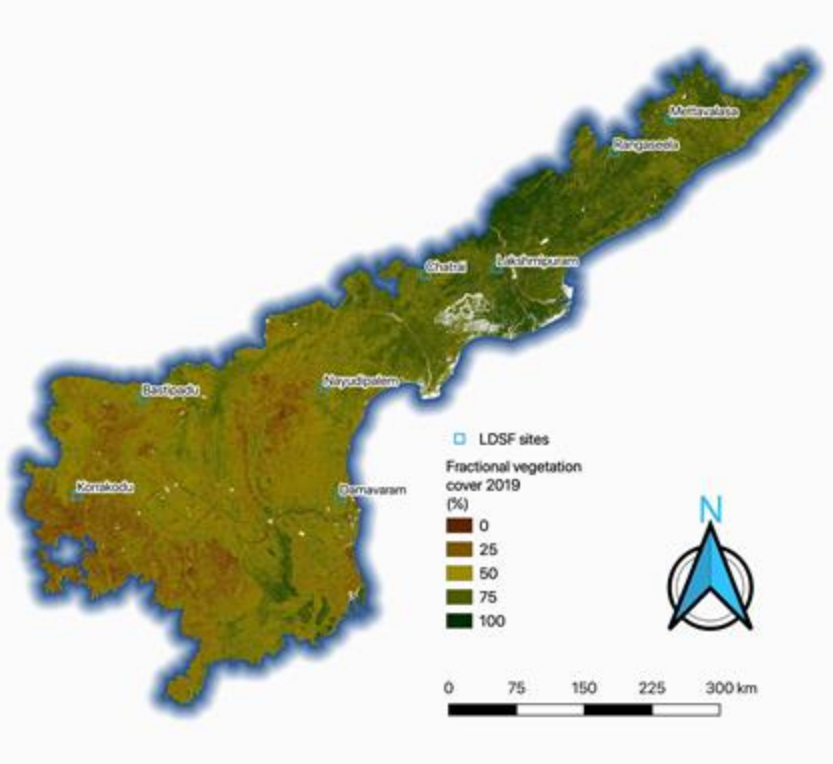
Mapping of soil and land health



Soil Partners' Day | 03-05 June 2024



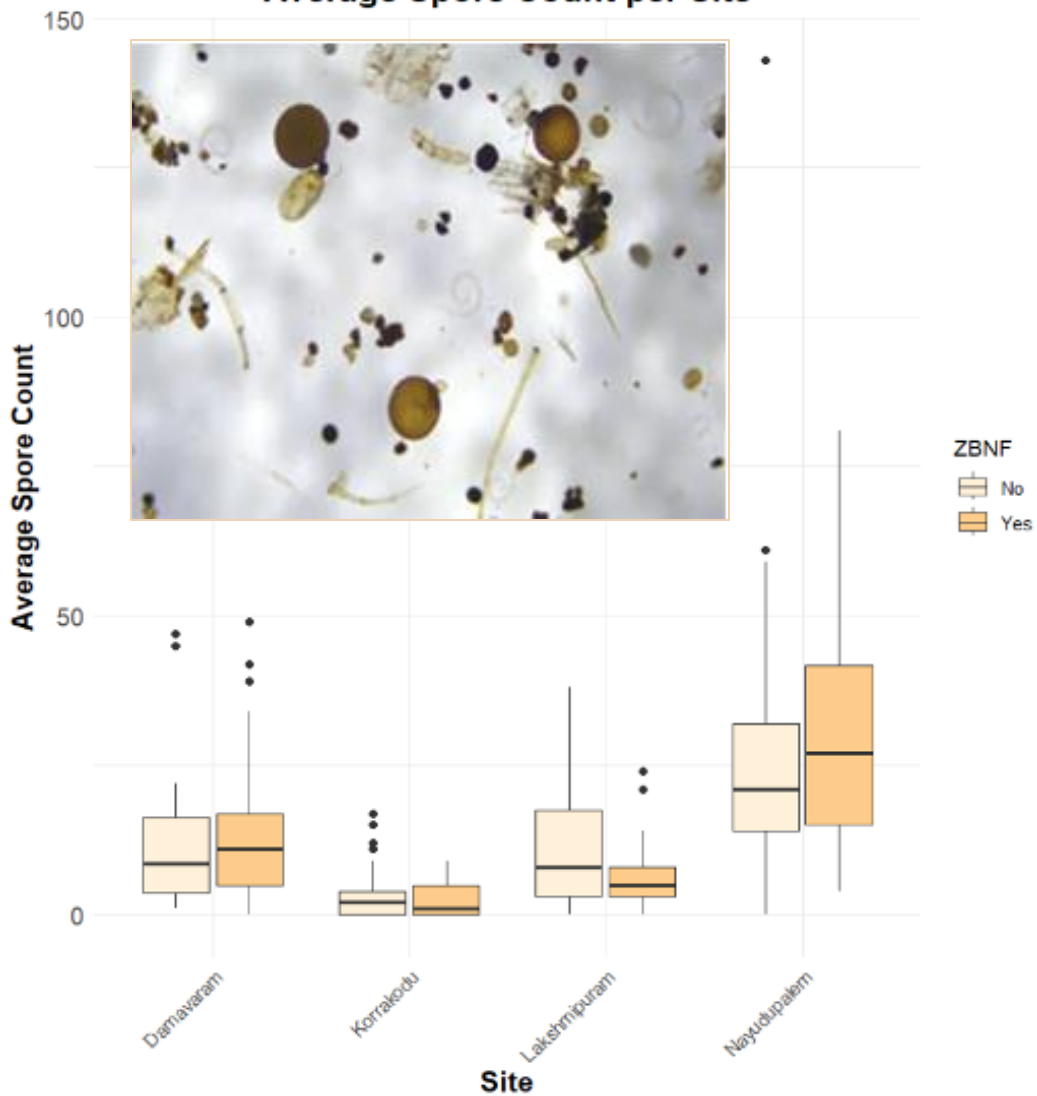
Spatially explicit assessments allow us to compare multiple indicators across sites/landscapes and over time.



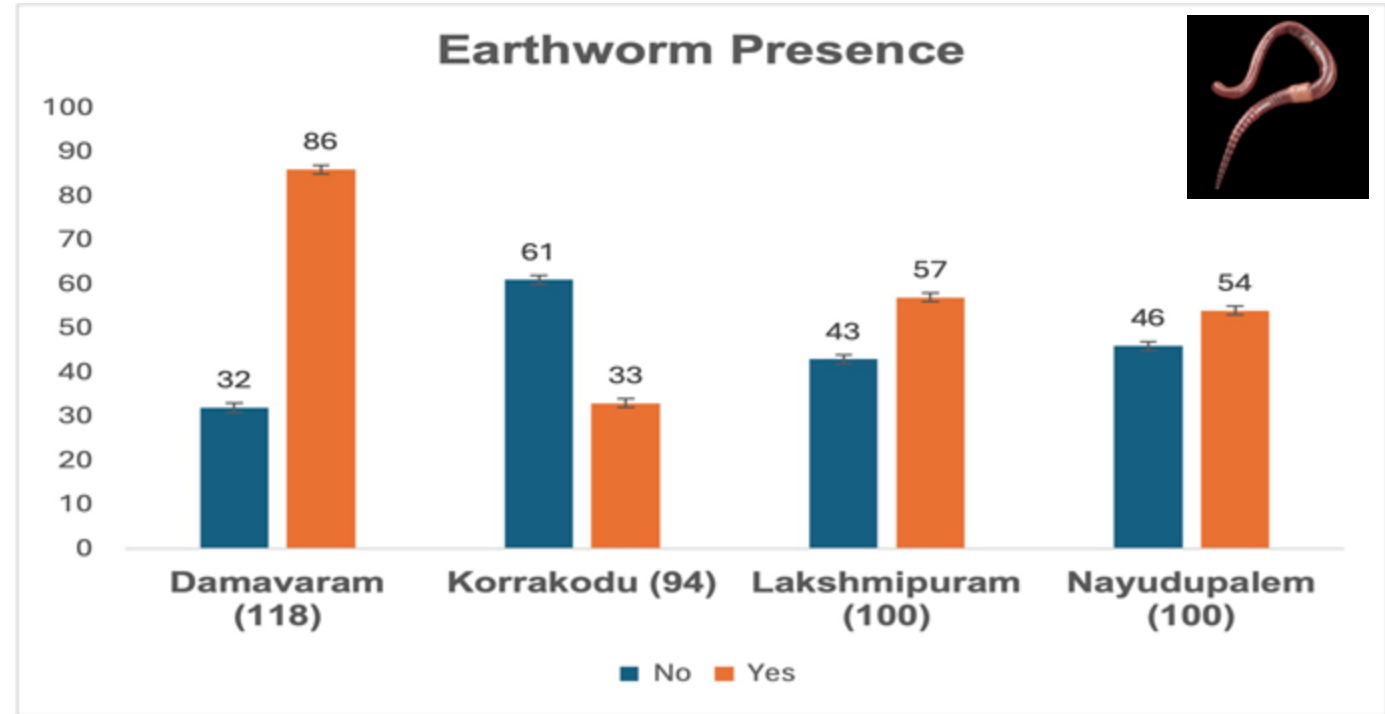
Soil Partners' Day | 03-05 June 2024



Average Spore Count per Site



- 217 total plots.
- 184 plots were non-APCNF.
- Higher counts of earthworms in Damavaram.
- Higher AMF abundance in Nayudupalem and Damavaram.

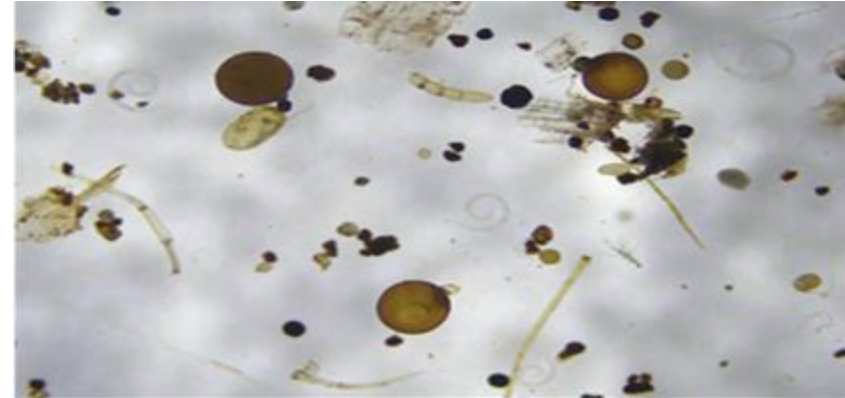


Soil Partners' Day | 03-05 June 2024





Case Study- Highest earthworm and AM Spore abundance in APCNF, LDSF site



Soil Partners' Day | 03-05 June 2024





Case Study : Evidence on Soil Health Improvement



Farmer details

P. Ram Mohan (Maripally, Allagadda, Nandayala, Soil - Black), > 6 yrs Practice



Soil Partners' Day | 03-05 June 2024

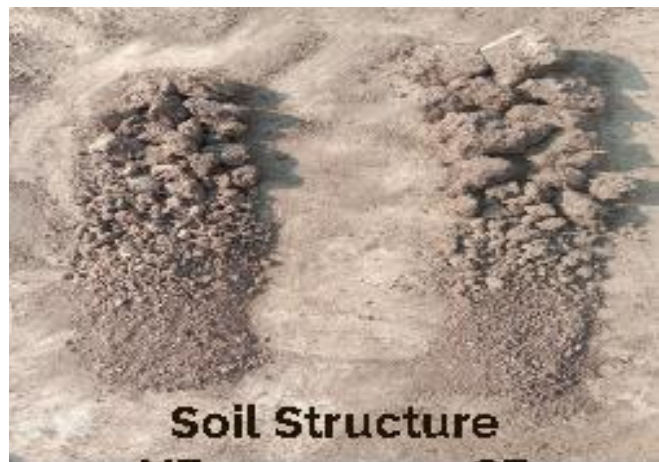




Case Study: APCNF Soil Vs CF Soil



Name of the Farmer & Details	CF , Venkataramana (Rudravaram, SN Padu/ Prakasam - Black cotton soil)	NF , Challa Meenamma (Rudravaram, SN Padu/ Prakasam) (>3 years, PMDS & All POPs - Black cotton soil)
------------------------------	---	--



Soil Structure
NF CF



Soil Texture
NF CF



Soil Porosity
NF CF



Soil Partners' Day | 03-05 June 2024





Case Study : APCNF Soil Vs CF Soil



Soil Colour
NF CF



No Earthworms

Earthworms
NF CF



Mottles
NF CF



Surface Crusting
NF CF



Soil Partners' Day | 03-05 June 2024





Case Study: Resilience to Cyclone due to Better Soil health



Hundreds of thousands of small and marginal NF practicing farmers saved from the complete disaster from Michaung cyclone (2023)



NF crops in the Palnadu, NTR, East Godavari, West Godavari, Eluru, Bapatla, Konaseema, Krishna, Prakasam, Guntur, and Kakinada districts of Andhra Pradesh shows better crop stand with good root growth due to the healthy soil condition and withstood crop lodging compared to CF Crops.



Soil Partners' Day | 03-05 June 2024





APCNF Innovations | Farming Plans | Customization



Soil Partners' Day | 03-05 June 2024



APCNF MOVEMENT NF INNOVATION: A Solution to Soil Health Improvement - Pre Monsoon Dry Sowing (PMDS)



Navadhanya

Seed Pelletization



PMDS field

- Tolerate high temperatures and germinate with low
- If no moisture, seeds survive in soil for 6 months and germinate when water is available.
- Mulch acts as catalyst - harness the water vapor from atmosphere - percolation of dew into the soil.
- Crops - Green manure - enriching the soil.
- Also, provide additional income, food for their families, and livestock
- Legumes species improve ecosystem functions
- Overall, improves soil fertility, aid carbon sequestration, and reduction of GHG emissions

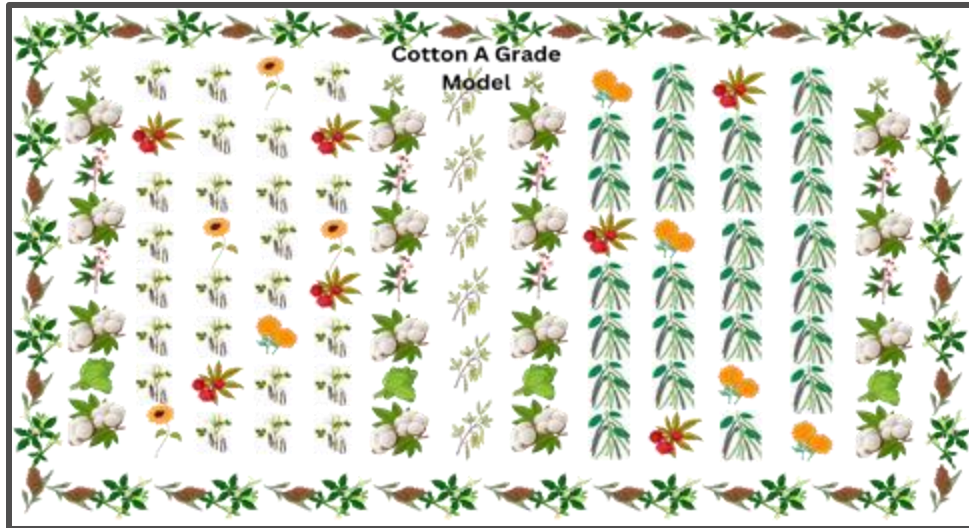


Soil Partners' Day | 03-05 June 2024





A Grade Model



Blackgram, Greengram, Cowpea, Redgram

Sunflower, Safflower, Clusterbean, Fieldbean, Sesamum, Castor, Marigold, Vegetables, Leafy vegetables

- Promote biodiversity, soil health, and environmental conservation.
- Primary crops: One time income, Secondary crops: Cash Flow, Biodiversity crops: Sustainability
- Pest and Climate resilience
- Developed customized models for various cropping systems in Andhra Pradesh

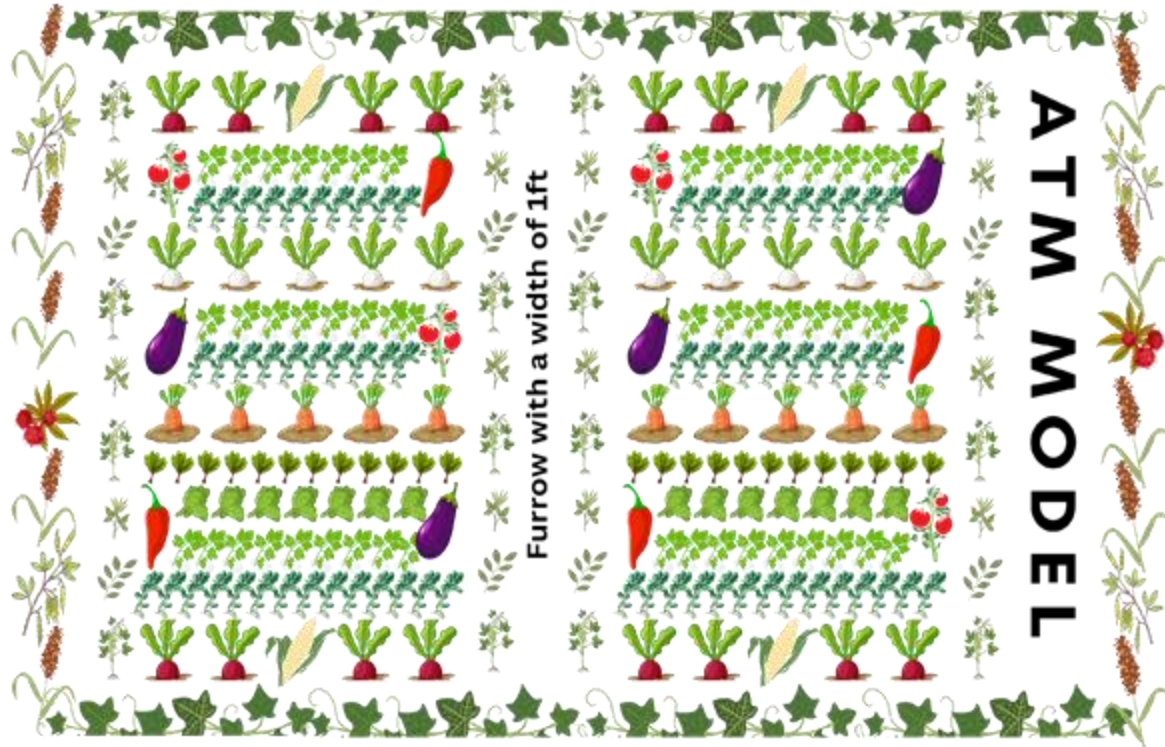


Soil Partners' Day | 03-05 June 2024





ATM Model



Suitable for small farm holders (20 -30 cent)

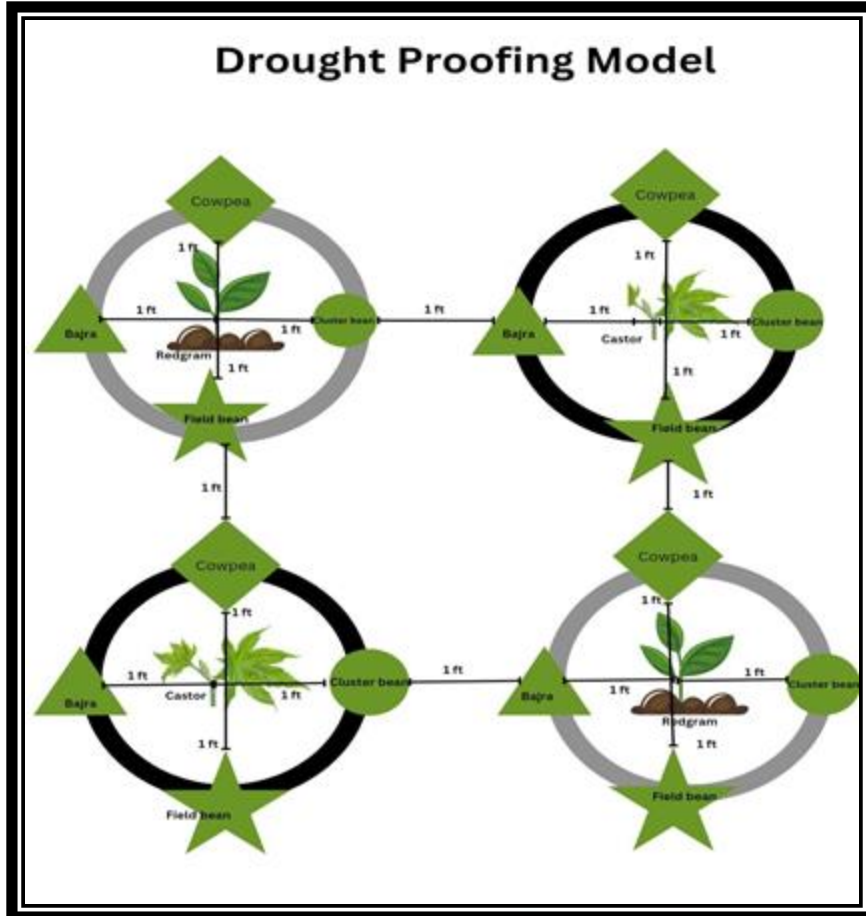


Soil Partners' Day | 03-05 June 2024





Drought proofing model : Conversion of barren lands to cultivable lands



- ◆ Cowpea
- ▲ Bajra
- ★ Field Bean
- Cluster Bean



- Enhances resilience against drought
- Relevant in arid and semi-arid regions
- Strategic selection and arrangement of crops
- Resilient and hardy crops (Red gram and castor), which are known for their deep root systems and perennial nature.



Soil Partners' Day | 03-05 June 2024





Five Layer Model



- Layer 1** → Trees of 7000 to 1200 ft like coconut, mango, jamun, jack fruit, sapota, wood apple, teak, coconut, palm tree, banyan, tamarind or cashew with a minimum spacing of 12 meters.
- Layer 2** → Medium sized tress (5400 to 7000 ft) like mosambi, dwarf mango, santra, papaya, lemon, guava, orange, banana, arecanut, perennial drumstick are planted with a minimum spacing of 6 meters.
- Layer 3** → Trees of length from 3700 to 5400 ft and they are seethaphal, perennial curry leaves, perennial castor, Perennial red gram, beetle vine or black pepper with a minimum spacing of 3 meters.
- Layer 4** → Plants from size 1800 to 3700 ft in length and they are mostly leafy vegetables or spice plants.
- Layer 5** → Plants up to 800 ft in length such as creepers, bulbs like onion and garlic, tubers like potato, sweet potato, yam, carrot and beet root



Soil Partners' Day | 03-05 June 2024





Five Layer Model



Mimicking the natural (forest ecosystem) | Five different horticulture crop species
| Maximizes the utilization of land | Optimize resource utilization.

Advantages of 5 Layered Model

- Efficient land utilization
- Sun light harvesting
- Conservation of biodiversity and natural ecosystems
- 365 Days Green Cover with perennial layers- sequester the carbon
- Improve soil structure
- Increases water holding capacity
- Raise in Ground water table
- Improved micro-climate
- Chemical residue free food, & fodder with diverse nutrient
- Better livelihood of farmer

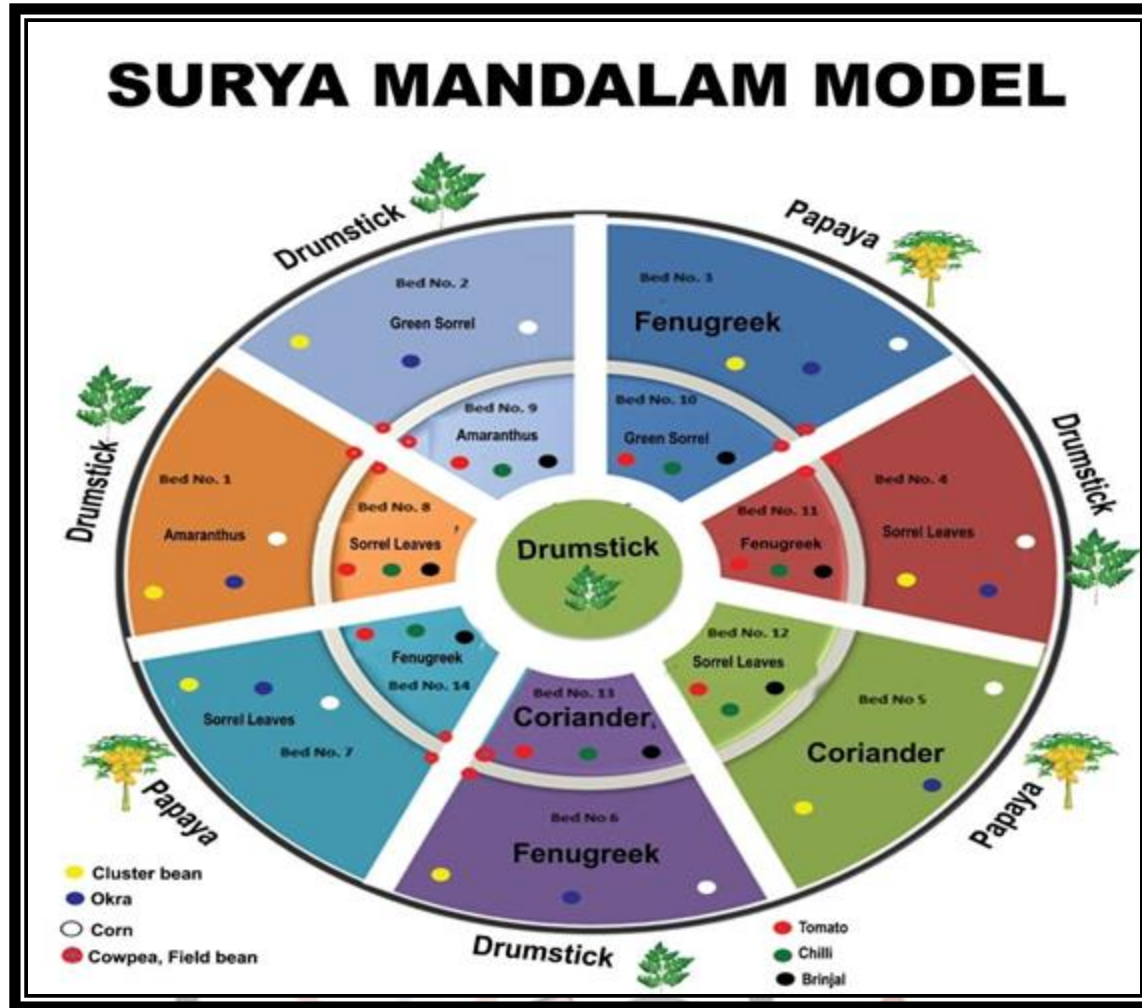


Soil Partners' Day | 03-05 June 2024





Nutri-Garden Model / Surya Mandal model



Soil Partners' Day | 03-05 June 2024





Future strategies



- ❑ Shifting towards sustainable food systems
- ❑ Focus on agroecological, regenerative farming methods
- ❑ Exploring Emerging Research Areas in Natural Farming/ Sustainable Agriculture:
 - ❑ Increasing above and below-ground biodiversity | Seed microbiome | Trichomes | Mycorrhizae | Biochar
- ❑ Upscaling Natural Farming: Collaboration and Networking | Policy Integration | Market Support | Monitoring and Evaluation | Technological Aids | Aligning with SDGs



Soil Partners' Day | 03-05 June 2024





Our team/ acknowledgement



Mr. Vijay Kumar
EVC, RySS



Mr Lakshman Naik
CTIO, RySS



Dr Varaprasad
Advisor,
RySS - IGGAARL



Dr. Ramanjaneyulu
ED, CSA



Dr Tor Vagen
PS, ICRAF



Mr Vishy Teki
TL-Com., RySS



Dr. G. Varalaxmi
SA,
RySS-IGGAARL



Dr Vinutha
RA



Dr. Aparna N
PLA,
RySS-IGGAARL



Ms Sandhya V
PLA,
RySS-IGGAARL



Ms Chinmaie
RA



Soil Partners' Day | 03-05 June 2024





ks.varaprasad@apaari.org
RySS link: <https://apcnf.in/ryss/>

THANK YOU

*Let us move steadily into a transformed paradigm of
Natural farming- Better soil-crop-human-planet- well being*

GLOBAL SOIL

*This borrowed earth needs to be returned in a better shape to our
children....*





RySS-IGGAARL on soil Health



Farmer-led Participatory Research, Evidence, Knowledge & Learning through innovation and experimentation | Democratized, Localized, Customized

4-year Bachelor's degree in natural farming – A flagship program ; Offered to NF practitioners – farmers/tenants/farmworkers or their children - Cadre/Potential Farmer Scientists/ Educated Young Practitioner



Sustainable ways | Climate-resilient Villages | Knowledge Repository | Network



Soil Partners' Day | 03-05 June 2024

