# Farmers' prosperity, food and nutrition security for all and environment health in the context of climate emergency – learnings from APCNF

## 6th Nov, 2024 – MCR HRD Institute - Special Foundation course for AIS and CCS Officers

## Andhra Pradesh Community Managed Natural Farming (APCNF)

## Vision 2035 - all 60 lakhs farmer households, and 20 lakhs farm worker households


**Vijay Kumar Thallam, Executive Vice Chairman, RySS**

**Advisor to Govt, Agriculture and Coop Dept, Govt of A.P**

# APCNF programme – a people's movement

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

**Whole village concept – all farmers and all farms**

**2016-17**
40,656 farmers
704 (v)

**2020-21**
480,000 farmers
3730 (v)
220,000 Ha

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

**2022-23**
851,000
farmers
3730 (v)
378,000 Ha

30 % villages
17 % of farmers
8.1% of area

**2023-24**
10,37,000
farmers
4120 (v)
486,000 Ha
352,000
landless farm workers

**Target**

32 % villages
21 % of farmers
10.3 % of area

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

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

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

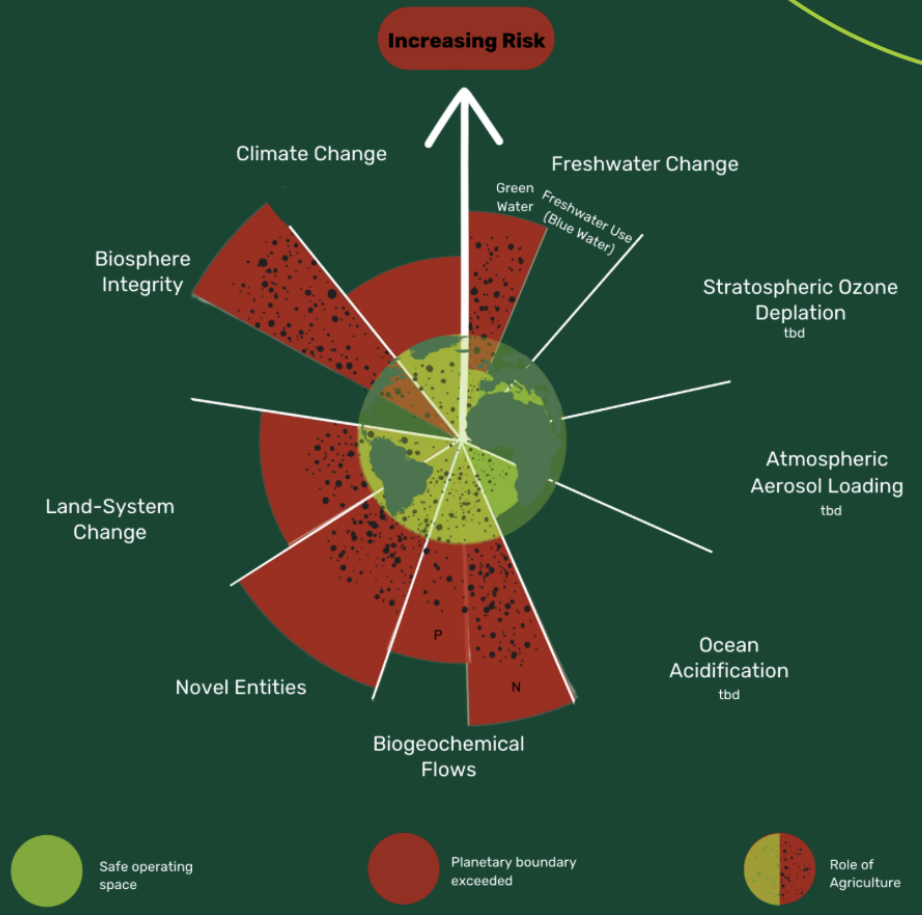
Funds: Govt – PKVY, NMNF, KfW
Grants: Azim Premji Foundation, Co Impact

# THE WHY ?
# The climate emergency and global ‘meltdown’

Reason Why

## The current agri-food system is the greatest cause for the degradation of our planetary health

Additionally, in regard to human and animal health, crops have greatly reduced their antioxidants, micro- and phytonutrients due to modern genetics, agricultural practices, and degraded soil health underlying health issues such as obesity, cardiovascular diseases, cancers and diabetes.




Own figure based on Wang-Erlandsson et al. 2022; Persson et al. 2022; Steffen et al. 2015, Campbell et al. 2017; Kovac & Kravic 2023.

## India’s soil emergency

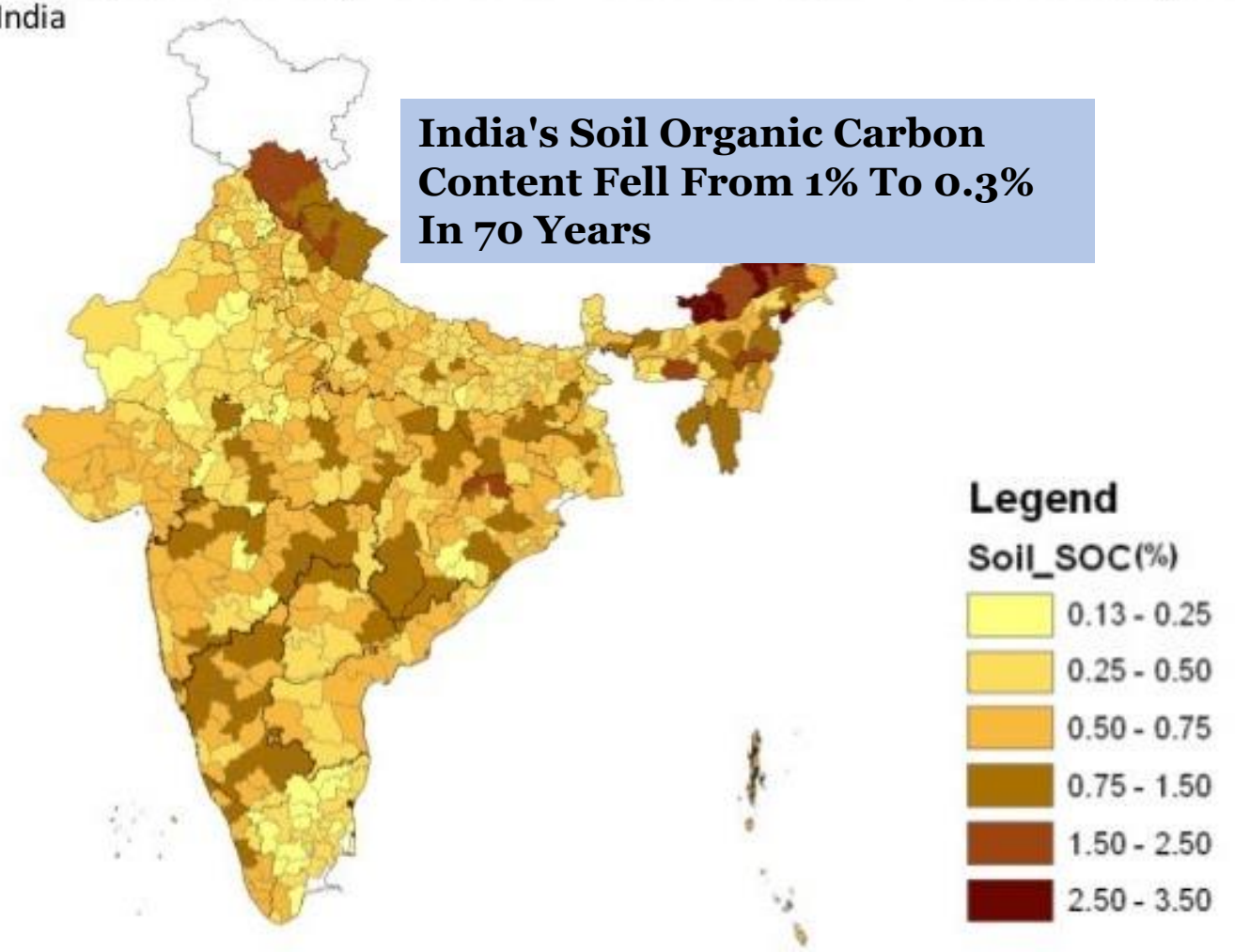
The world loses 24 billion tons per year. India is losing 5 billion tons of soil per year - 16 tons of soil per hectare per year

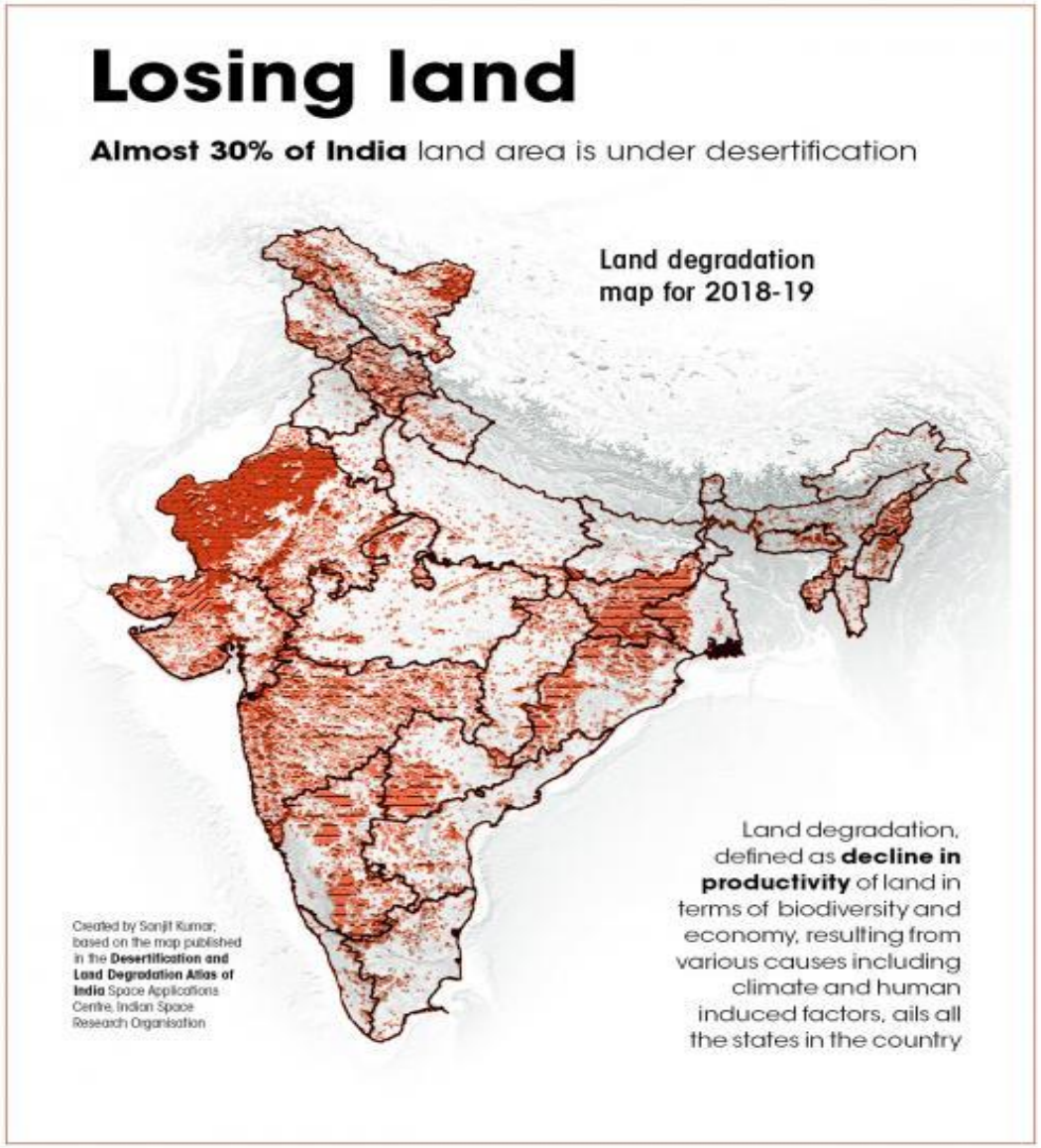
With 2.2% of the World’s landmass, India is losing 21% of the annual loss of soil

# Soil Health - Current status

Map depicts the soil organic carbon % in the 0-20cm depth in all the rice ecologies of India

**India's Soil Organic Carbon Content Fell From 1% To 0.3% In 70 Years**




**Soil health in India is deteriorating fast on key indicators - nutrients, SOC, soil moisture, soil porosity, etc.**

# India’s water emergency

India has 16 per cent of the world’s population, but the country possesses only 4 per cent of the world’s freshwater resources.

70% water is used for irrigation worldwide, but it is 84% in India.

# Fertiliser use – 1970 to 2016

## Five Decades of India's Agriculture

| Parameter | 1970-1971 | 1980-1981 | 1990-1991 | 2000-2001 | 2011-2012 | 2016-2017 |
|---|---|---|---|---|---|---|
| Net Sown Area (M ha) | 140 | 140 | 143 | 141 | 141 | 141 |
| Gross Sown Area (M ha) | 165 | 172 | 186 | 185 | 196 | 198 |
| Net Irrigated (M ha) | 31 | 39 | 48 | 55 | 66 | 68 |
| Fertilizer Use Nutrients (Mt) | 2.2 | 5.5 | 12.5 | 16.7 | 27.8 | 25.9 |

Increase in per hectare Fertiliser consumption:
13.0 kgs/ha in 1970 to 130 kgs/ha in 2016.

# Decline in nutrition values over time – a study from U.K

The level of every nutrient in almost every kind of food has fallen between 10 and 100%.

**Consumption of food for Mineral Requirement in an individual - study from U.K**

**1940**

Meat
Fruits
Vegetables

**1991**

Meat × 2
Fruits × 3
Vegetables × 5

**U.K - Mineral depletion in vegetables**
**1940 - 1991**
**Average of 27 kinds of vegetables**

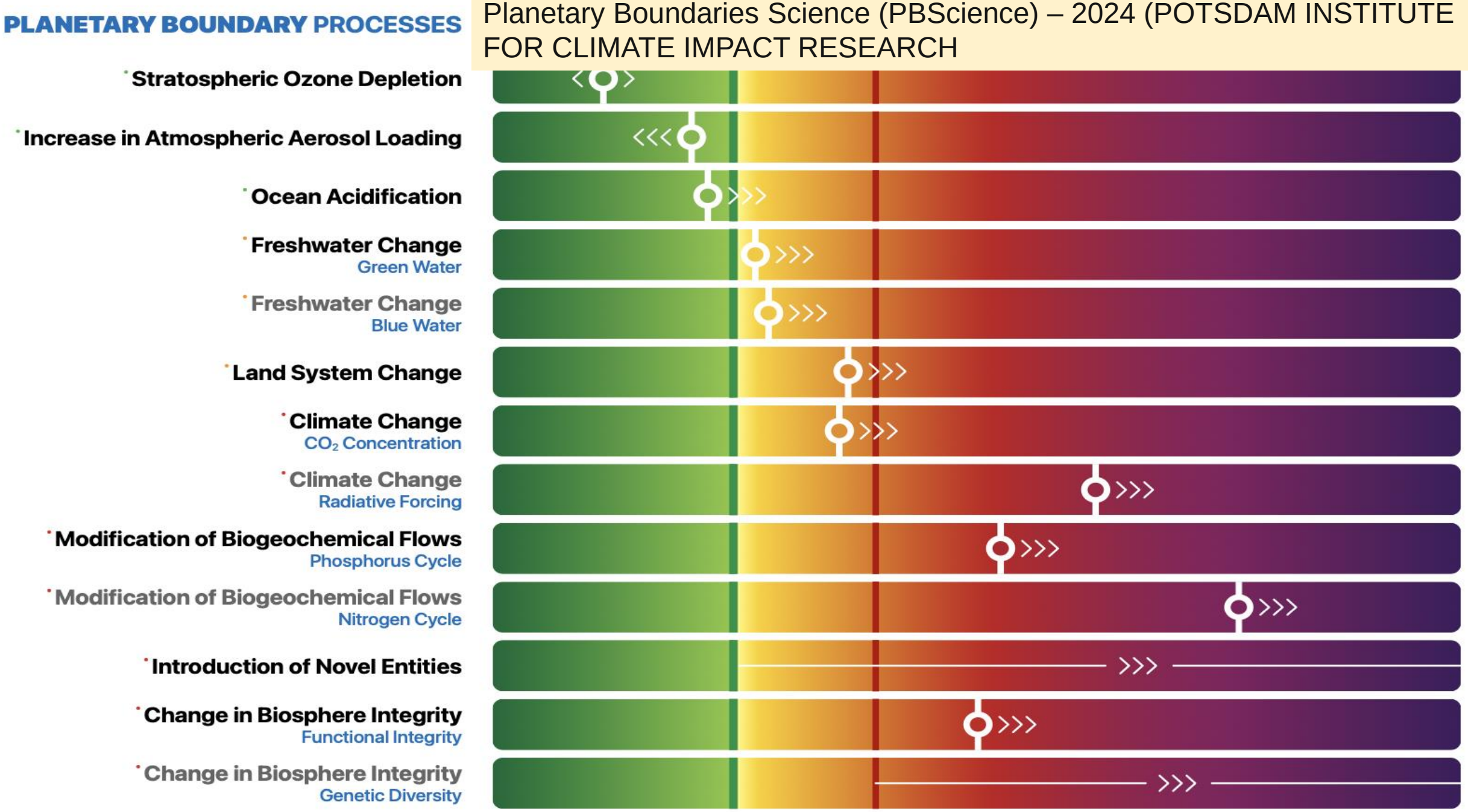
- ν Copper - declined by 76%
- ν Calcium - declined by 46%
- ν Iron - declined by 27%
- ν Magnesium - declined by 24%
- ν Potassium - declined by 16%

**U.K - Mineral depletion in meat**
**1940 - 1991**
**Average of 10 kinds of meat**

- ν Copper - declined by 24%
- ν Calcium - declined by 41%
- ν Iron - declined by 54%
- ν Magnesium - declined by 10%
- ν Potassium - declined by 16%
- ν Phosphorus - declined by 28%

**The mineral depletion in meat and dairy reflects the fact that animals are consuming plants and/or grains that are themselves minerally depleted.**

Planetary Boundaries Science (PBScience) – 2024 (POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH



# Farming in harmony with nature – a solution for these  multiple emergencies

What is **Natural farming** ? It is **mimicking nature**.

A holistic land management practice that leverages the **power of photosynthesis** in plants close the carbon cycle, and build soil health, crop resilience and nutrient density.

**It is the future of agriculture**

*APCNF is based on modern scientific advances. It is not traditional or ancestral knowledge.*

It is an emerging Science. About 25 – 30 years old. The last 10 years have seen many rapid developments.

APCNF is **not the same** as traditional agriculture.

As far as nutrient cycling is concerned, the biological inputs in natural farming are not meant to provide nutrients (N,P,K, etc). They are meant for stimulating the soil microbiome to make nutrients bio available to plants.

The bio inputs used in NF are only 5% of bio fertilizers used in traditional agriculture

**There is no need for even 1 gram of external fertilizers – synthetic or organic**

# Inspirational global scientists of this emerging science

1. Elaine Ingham, Soil Microbiologist, U.S.A ( Soil food web)
2. Walter Jehne, Soil Microbiologist and Climate scientist , Australia (rivers of water in the air , natural farming enables plants to draw this water)
3. Christine Jones, Soil Microbiologist, Australia
4. Kris Nichols, Soil Microbiologist, USA
5. Nicole Masters, Soil Microbiologist, USA
6. James White, Soil Microbiologist, USA (rhizophagy, endophytes, core microbiome )
7. Ray Archuleta, Soil Scientist, USA (NRCS scientist – advocating Regenerative agriculture)
8. Rick Haney, Soil Microbiologist, USA, soil testing based on microbial respiration
9. ERA – Ecosystem Restoration Alliance ( a Group of Scientists and Organizations across the World advocating nature based solutions)

# Nature's Sophisticated Nutrient and water cycling Mechanism

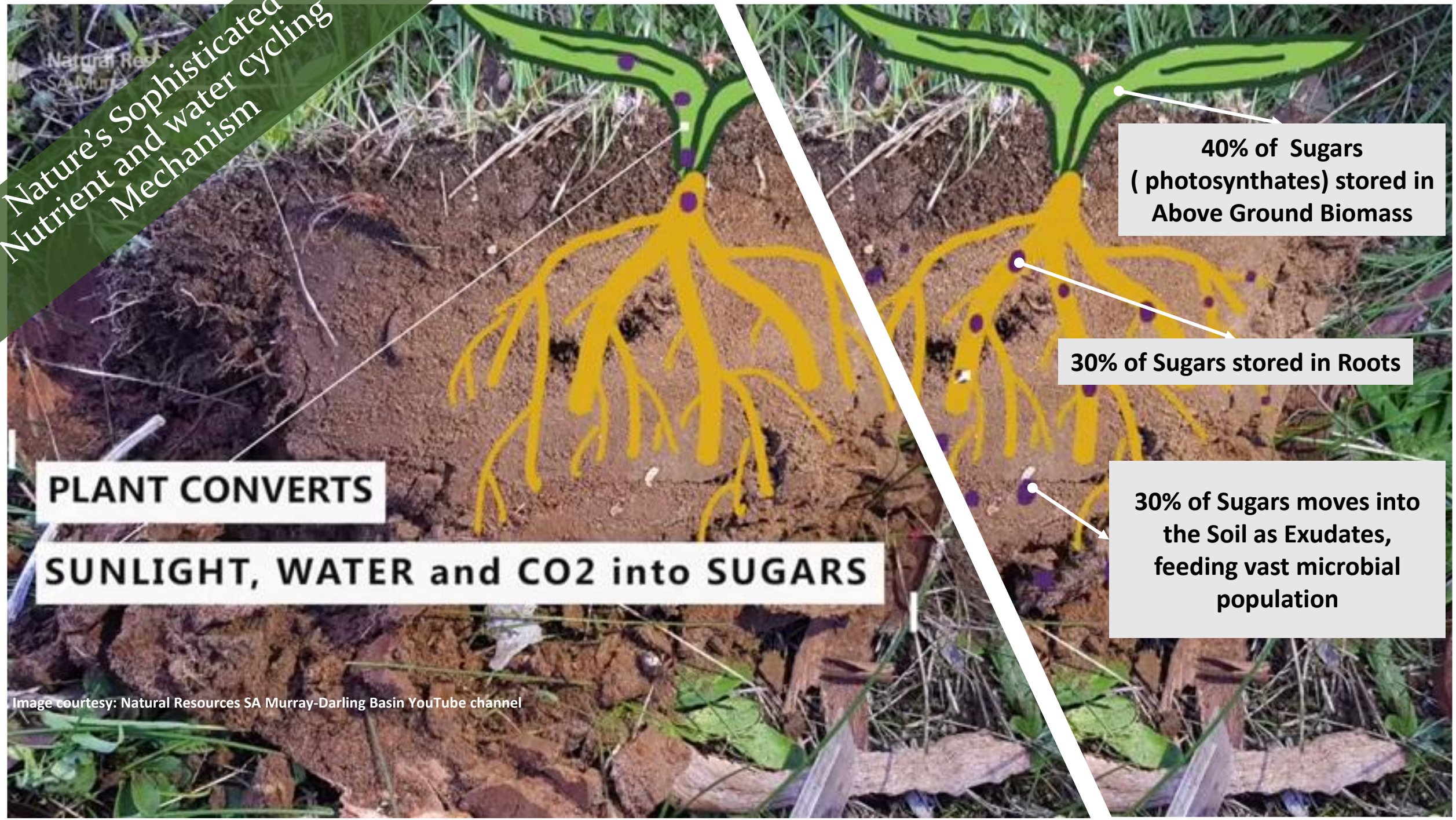
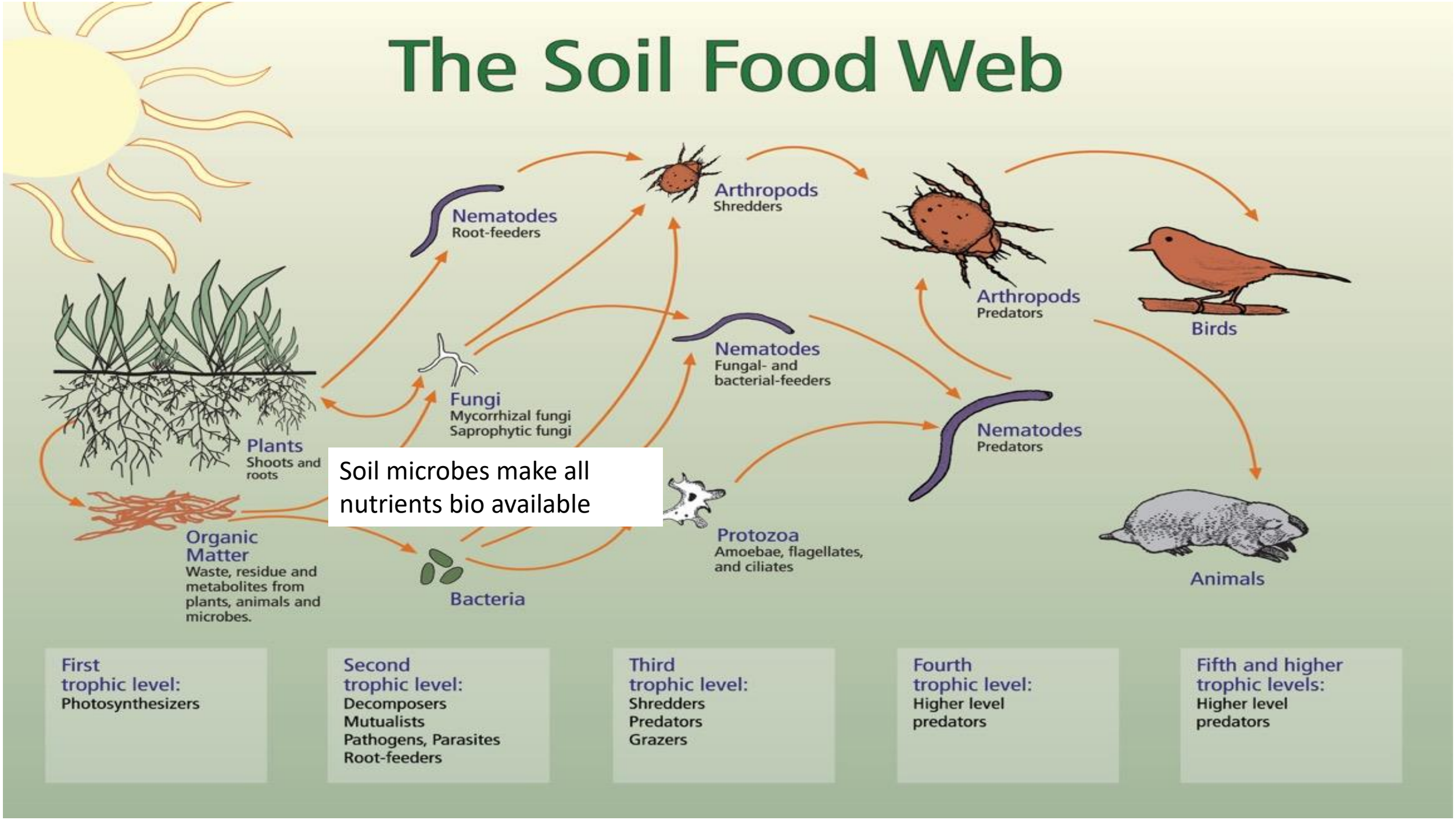
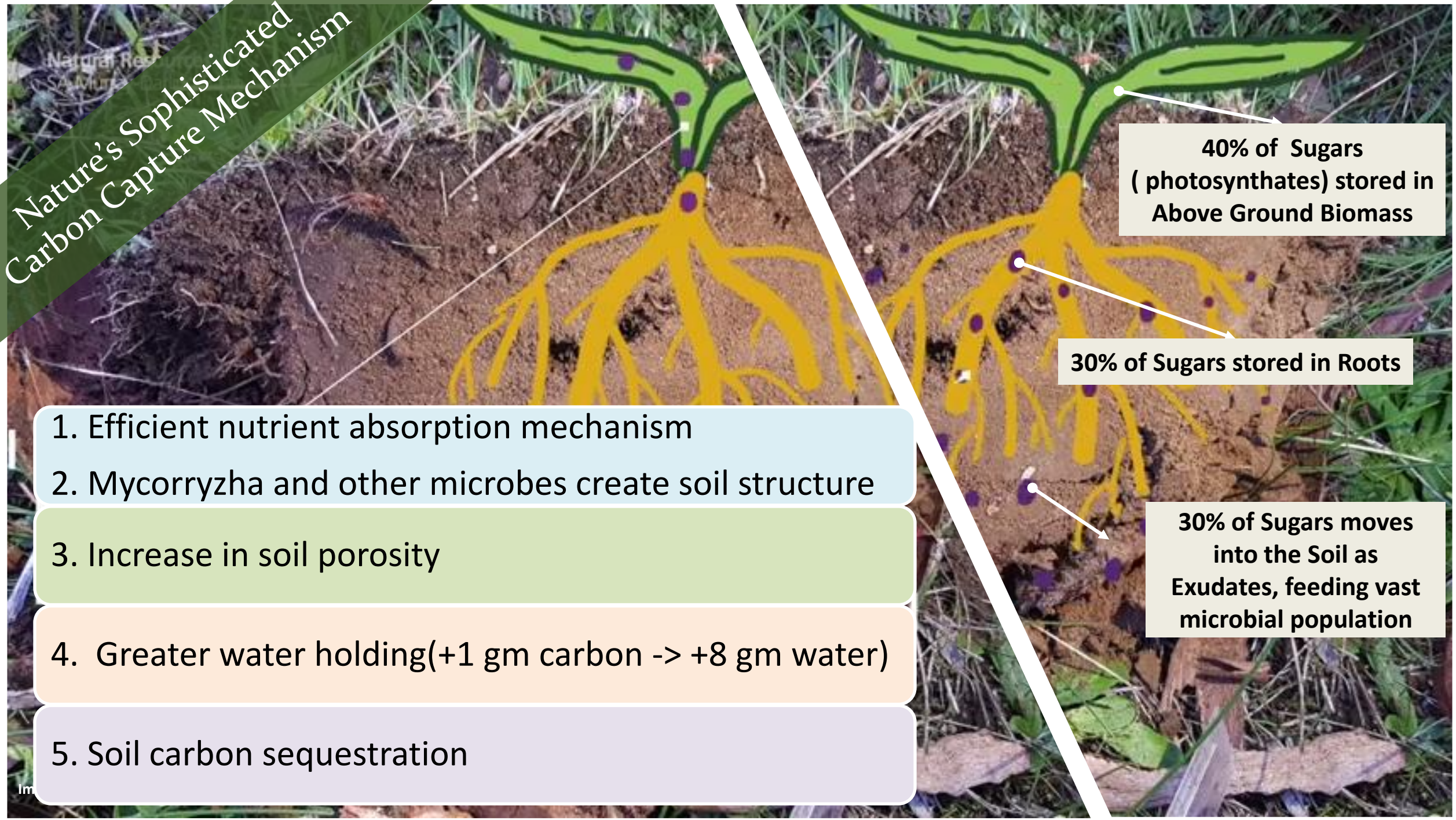



Image courtesy: Natural Resources SA Murray-Darling Basin YouTube channel

# The Soil Food Web



# Nature's Sophisticated Carbon Capture Mechanism

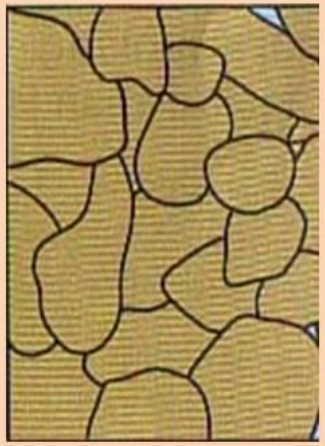


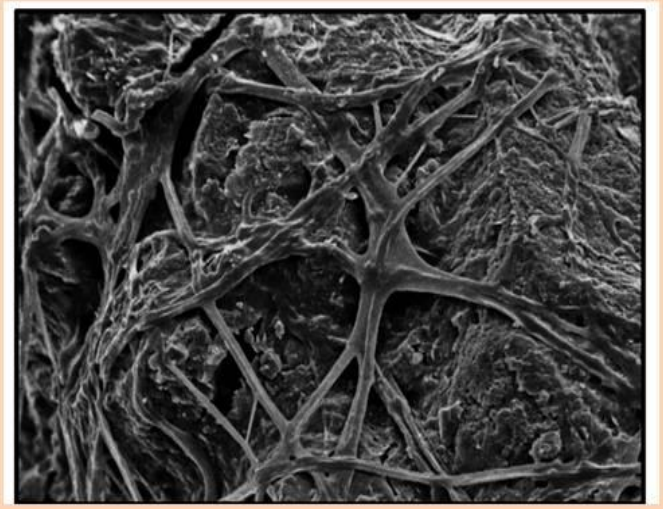

1. Efficient nutrient absorption mechanism
2. Mycorryzha and other microbes create soil structure
3. Increase in soil porosity
4. Greater water holding(+1 gm carbon -> +8 gm water)
5. Soil carbon sequestration

# Soil structure and water conservation - building sub soil reservoirs

## Soil aggregation

Non porous and non-permeable

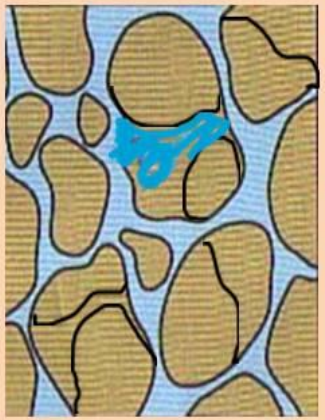




Fungal hyphae, bacteria & root exudates glue together the soil particles

(Electron microscopic image)

Porous and permeable with connected pore spaces



## Soil Aeration

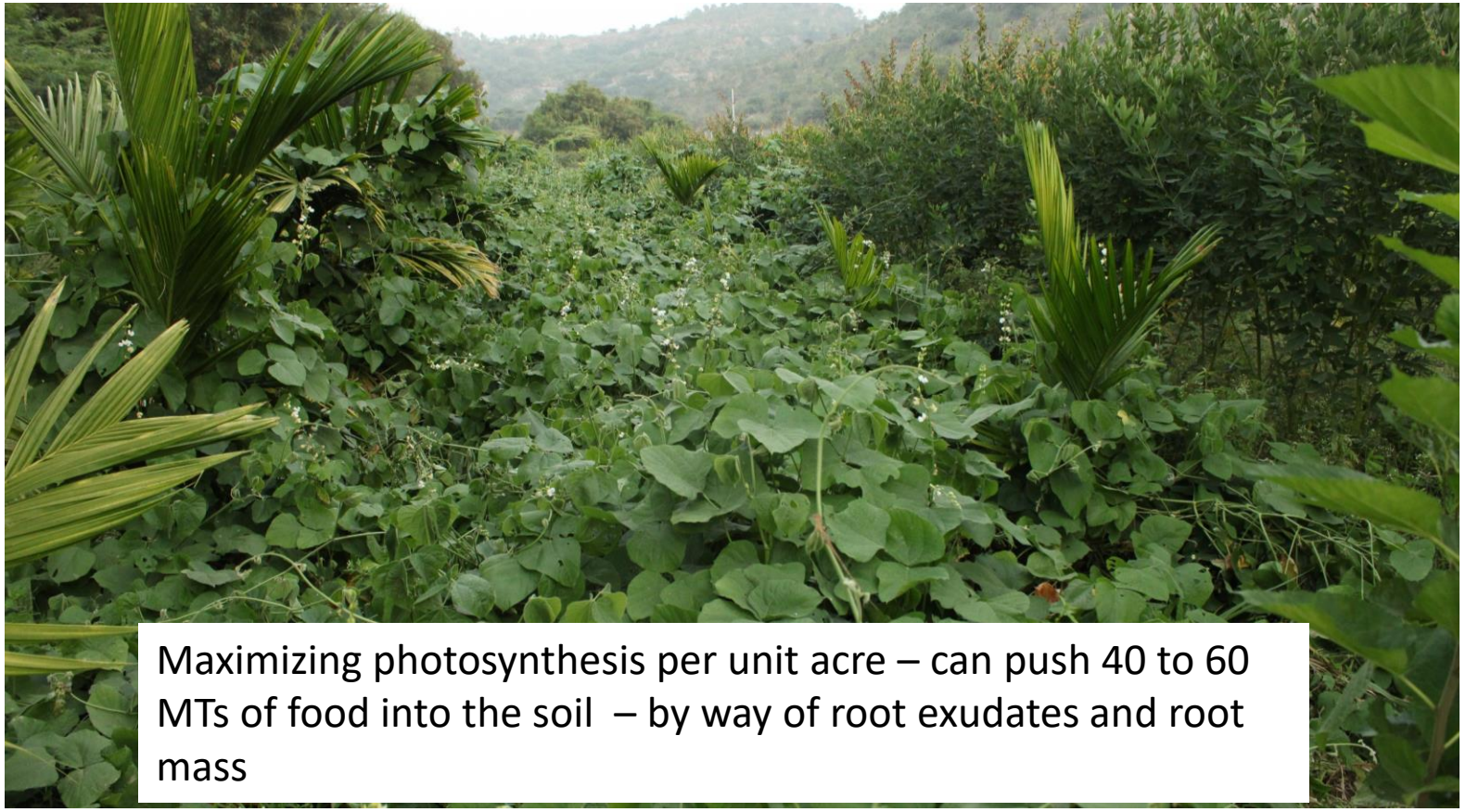
- Water infiltration
- Water holding
- **Water vapour harvested for irrigation**

# 9 General Principles of AP Community managed Natural farming

**Mimicking Nature**

1. Soil to be covered with crops 365 days, (Living root principle)
2. Diverse crops , 15 – 20 crops, include trees
3. Keep soil covered with crop residues, whenever living plants are not there
4. Minimal disturbance of soils – minimize tillage
5. Farmers' own seeds to be used. Indigenous seeds preferred
6. Integrate animals into farming
7. Bio stimulants as catalysts to trigger soil biology
8. Pest management through better agronomical practices and botanical pesticides

**9. No synthetic fertilizers, pesticides, herbicides, weedicides**



Maximizing photosynthesis per unit acre – can push 40 to 60 MTs of food into the soil – by way of root exudates and root mass

# 365 DGC and Crop diversity

Crop diversity is an integral part of the APCNF system.

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

# Microbial seed coating - Beejamrutham

Ingredients

- Cow dung – 2 kg
- Cow urine – 2 liters
- Lime – 40 grams
- Handful of chemical free soil
- Water – 20 liters


Wrap the cow dung in a cloth and submerge in water and let it soak for 12 hours


Squeeze the cloth after 12 hours, add cow urine, lime, chemical free soil. Mix well in clock wise direction


Spray the concoction on all seeds, ensuring each seed is coated by it before sowing

# Soil Microbial enhancement - Bio stimulant - Ghanajeevamrutham

Ingredients

- Cow dung - 100 kg
- Jaggery - 1Kg
- Pulse flour- 1 kg
- Cow urine - 10 liters
- Hand full uncontaminated soil

**Step 1**

Mix all the ingredients properly

**Step 2**

Make patties and shadow dry for 5 – 7 days for fermentation

**Step 3**

Powder the patties and apply in the field at the time of sowing

# Soil microbial enhancement – Liquid biostimulant - Dravajeevamrutham

**Ingredients**

- Cow dung- 100kg
- Cow urine- 3-6 ltrs
- Pulse flour- 2 kgs
- Jaggery – 2 kgs
- Water- 200 ltrs
- Hand full of uncontaminated soil

Step 1

**Add all the ingredients and mix, clockwise, twice a day.**

**Keep it covered**

Step 2

**Keep it fermented for 5 – 7 days. The colour and smell changes.**

**TONICS**

1. PANCHAGAVYA
2. EGG AMINO ACID
3. DASHAPARINI
4. FISH AMINO ACID

**Spraying of Dravajeevarutham in the field**

# Pest management through botanical bio stimulants and mechanical devices

Preparation of ***kashayams*** (bio-innoculants for pest management prepared from local ingredients

Yellow and blue sticky traps

# APCNF IMPACTS

**Independent Assessment by I.D.S**
**8 seasons till now - 2018-19 (2 seasons) and 2019 – 20 (2 seasons) , Kharif 2020 and Rabi 2020-21 ( 2 seasons) and Kharif 2021 and Rabi 2021-22 ( 2 seasons)**

Cost of cultivation - significant reduction - NF costs are much lower than non-NF, across all crops

Yield differences are not significant between NF and Non-NF farms

**Significant increase in net income for NF farmers**

NF farms reported better soil health, crop health, resilience, economic empowerment of farmers and dignity of labor.

The report also mentioned that APCNF has higher potential for expansion of extension services by way of increasing CRPs at the village level

# Summary Results For Kharif 2021-2022

| Crop | Yields (quintals/ hectare) | | | Gross Income on Output (₹/hectare) | | | Paid out Costs (₹/hectare) | | | Net returns (₹/ hectare) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NF | CF | % Change | NF | CF | % Change | NF | CF | % Change | NF | CF | % Change |
| Paddy | 45.89 | 39.12 | 17 | 99,612 | 88,491 | 13 | 54,173 | 65,659 | -17 | 45,439 | 22,832 | 99 |
| Groundnut | 16.35 | 15.64 | 5 | 71,529 | 45,850 | 56 | 50,933 | 55,113 | -8 | 20,596 | -9,264 | * |
| Cotton | 12.61 | 11.53 | 9 | 84,581 | 81,358 | 4 | 53,957 | 73,770 | -27 | 30,624 | 7,588 | 304 |
| Red gram | 6.07 | 4.78 | 27 | 54,163 | 43,305 | 25 | 31,490 | 28,382 | 11 | 22,673 | 14,923 | 52 |
| Chillies | 26.31 | 26.91 | -2 | 310,419 | 282,723 | 10 | 99,240 | 123,301 | -20 | 211,179 | 159,422 | 32 |
| Ragi | 12.19 | 9.01 | 35 | 133,854 | 89,359 | 50 | 43,746 | 44,341 | -1 | 90,107 | 45,018 | 100 |
| Tomato | 186.7 | 133.45 | 40 | 220,781 | 1,60,673 | 37 | 71,805 | 100,892 | -29 | 148,976 | 59,780 | 149 |

*In view of negative net income on output in CF, percentage change over NF cannot be expressed as a %

**Source*: IDSAP, Field Survey 2021-22**

**NF farmer – 2.2 years experience**

**** NF sample HH- 1380, CF sample HH -974***

*****NF CCEs - 470, CF CCEs - 263***

# Summary Results For Rabi 2021-2022

| Crop | Yields (quintals/hectare) | | | Gross Income on Output (₹/hectare) | | | Paid out Costs (₹/hectare) | | | Net returns (₹/hectare) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NF | CF | % Change | NF | CF | % Change | NF | CF | % Change | NF | CF | % Change |
| Paddy | 59.7 | 60.31 | -1 | 108,810 | 1,09,362 | -1 | 52,350 | 62,474 | -16 | 56,460 | 46,888 | 20 |
| Groundnut | 24.1 | 26.41 | -9 | 154,440 | 1,66,556 | -7 | 59,202 | 62,293 | -5 | 95,238 | 104,263 | -9 |
| Bengal gram | 19.9 | 7.24 | 175 | 110,131 | 36,948 | 198 | 31,761 | 32,651 | -3 | 78,370 | 4,297 | 1724 |
| Black gram | 14 | 10.71 | 31 | 94,697 | 68,747 | 38 | 19,312 | 32,098 | -40 | 75,385 | 36,649 | 106 |
| Maize | 52.7 | 45.36 | 16 | 115,581 | 96,690 | 20 | 48,808 | 48,538 | 1 | 66,773 | 48,152 | 39 |

**Source*: IDSAP, Field Survey 2021-22***

**** CNF sample HH- 1145, Non - CNF sample HH - 737***

**NF farmer – 2.2 years experience**

****CNF CCEs - 465 , Non - CNF CCEs - 288***

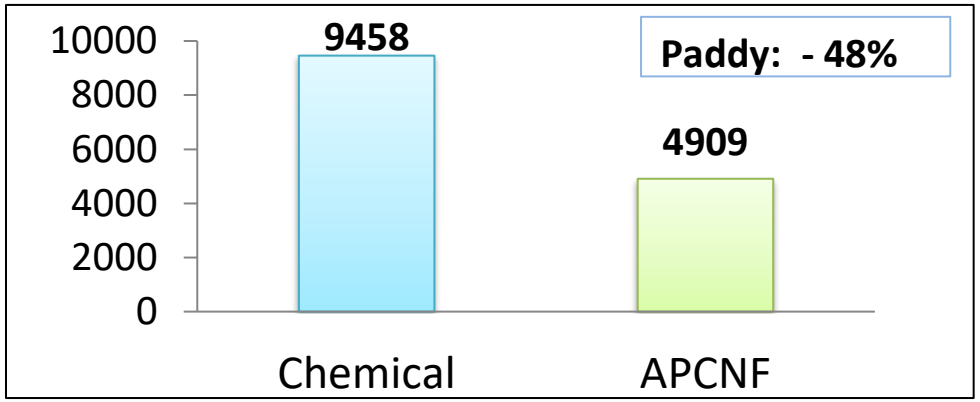
# Improved Biodiversity

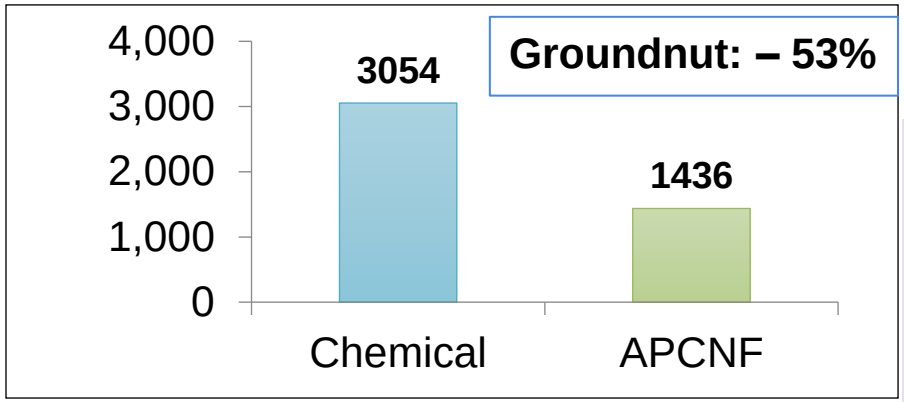
Average number of Earthworms per square meter in Natural Farming plot is 46.83 as compared to conventional plot where it is 5.71

Increase in Beneficial insects


Significant increase in birds nest and birds visiting Natural Farming fields

# Water consumption in one cropping cycle 2020-21 (RySS – internal study)

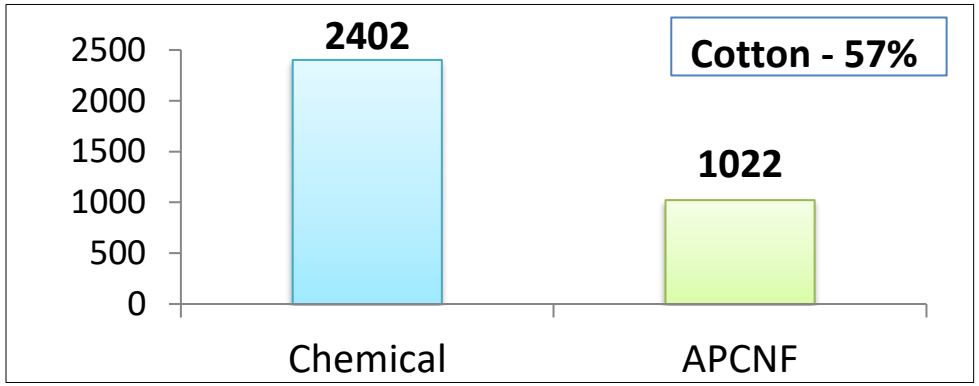


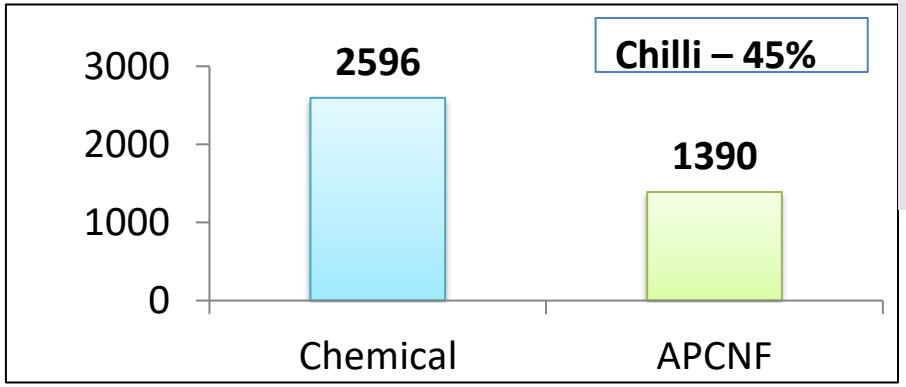




**External independent studies:**

**1. ASCI – Core Carbon X**

**2. WALAMTARI Ministry of Water Resources**




**Y-axis = Water consumption in kilolitre**


Resilience to floods:
NF Farmers have experienced less damage compared to other farmers
December 2023 – MICHAUNG CYCLONE
CONVENTIONAL CHEMICALLY FARMED PLOT
NATURAL FARMING PLOT

# Resilience through natural farming

**December 2023 : Resilience to Cyclone Michaung - ‘natural’ calamity or ‘man-made’ calamity**

**https://www.youtube.com/watch?v=ZVenIFdI7ks**

# Cotton-Crop stand in the field after receding of floods – August – Sept 2024

S2S PMDS > 3years

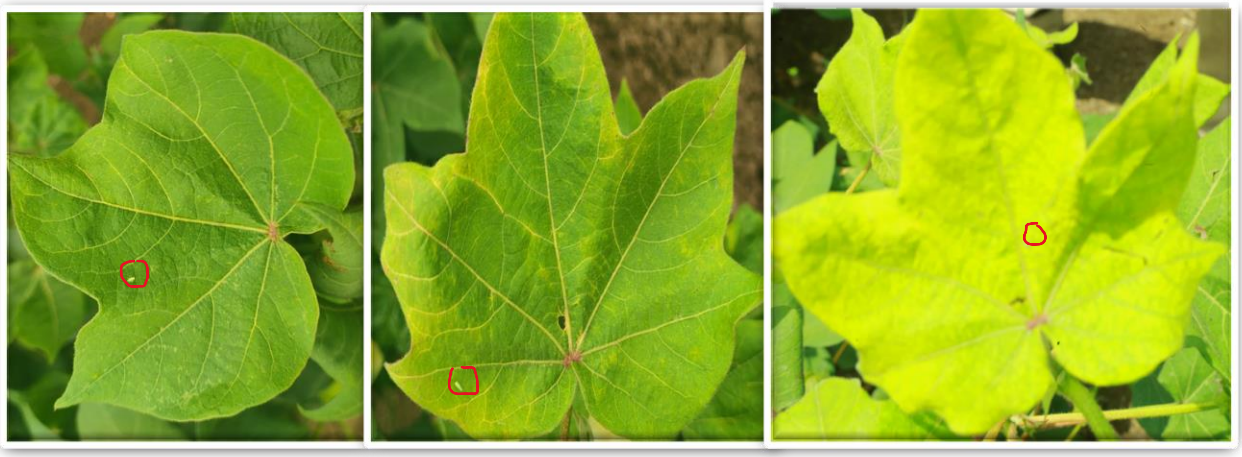

S2S PMDS < 3years

Chemical field

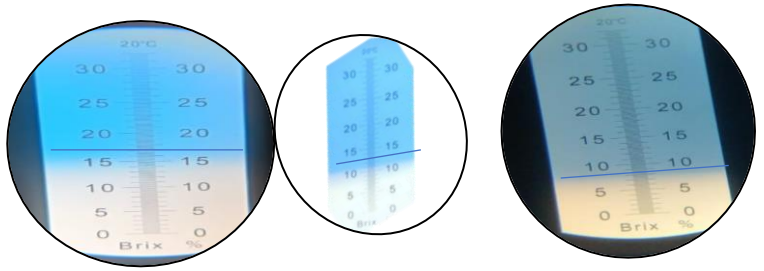
**Cotton - NTR**

# Improved tolerance to pests and diseases in natural farming -Palnadu

## Leaf colour changes



| S2S PMDS > 3yrs<br>Green | S2S PMDS < 3yrs<br>Light green | Chemical<br>Pale Yellow |
|---|---|---|



| S2S PMDS > 3yrs<br>Brix % 14 | S2S PMDS < 3yrs<br>Brix % 10 | Chemical<br>Brix % 8 |
|---|---|---|

***High Brix content correlates with high sugar concentration and less damage by the pests and insects***

## Pest and Disease Incidence

| S2S PMDS > 3yrs<br>low 10%<br>Affected by - Jasside only<br>BRIX % 14 | S2S PMDS < 3yrs<br>Medium 20%<br>Affected by – Jassids, mealybug<br>BRIX % 10 | Chemical – high 55%<br>Affected by – Jassids, mealybug<br>BRIX % 8 |
|---|---|---|

## Low Flower drop in natural farming

| S2S PMDS > 3yrs<br>9 No's | S2S PMDS < 3yrs<br>15 No's | Chemical<br>23 No's |
|---|---|---|

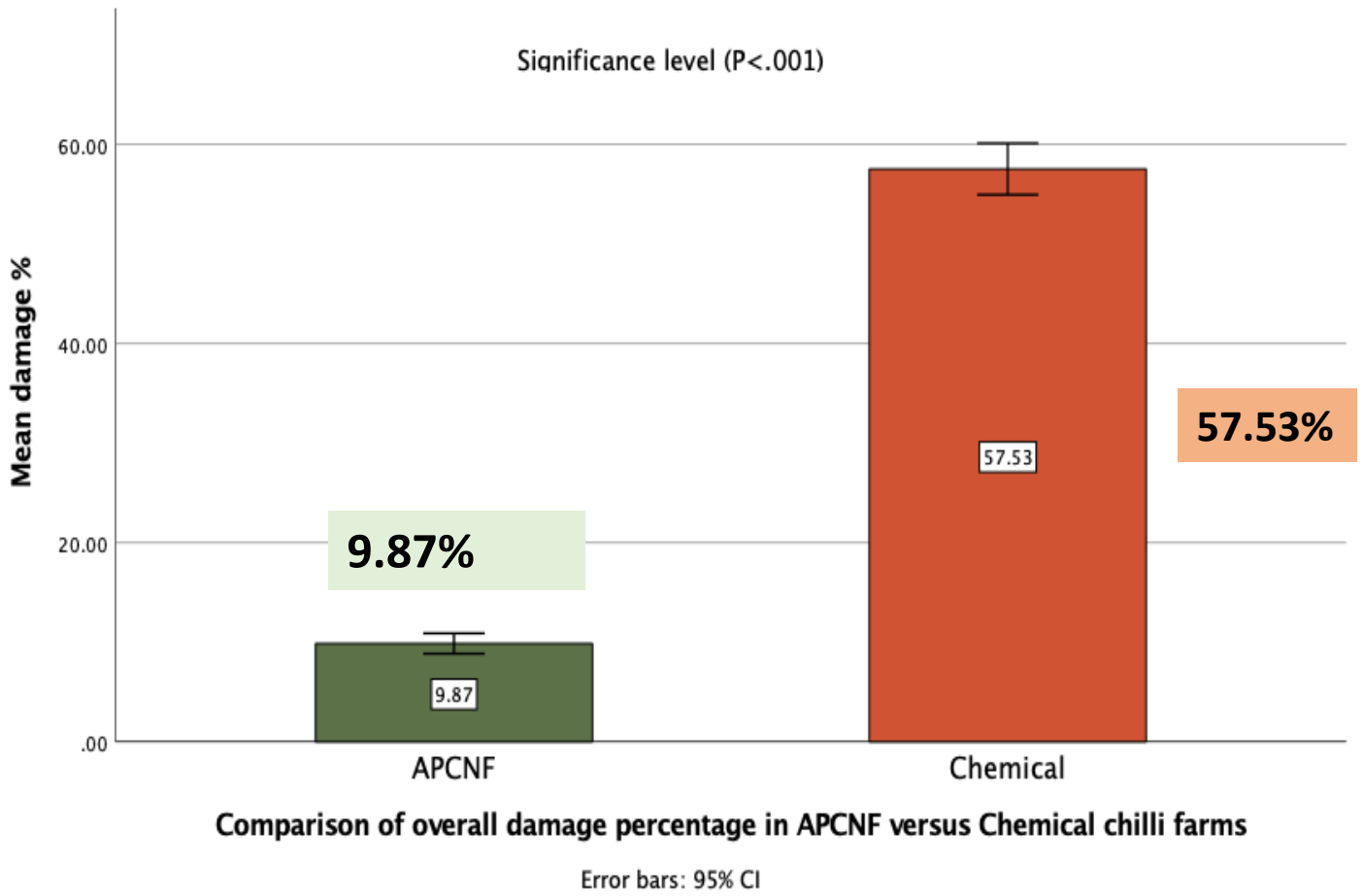
**Average Flower drops(m2)**

# Resilience to pest attack

Percentage damage in chilli crop in APCNF versus Chemical crop : Due to Thrips infestation

- Number of farmers surveyed : 143 in Guntur and Prakasam
- APCNF farms : 70
- Chemical farms : 73

- The average proportion of damage in APCNF farms **is just 10 %**, compared to conventional farms, where the average percentage of damage is substantial - 57 %



# Food and Nutrition diversity

Aim to include 5-7 food groups in the household diet

Universal coverage strategy

Focus on landless, farmworkers

**Homestead gardens – Mini food forest in one's own backyard**

# Research studies on APCNF with International research organisations

- **Walter Jehne, Australian Climate Scientist –** PMDS, 365 DGC
- **University of Reading** : Comparing production system (APCNF vs Organic vs Conventional)
- **CIFOR- ICRAF** : GHG Comparison , LDSF
- **Global Alliance For Future of Food and GIST** – TeebAgri framework, true cost accounting for Natural farming food
- **U.N.F.A.O** and CIRAD - Foresight Study - AgroEco 2050
- **James Hutton Institute** - Study on Nutrient Dynamics – PhD thesis
- **Tufts, Wood Hole Institute, USA** - Long term studies to track climate resilience and economics of natural farming
- **University of Edinburgh** - BLOOM study to assess health and nutrition impact of NF food
- **CGIAR** – comprehensive impact assessment of natural farming
- **POTSDAM INSTITUTE OF CLIMATE CHANGE** – calibration of APCNF models vis-à-vis different climate scenarios

World Agroforestry · University of Reading · FAO FIAT PANIS · cirad · Woods Hole Research Center · Tufts University · The James Hutton Institute · The University of Edinburgh · Global Alliance for the Future of Food

# Ongoing Research studies in collaboration with National research organisations

- Collaboration with **ICAR** institutes – **rice, maize, cotton, pulses, abiotic stresses** – a comparison between Natural farming and conventional farming in **farmers' fields**
- **State Agriculture and Horticulture University of A.P –** major crops in the State
- Comparative analysis of Water and Energy use reduction in APCNF vs Chemical farms –**WALAMTARI**, **ASCI and Core Carbon X**
- In house studies by RySS Science team with farmers

**… our farmers are the best Scientists**

WALAMTARI

CEEW THE COUNCIL

STEP CENTER FOR STUDY OF SCIENCE, TECHNOLOGY & POLICY

भाकृअनुप ICAR

# List of publications (External)

| # | Research paper Title | Publisher | Author(s) | Year |
|---|---|---|---|---|
| 1 | NATURAL FARMING THROUGH A<br>WIDE-ANGLE LENS True Cost Accounting Study of Community Managed Natural Farming in Andhra Pradesh, India | GIST Advisory, Global Alliance for Future of Food | Contributing authors: Harpinder Sandhu, Pavan Sukhdev, Kavita Sharma, Carl Obst, Jules Pretty, Zareen Bharucha, Haripriya Gundimeda, Nachiketa Das, Manasi Bhopale.<br>Study Leader: Professor Harpinder Sandhu<br>Report manager: Dr. Chiara Gastaldi | July 2023 |
| 2 | Agro-industry vs agroecology?<br>Two Contrasting Scenarios for 2050 in Andhra Pradesh, India | | Bruno DORIN (Cirad/Cired, France)<br>Anne-Sophie POISOT (FAO, Italy)<br>Thallam VIJAY KUMAR (RySS, India) | October 2023 |
| 3 | Theory, Practice, and Challenges of Agroecology in India | International Journal of Agricultural Sustainability | Bruno Dorin | 2021 |
| 4 | Political analysis of the adoption of the Zero-Budget natural farming program in Andhra Pradesh, India | Agroecology and Sustainable Food Systems | Divya Veluguri, Jesse B. Bump, Nikhil Srinivasapura Venkateshmurthy,<br>Sailesh Mohan, Karthik Teja Pulugurtha & Lindsay M. Jaacks | 2021 |
| 5 | Towards redesign at scale through zero-budget natural farming in Andhra Pradesh, India* | International Journal of Agricultural Sustainability | Zareen Pervez Bharuchaa<br>, Sol Bermejo Mitjansa and Jules Pretty | |
| 6 | Investigating Pathways for Agricultural Innovation at Scale<br>Case Studies from India | CEEW and Commission on Sustainable Agriculture Intensification | Apoorve Khandelwal, Nandini Agarwal, Bhamini Jain, Darshna Gupta and Anjaly John | 2022 |

A compiled list of the research can be availed here - https://drive.google.com/file/d/1K0Q1MXj3o9ozmX7lRAoDrM-ZaZ_6aUzo/view?usp=sharing

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| **7** | Impact of Zero Budget Natural Farming on Crop Yields in Andhra Pradesh, SE India | Sustainability | Sarah Duddigan 1,* , Chris D. Collins 1, Zakir Hussain 2, Henny Osbahr 3, Liz J. Shaw 1, Fergus Sinclair 4, Tom Sizmur 1 , Vijay Thallam 2 and Leigh Ann Winowiecki 4 | 2022 |
| **8** | Climate impacts of natural farming: A cradle to gate comparison between conventional practice and Andhra Pradesh Community Natural Farming. | CABI Digital Library | Todd S. Rosenstock t.rosenstock@cgiar.org, Megan Mayzelle, Nictor Namoi, Peter Fantke | 2021 |
| **9** | Can countries Expand Agriculture without losing Biodiversity | BioScience, Volume 72, Issue 6, June 2022, Pages 501–507 | Carolyn Beans | 2022 |
| **10** | Do birds return to Agricultural Landscapes through adoption of Natural farming Practices? A comparison of Natural farming vs chemical farming in Andhra Pradesh | Agricultural sciences | Zakir Hussain, Bhavana Bopanna, Himabjndu Anisetti et al | 2022 |
| **11** | Can Zero Budget Natural farming save inputs costs and fertilizers | CEEW | Niti Gupta, Saurabh Tripathi, and Hem H. Dholakia | 2020 |
| **12** | Zero Budget Natural Farming<br>for the Sustainable Development Goals<br>Andhra Pradesh, India | CEEW | SAURABH TRIPATHI, TAUSEEF SHAHIDI, SHRUTI NAGBHUSHAN, and NITI GUPTA | 2018 |
| **13** | The politics of knowledge | Global Alliance for the future of food | Multiple authors | 2019 |
| **14** | Agroecology and sustainable smallholder agriculture: An exploratory analysis with some tentative indications from the recent experience of “Natural farming in Andhra Pradesh” | Indian social science Quarterly, Vol. 41, Number 3, Jul-Sep 2022 | D Narasimha Reddy | 2022 |

# Natural farming and water : Distribution of raindrops ( global avg)

**100 rain drops falling on soils**

**2 drops stored in dams**

**12 drops in streams**

**86 drops?**

**How to minimize runoff and evaporation losses ?**

**Natural farming enables this through better water percolation, greater water holding and reduced evaporation losses**

Back to atmosphere

**36 drops**
transpiration and green growth

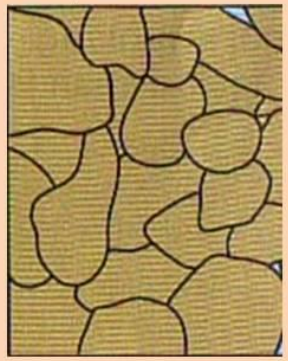
**50 drops**
run-off / evaporation

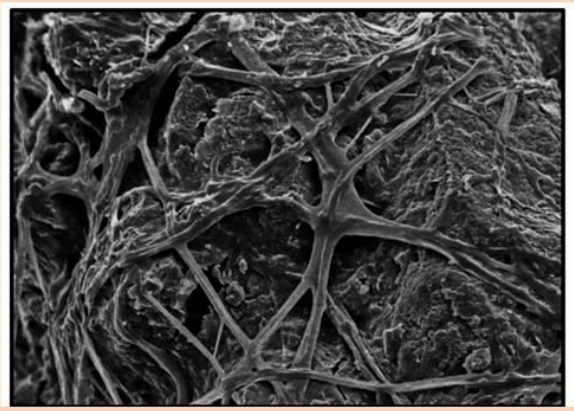
**But there is an additional phenomenon triggered by Natural farming – harnessing water from the air.**

# NF - a possible solution to the global water problem and reversal of desertification

## Soil aggregation

Non porous and non-permeable

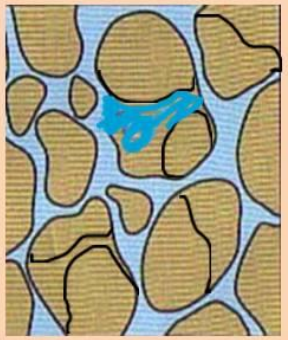




Fungal hyphae, bacteria & root exudates glue together the soil particles

(Electron microscopic image)

Porous and permeable with connected pore spaces



## Soil Aeration

- Water infiltration
- Water holding
- **Water vapour harvested for irrigation**

**Rivers of water in the air – in tropical countries, air contains 10 times the water in the rivers – upto 50,000 ppm. Natural farming is enabling plants to harness this water vapour**

**16th Nov 2019 - Mr. Walter Jehne, Soil- Microbiologist, Australia, visiting the PMDS field**

# PMDS is a Global Break through

## Analysis by Walter Jehne, a climate scientist from Australia

PMDS crop – estimated to be 12 – 15 tons/hectare – this crop has consumed 15,000 tons of water
But, total water received through rainfall accounted for only 4000 tons of water.

**Possible sources of water listed by Walter**

- Bio stimulants used in ZBNF can lead to germination of plants without much water
- Mycorrhyzal fungi stimulated by biostimulants gets water to the roots from the soil film ( beyond wilting point)
- Increased Soil porosity enables roots to go deeper, better infiltration of rain water, and better water holding
- Water vapour harvesting – major source of water after shoot develops

Walter Jehne in his lecture in NITI Aayog on 26th Nov, 2019

‘ PMDS through NF in AP is a Global breakthrough. It is India‘s unique contribution to the world‘

# Harnessing water from the air through natural farming

**April 2023 – PMDS + 365 days green cover – Maize model :**

**https://youtu.be/kZ9WZJImuU8**

# Unique breakthrough of A.P - Seed Pelletization: Critical part of Summer sowing, PMDS

**Navdhanya seed mix, consisting of 9 pulses and legumes**

***Seed pelletization:*** Seeds are coated with Bijamrutham, clay powder, Ghana Jeevamrutham – powdered and sifted, and wood ash, with sprinkling of water.

The resulting pellet is 3 to 5 times the size of the original seed.

The seed pellet protects the seed, allows for moisture retention and creates favorable conditions for seed germination

The image below: process of pelletization. It is a snapshot of a YouTube video which demonstrates the same.

**Greening a ‘desert’**
**Restoring degraded lands through Natural farming - just 3 months of intervention**

# Scaling up of Pre – Monsoon Dry Sowing breakthrough – harnessing water from the air

PMDS - For 30 to 60 days green cover in the premonsoon period, when soils are kept bare

**Target: 12 lakhs farmers in 2024**

| | PMDS 2018 | PMDS 2019 | PMDS 2020 | P.M.D.S 2021 | P.M.D.S 2022 | P.M.D.S 2023 |
|---|---|---|---|---|---|---|
| Number of farmers | 11 (Pilot) | 21,635 | 103,340 | 348,000 | 600,700 | 862,800 |
| Area covered (in acres) | 11 acres | 13,068 | 80,409 | 353,000 | 608,700 | 954,500 |

# Game changer model from APCNF – 'A' grade crop models

- A grade model – in the same plot of land there is one major crop + 4 to 6 associated crops and 25 biodiversity crops ( 5% of the seed weight of the 5 – 7 main crops).
- The crop diversity is maintained throughout the year through relay sowing - 365 days green cover, higher land equivalent ratios
- Sowing pelleted seeds in dry conditions

Crop protocols developed for all major crops and are being tested.

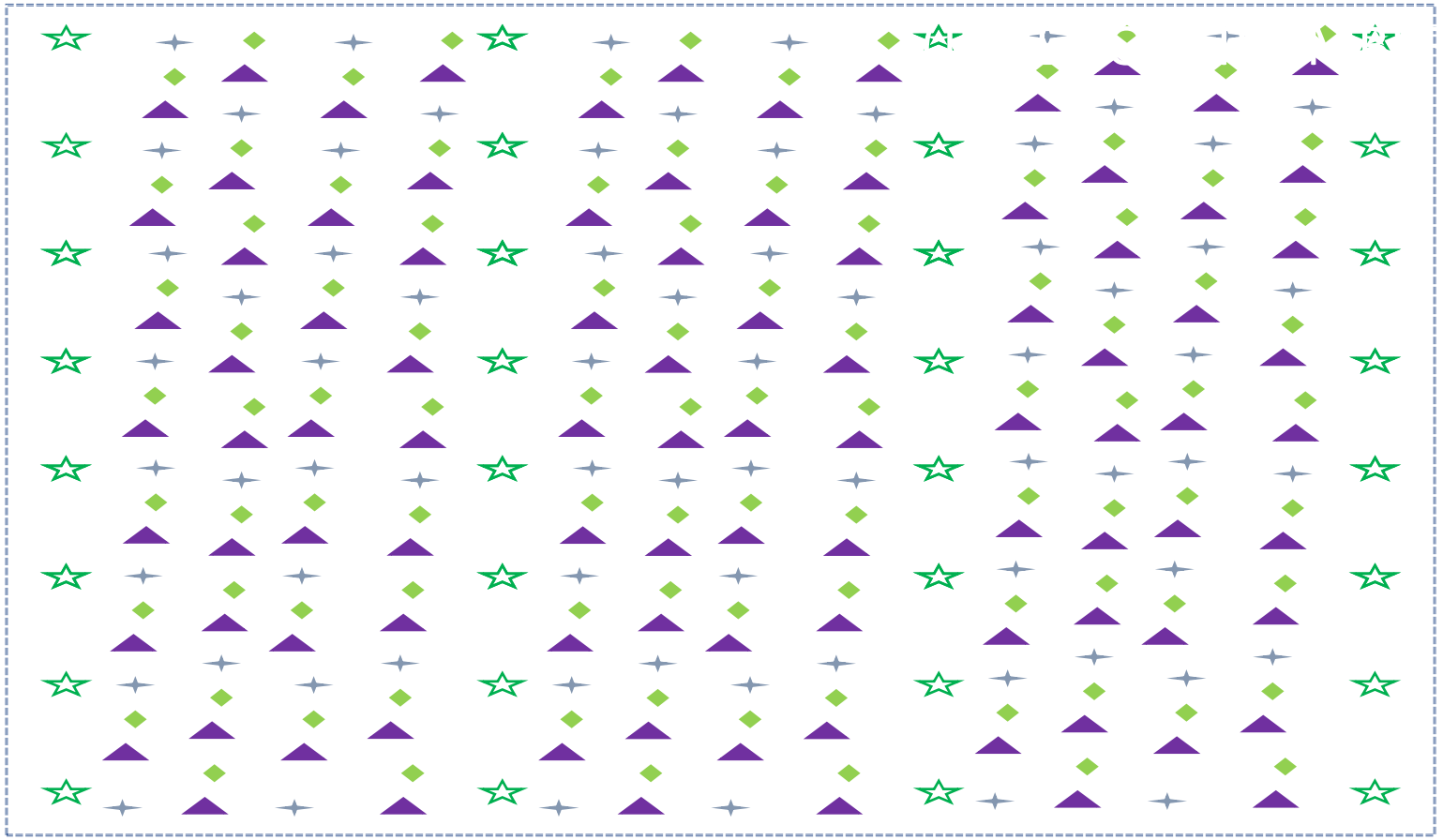
Our target : **Net income of Rs. 25,000 per month** per family with holding ranging from 1.5 to 2.0 acres. ( A grade crop model + ATM model)

To develop **100,000** such farmers in Andhra Pradesh in the next 3 years, and **300,000** farmers by 2029

And, able to get all diverse food crops for their own consumption.

*All these practices implemented in the same plot of land create an excellent model of climate resilient farming.*

# COTTON ‘A’ GRADE MODEL
# COTTON, COWPEA, PEARL MILLET, CLUSTER BEAN
# *GREENGRAM, OKRA, CASTOR*



**LEGEND**

- COTTON
- COWPEA
- PEARL MILLET
- CLUSTER BEAN
- GREENGRAM
- OKRA
- CASTOR

## COTTON A-GRADE MODEL

### Crop Geometry and Seed rate (June to September)

| SNo | Name of the crop | Crop Geometry Spacing (cm) | Seed Rate (Kg/Acre) | Duration |
|---|---|---|---|---|
| 1 | Cotton | 60 x 150 | 0.800 | Perennial continued |
| 2 | Cowpea | 30 x 30 | 3.00 to 5.00 | 90 days |
| 3 | Pearl Millet | 30 x 30 | 1.600 | 90 days |
| 4 | Cluster bean | 30 x 30 | 4.000 | 120 days |
| 5 | Okra | 120 x 120 | 1.00 to 1.25 | 120 days |
| 6 | Castor | 20 x 20 | 2.00 to 2.50 | Perennial |
| 7 | Biodiversity 25 crops | Randomised | 5 % Seed rate | for 365 days |

**25 DAYS CROP**

**45 DAYS CROP**

**180 DAYS CROP**

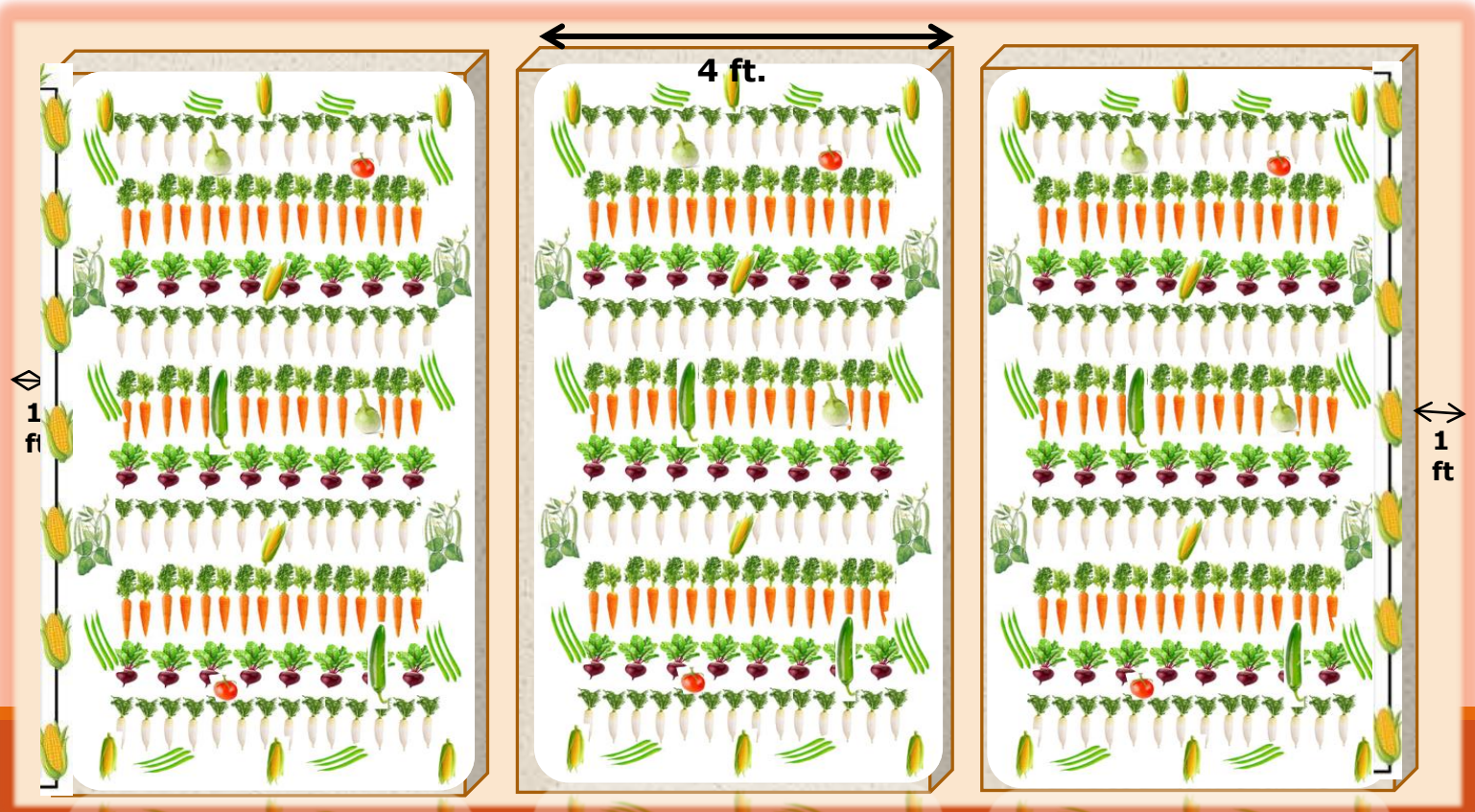

**365 DAYS CROP**

ATM model suited for landless farm workers and small farm holders
It is a 800 sq meters ( 0.20 acres) model with 15 – 18 vegetable crops.
There is continuous relay cropping of vegetables – planting a new crop at the time of harvesting
Farmers get incomes from the 15th day itself. Each crop that is harvested is replaced with another crop.
farmers can get net incomes of Rs.50,000 to Rs.100,000 per annum.

# Any Time Money Model (ATM)

Crop Geometry and Seed rate for 20 cents (or) 0.20 acres ( 800 sq m )

| S No | Name of the crop | Crop Geometry Spacing (cm) | Remarks |
|---|---|---|---|
| 1 | Leafy Vegetables | 5 x 5 | Repeated every 25 days |
| 2 | Radish | 10 x 22.5 | Repeated every 45 days |
| 3 | Beet root | 10 x 22.5 | Repeated every 75 days |
| 4 | Carrot | 10 x 22.5 | Repeated every 90 days |
| 5 | Cowpea | 30 x 60 | Biennial |
| 6 | Brinjal | 90 x 60 | Perennial |
| 7 | Tomato | 90 x 60 | Biennial |
| 8 | Chillies | 90 x 60 | Perennial |
| 9 | Drum Stick | 300 x 300 | Perennial |
| 10 | Mango | 800 x 800 | Perennial |



# ‘A’ Grade Models in Paddy – widening bunds on 2 sides – L shaped

Perennial crop : Coconut

Diversified crops. Vegetables and Leafy Vegetables 10-15 crops

# Plantation on Extended Paddy Bunds




# Drought Proofing MODEL -

Crops Sown – Redgram, castor , Field bean, cowpea, bajra , Cluster bean – all are drought resistant crops.

**Red gram**:- Deep root system, up to 15 feet depth, break the hardpan, self littering up to 2 MTs leaves per acre

**Field bean**:- This crop becomes perennial, lipids on the surface of leaves reduces evapo-transpiration. Self littering.

**Pearl millet**:- Fibrous roots penetrates upto 3 feet depth, produces enormous biomass

**Castor**:- trap crop for pests

**Cluster bean**: - Regular yield in all seasons

# Drought proofing model in Rain-fed areas – M Adilakshmi of Ipur village, Palnadu has transformed half-an acre of dryland into a productive farm

# APCNF Implementation – the levers

**Government** support and advocacy – resources and implementation

**Knowledge** – POPs, videos, etc

**Research**

**Innovations** and continuous learning

**Social capital - Women SHG s** and federations

**Govt of A.P: Pro farmer policies and welfare measures, across the value chain.**

**Human capital Farmer to farmer** – extension system, Knowledge intensive

**Facilitating organizations** – Govt., NGOs and C.B.Os

**Collaborations** with Global and National institutions and Scientific experts

# Women in Natural Farming: Our biggest Strength

**7550** village SHG **federations, 202,000** women **SHGs** with a membership of **1,880,000 women** are in charge

- Programme Management, transparency
- Collective Action
- Peer Learning
- Farming Plans, and, consumption plans
- Inclusive of the poorest

# Farmer ‘heroes’ central to the programme

## A Knowledge intensive and not input intensive programme

Most effective dissemination is “farmer to farmer”

Best practicing farmers, Community resource persons (CRPs) engaged to take NF to other farmers.

**‘Teaching by doing’ and ‘Learning by doing’**

Inspiration

Knowledge Transfer

Handholding

Video Dissemination

Farmer Field Schools

10,000 Community Resource Persons @ 1/100 farmers

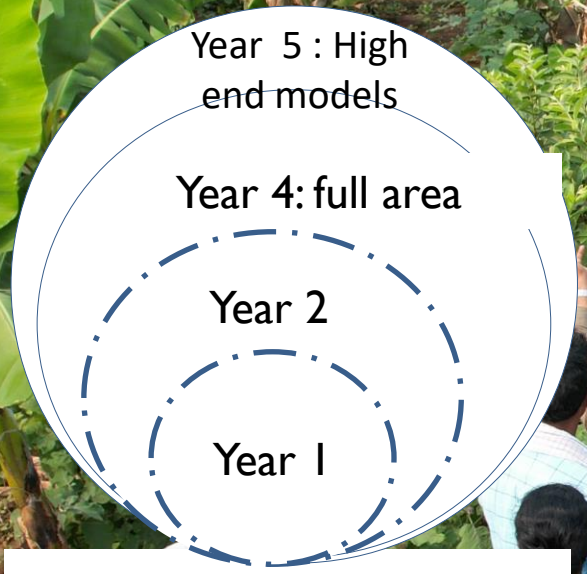
# Changing a farmer means changing entire village

All Villages | All Farmers | All Farms | All Practices

**Farmer Transformation**

**450 farmers in a Village**

**Village Transformation**




**Each farmer** takes 5 years to cover entire holding.

**10 -15%** farmers

**Year 1**

**35- 50%** farmers

**Year 2**

**>80%** farmers

**Year 3**

**100%**

**In 5 to 8 years, a village becomes a 'BIO-VILLAGE'**

**Year 8**

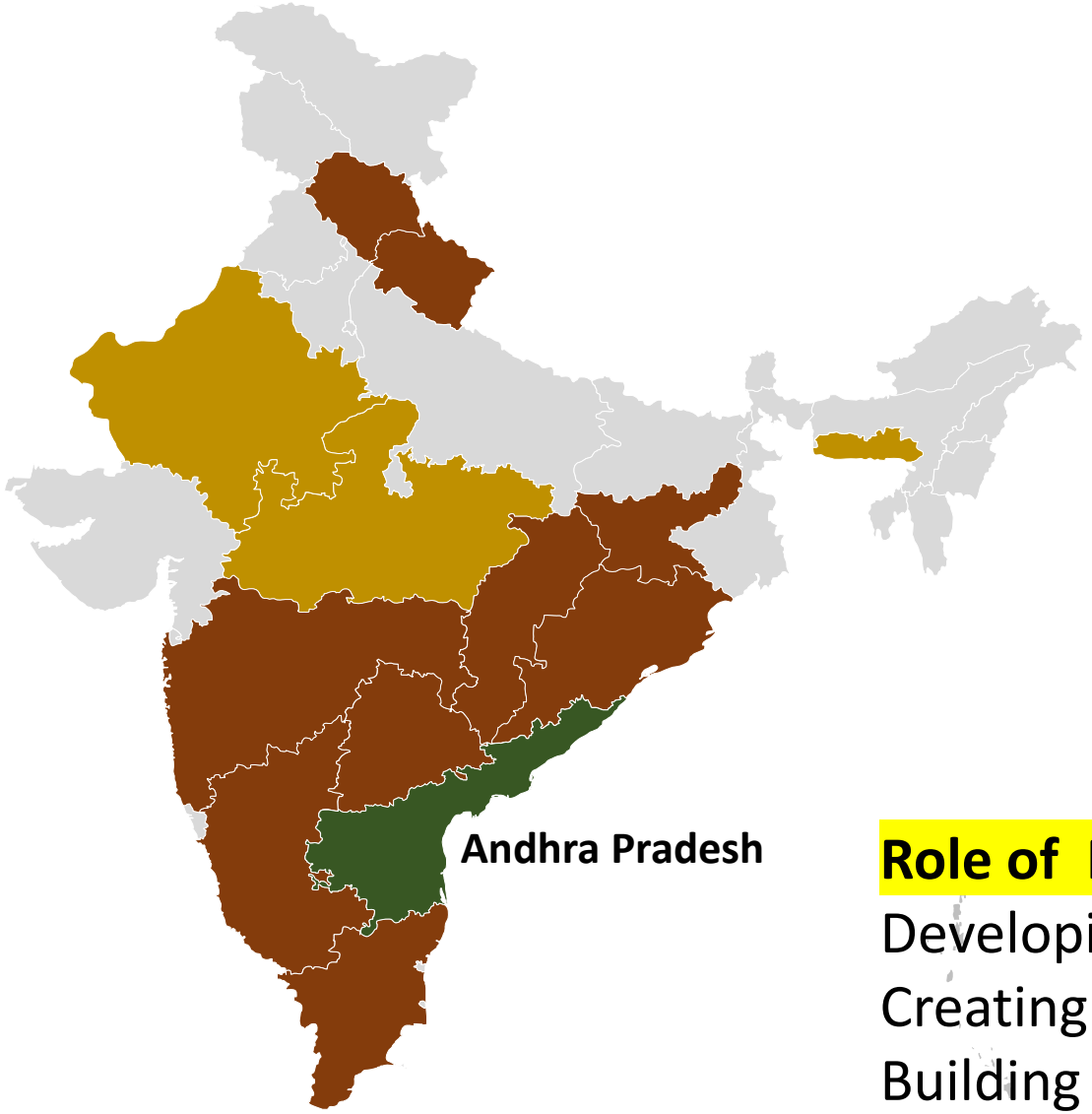
**Transformation Cost to cover 85% farmers and over 85% area is @ Rs. 15000/farmer over 0+7 years**

# Marketing

**Marketing initiatives**

- Own consumption
- Local area marketing
- Value addition for local consumption
- Certification, traceability
- Long value chains – TTD, PHALADA, RELIANCE, AMUL, etc
- Exports – Producers' Market

# APCNF as National Resource Organization – Supporting other states




| | |
|---|---|
| State Govts | 1.Madhya Pradesh<br>2. Meghalaya<br>3. Rajasthan |
| GIZ- NABARD Bank project + RySS support to NGOs | 1. Chhattisgarh<br>2. Himachal Pradesh<br>3. Karnataka<br>4. Maharashtra<br>5. Odisha<br>6. Telangana<br>7. Uttarakhand<br>8. Jharkhand<br>9. Tamil Nadu<br>10. Kerala |

**Role of RySS as NRO** –

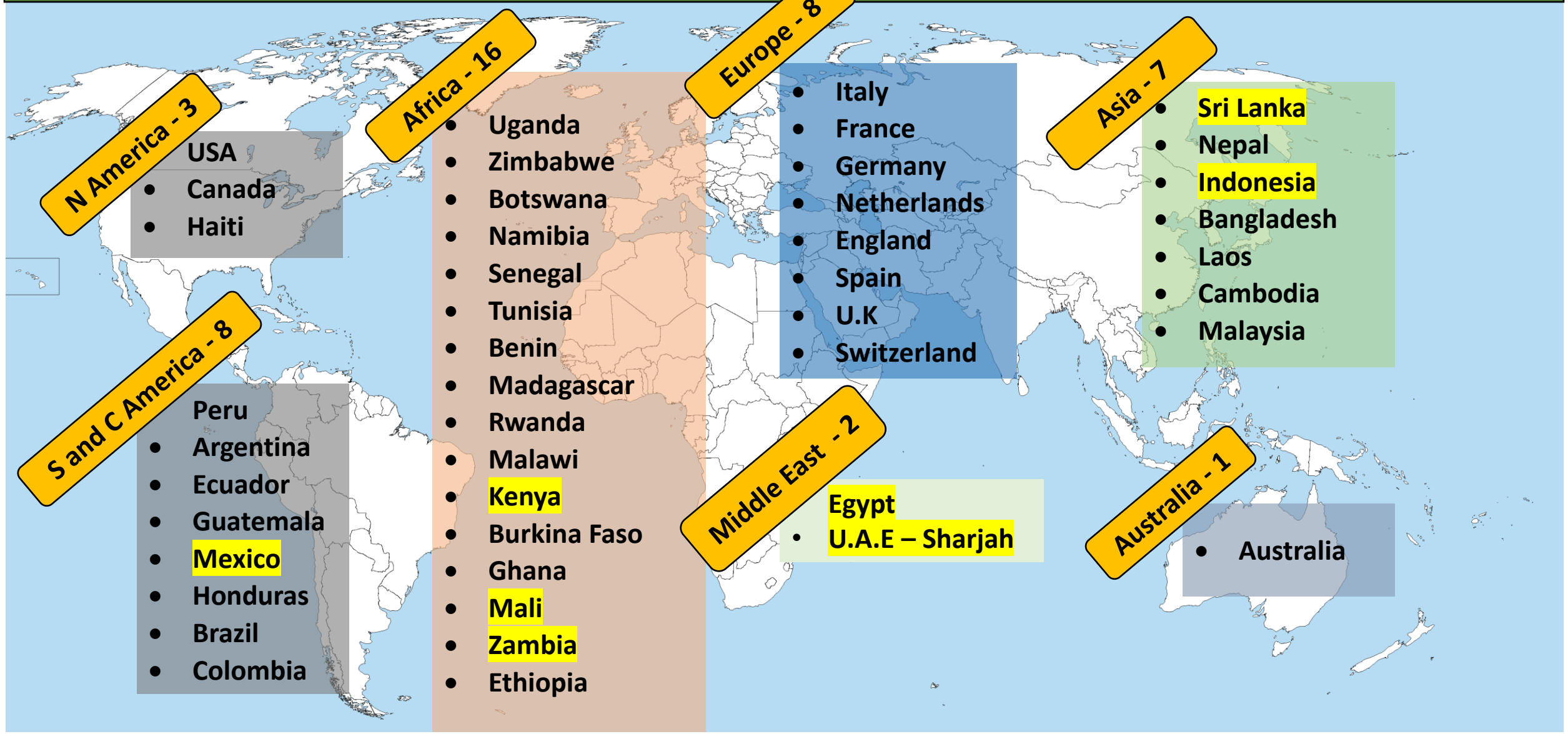
Developing proof of concept models

Creating local capabilities

Building sustainable mechanisms

Support by trained professionals and experienced mentors

# International delegations from 45 countries have visited from from all continents




# Indo-German Global Academy for Agroecology Research and Learning (IGGAARL)

Govt of Germany – 20 million Euros over 5 years

Govt of AP, INDIA – land, buildings and a budget of 15 million Euros

# Farmer Scientist Course

- **FSC is a 4-year Bachelor's degree in Natural Farming – A flagship program, launched on July 22nd 2023**
- **Field Practice and Practical Work to be 75% of the credits. Conceptual inputs via Classroom and Digital Learning;**
- **520 Farmer Scientists Students and 184 Mentors – for 2023-24 Academic year; Champion NF farmers are the teachers**

**1** Her/his field is a model, high-end NF field, 'A' – Grade mode - earn at least Rs.25,000 per month – village model plot

**2** Conducts field experiments, on issues important to the area

**3** Trains 'farmer trainers', the community cadres of the APCNF project

**4** Ensuring 50 other farmers in the village become 'A' Grade model farmers and earn remunerative incomes

**5** Catalyst in converting the village into a Climate Resilient Village

**6** Completes the classroom and practical sessions of the 4 year course

**The Andhra Pradesh Community Managed Natural Farming (APCNF) program of the Government of Andhra Pradesh won the prestigious Gulbenkian Prize for Humanity 2024.**

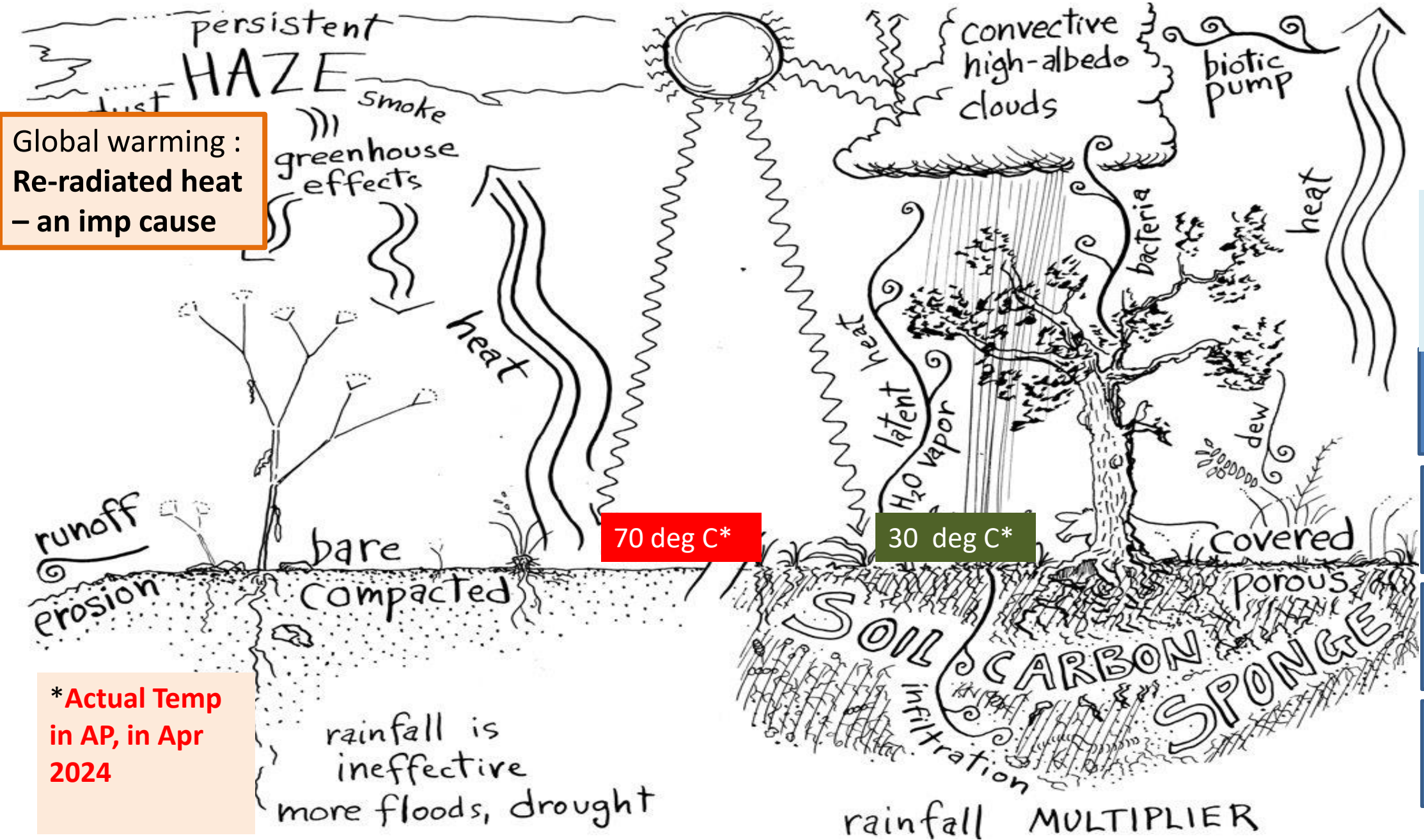
With an award of €1 million, the Gulbenkian Prize for Humanity recognises outstanding contributions to climate action and solutions that inspire hope and possibility.

APCNF received the Prize from Dr Angela Merkel (chair of the GPH Jury and former Federal Chancellor of Germany) at an award ceremony in Lisbon, Portugal on 11th July 2024.

The President of the Republic of Portugal and other dignitaries from Government of Portugal as well as eminent experts from across the world were also present at the ceremony.

# APCNF 365 Days green cover shows a path for naturally cooling the planet

Global warming : **Re-radiated heat – an imp cause**




*Actual Temp in AP, in Apr 2024

APCNF - 365 DGC – A WIN – WIN-WIN

- Reversal of desertification
- Soil / Water conservation
- Food and nutrition security
- Income generation

# *The need for taking natural farming to all the farmers in the country 2047*

1. Farmers wellbeing and prosperity. Regular incomes throughout the year.
2. All Citizens: healthy and nutritious food
3. Environment – positive impacts - healthy soils, adequate water availability, reduction in pollution, revival of biodiversity, and all other ecosystem benefits
4. Reversing  climate change and cooling the planet – safest pathway
5. Year long employment  for farmers, even in rainfed lands
6. Profitable jobs for rural youth in their own villages  - reduce distress migration
7. Reverse desertification
8. Reduce **unnecessary subsidies** on fertilizers and power
9. Gives India a huge edge in exports – Scope 3 compliance

# *How do we reach all 120 million farmers in the country ? Lessons from APCNF*

1. 9 years of APCNF, greatly reduces the learning curve for other States
2. Science and technology required for the transformation is readily available, through APCNF's work. Even though more research is required to make it better, we need not wait.
3. Taking this knowledge to all farmers and staying with them till the transformation is completed is the key. It requires:
   - a **strong women SHG network.** Luckily we have a very strong network in the country, thanks to NRLM and more than 100 million rural women are organized, across all States, all Districts and all Blocks in the country

   - **farmer to farmer extension** system is already very popular in the country, thanks to the national rural livelihoods mission

# *How do we reach all 120 million farmers in the country ? Lessons from APCNF*

4. Long term handholding support is critical. Need to involve Gram Panchayats, Women federations at village and block levels, FPOs and NGOs. A movement on the lines of the Swaachh Bharat Abhiyan is essential to energize and involve everyone.
5. Transformation to natural farming  is a behaviour change issue. Hence long term handholding is a must. Projects however are taken up with a project cycle of 3 years, and, then action shifts to the next village. This is dysfunctional

6. We need to adopt a whole village approach and invest 10 – 12 years in each village till all the farmers change and the change is irreversible. Need to involve Gram Panchayats, Women SHG federations at village and block levels, FPOs and NGOs for this support.

# *How do we reach all 120 million farmers in the country ? Lessons from APCNF*

7. Grassroots Academies to create Farmer Scientists, from among young farmers in the country is very essential for the transformation

8. State Agriculture Universities , Agriculture Colleges to incorporate Natural farming  science and technology in their curricula, and conduct Research in Farmers' fields

9. Providing incentives at the beginning of the programme is counter productive. It is important to design post facto benefits – ecosystem credits, etc.

**“..We do not inherit the earth from our ancestors, we borrow it from our children..”**

**LET US ALL ACT NOW**

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