Science behind natural farming and how its application can lead to farmers prosperity, better health for citizens, climate resilience and cooling of the planet

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

and Spl C.S, Natural Farming, Agriculture 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

Target

32 % villages
21 % of farmers
10.3 % of area

12,50,000
farmers
4400 villages
620,000 Ha

2024-25

30 % villages
17 % of farmers
8.1% of area

10,37,000
farmers
4120 (v)
486,000 Ha

2023-24

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

851,000
farmers
3730 (v)
378,000 Ha

2022-23

480,000 farmers
3730 (v)
220,000 Ha

2020-21

40,656 farmers
704 (v)

2016-17

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

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

Funds: Govt – PKVY, NMNF, KfW loan
Grants: 1. Azim Premji Philanthropy
2. Co Impact

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

Unique innovations of Govt of A.P

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

Farmer Distress

Food system – multiple crises

High Costs of Cultivation (Seeds, Fertilizers, Pesticides)

Prolonged Dry Spells, Droughts

Acute water shortages, Drying of Borewells

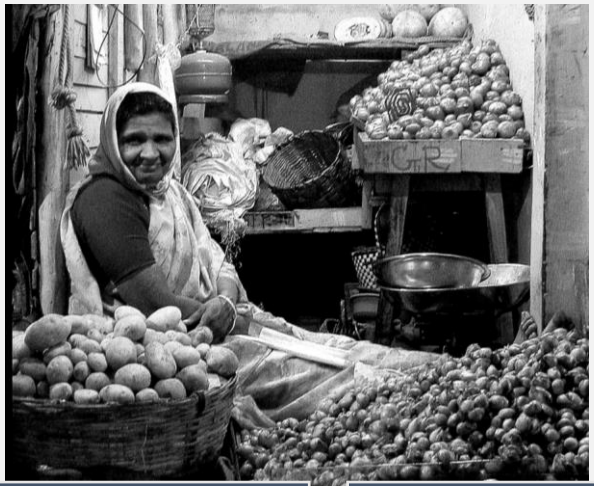
More frequent cyclones, floods, unseasonal rains

Problems of Small, marginal farmers and Tenants,

Rural-Urban migration

Market Uncertainty

Consumer Food Plate



Food Scarcity

Chemical Residues

Heavy metal contamination in food

Lack of micro nutrients, trace minerals

Soil degradation,

Continuous loss of soil organic matter

Water stress and water emergency

Heatwaves – global warming

Decreased bio diversity

Water and air pollution

Environment crisis

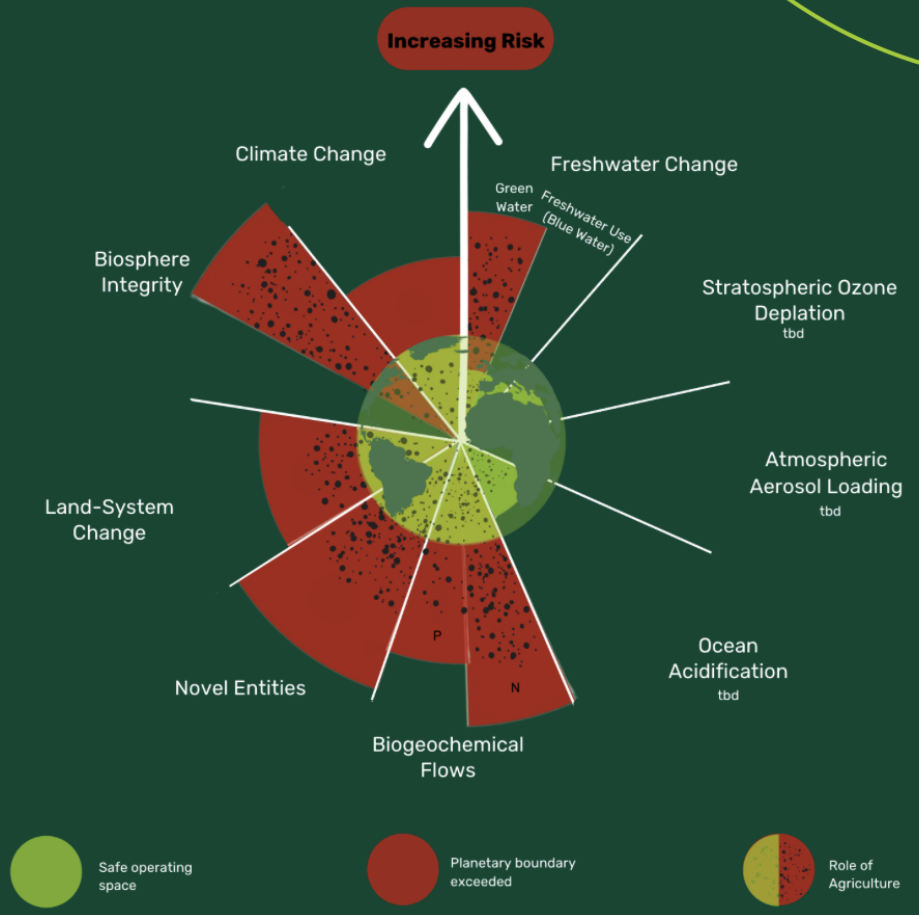
Climate emergency

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.

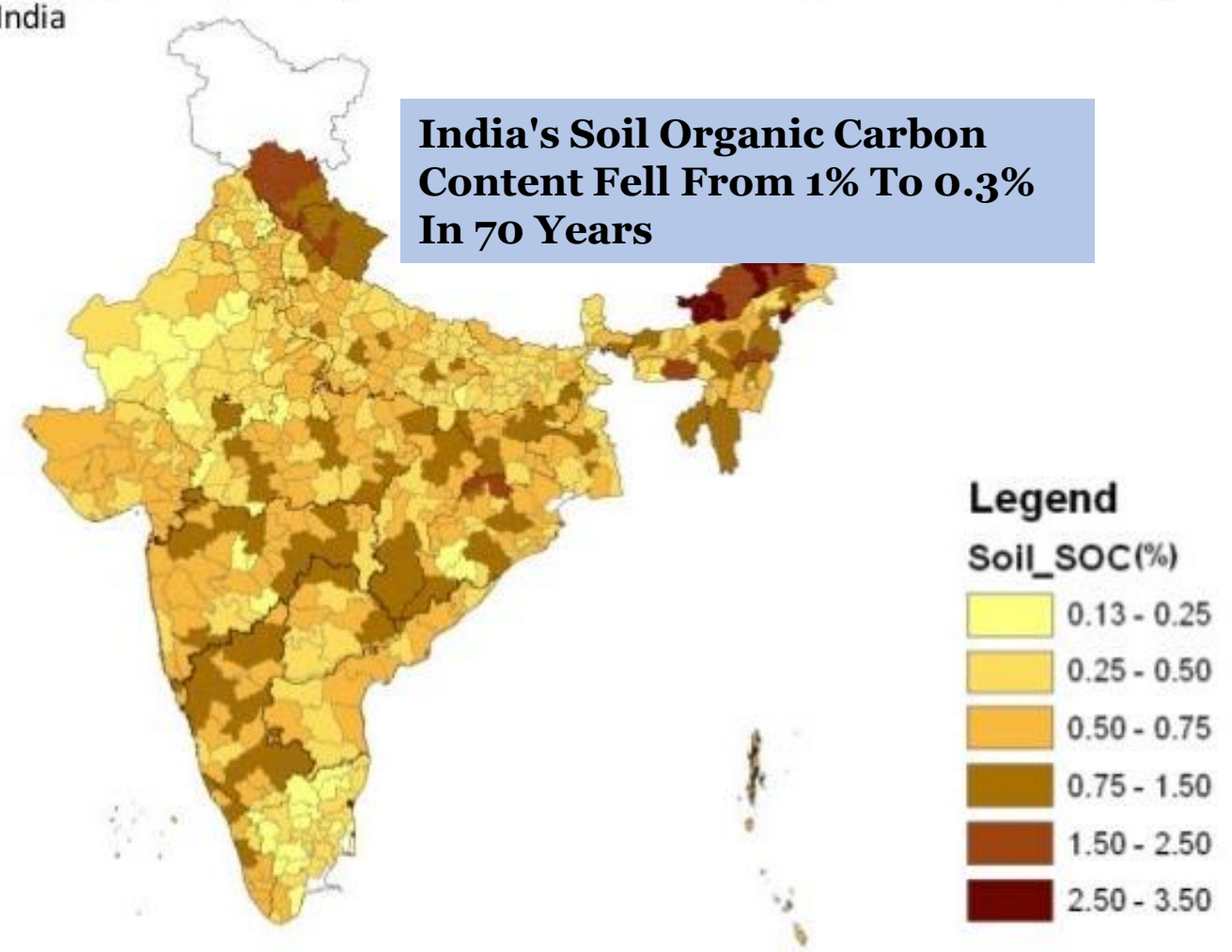
India’s soil emergency

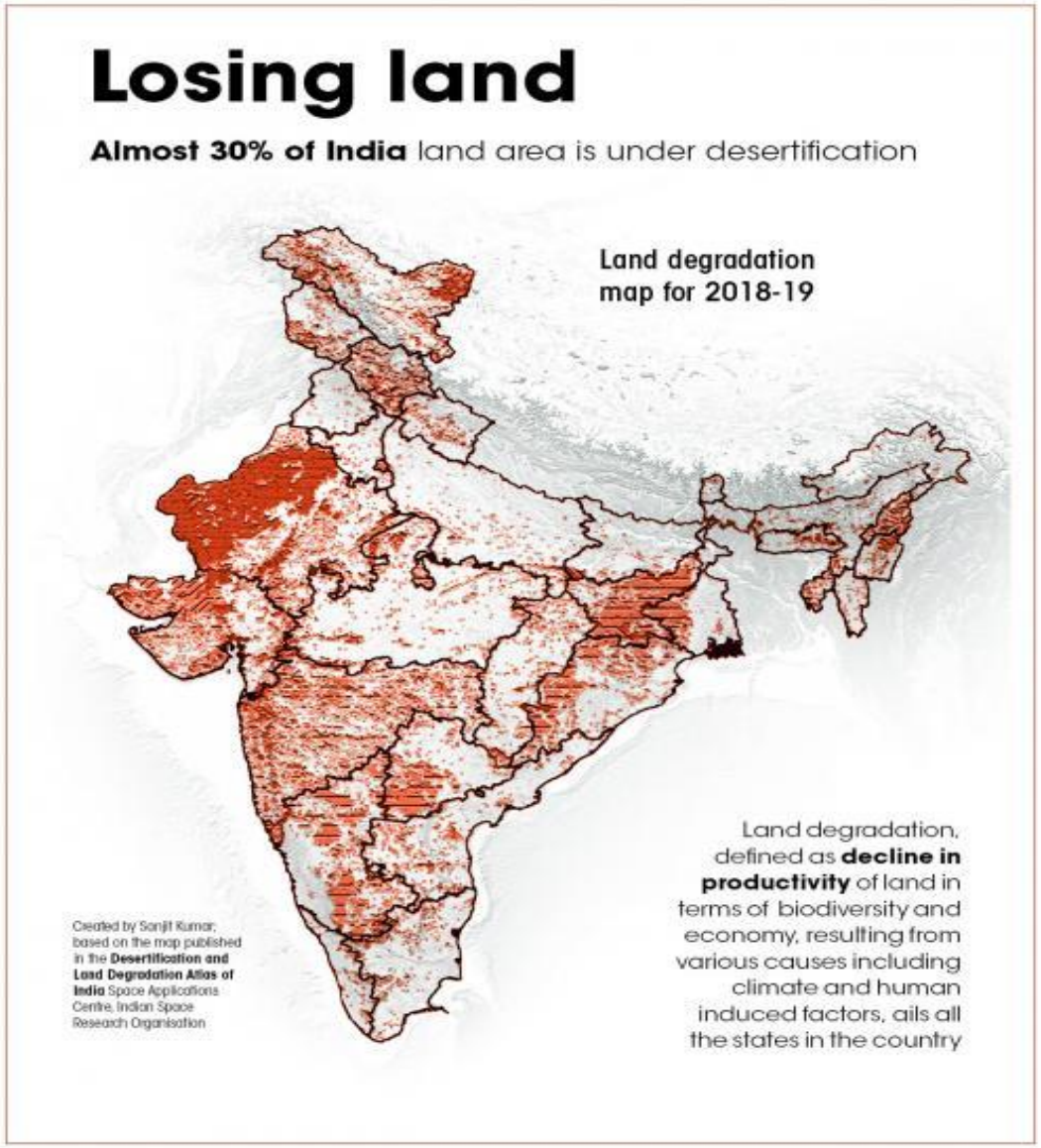
The world loses 24 billion tons per year. India is losing 5 billion tons of soil per year - 16 tons of soil per hectare per year

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 and decrease in fertilizer use efficiency :

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

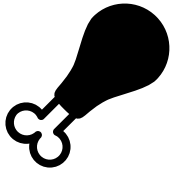
Meat
Fruits
Vegetables

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%

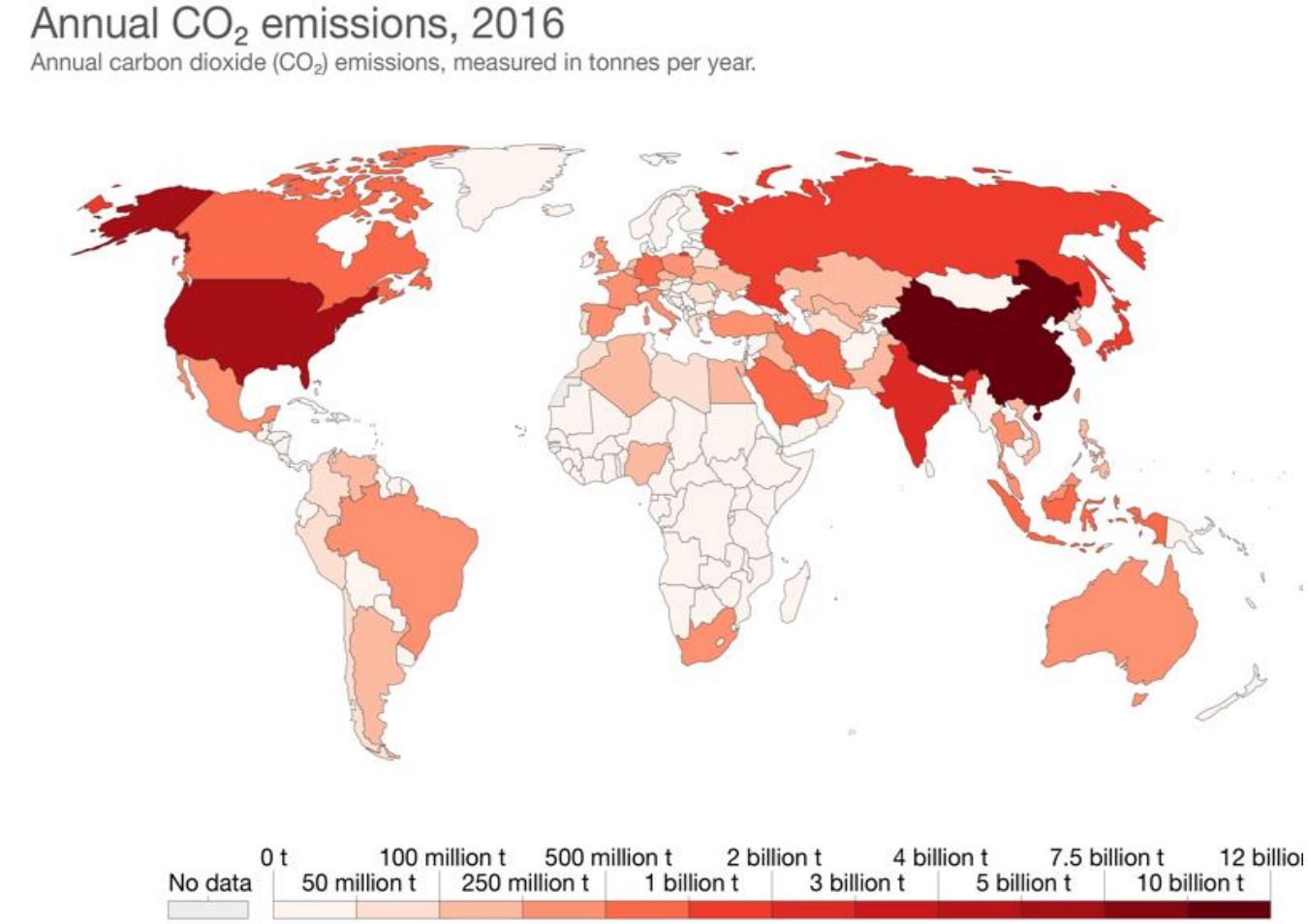


U.K - Mineral depletion in meat
1940 - 1991
Average of 10 kinds of meat

- 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.

Role of food systems in GHGs – 34%



Current land management – leading to steady loss of soil organic matter

- **DEFORESTATION**
- **FOREST FIRES BURNING CROP RESIDUES**
- **PLOUGHING**
- **KEEPING LANDS FALLOW**
- **EXCESS IRRIGATION**
- **WIND AND WATER EROSION**
- **BIOCIDES – CHEMICAL FERTILIZERS AND PESTICIDES**
- **OVERGRAZING**

Farmers are the frontline climate warriors. At the same time the current methods of farming are among the largest causes for climate change

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.

It is the future of agriculture

Natural farming is the future of agriculture. Rooted in our traditions and rooted in modern science.

A holistic view of sunlight, the elements, soil, microbes, plants and animals (incl human beings) and their inter relationships.

Pioneers who have inspired us: Dr. Sanghi, Dr Rupela, Sh. Dabholkar, Sh. Bhaskar Save, **Sh. Subhash Palekar**, Sh. Nammalwar, Sh.Deepak Suchde, etc.

APCNF journey – 2015 to 2024: discovery of science, correlating empirical evidence with science, from ‘Practices’ to ‘Science’

Understanding the limitations of current science.

(*for instance - less than 1% of microbes, invisible to human eye, have been characterized*)

Inspirational global scientists

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 – using soil microbial characteristics)

ERA – Ecosystem Restoration Alliance

Nature's Sophisticated Carbon Capture Mechanism

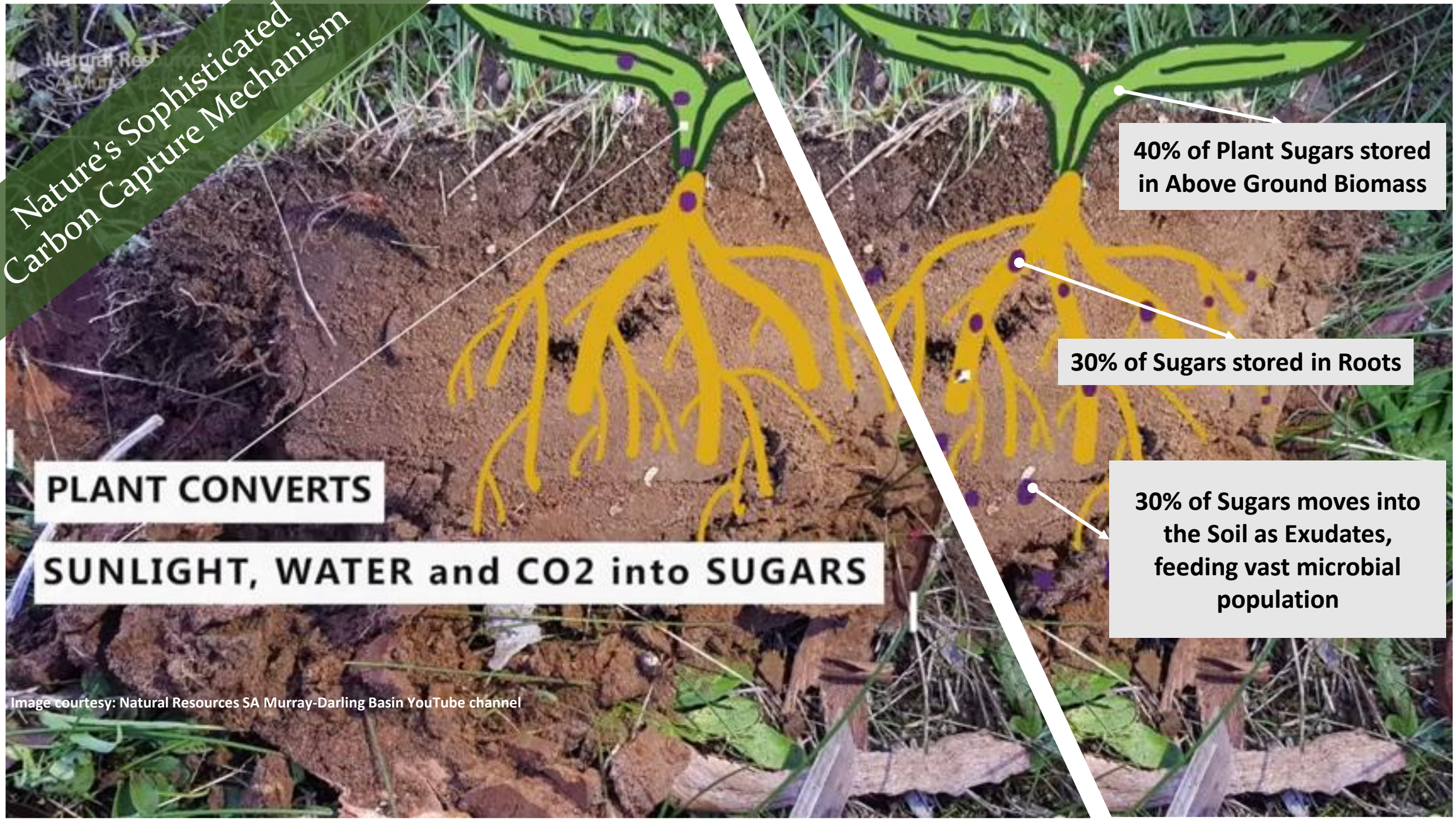
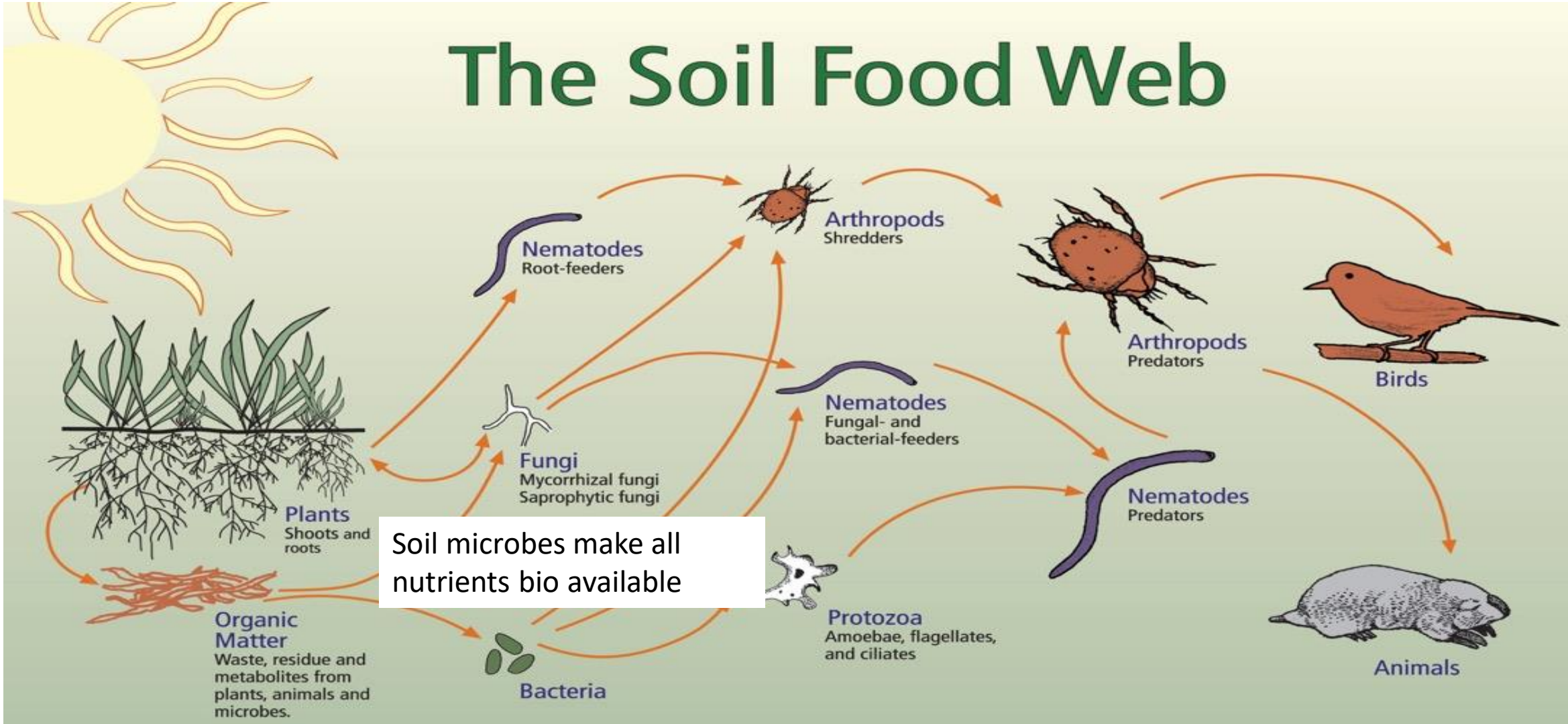


Image courtesy: Natural Resources SA Murray-Darling Basin YouTube channel

The Soil Food Web



First trophic level:
Photosynthesizers

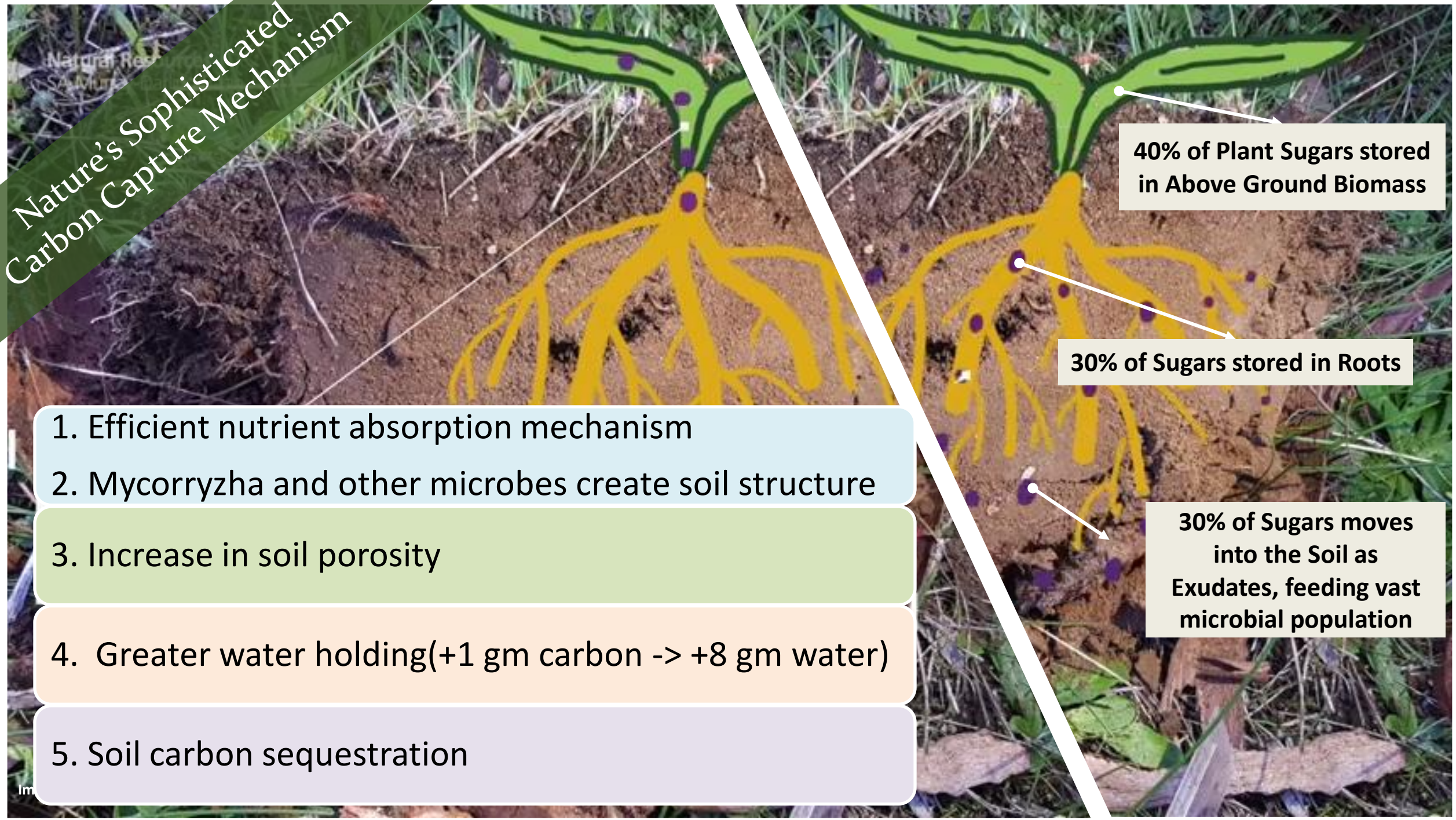
Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

Nature's Sophisticated Carbon Capture Mechanism

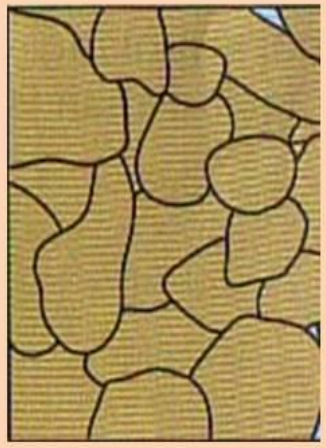


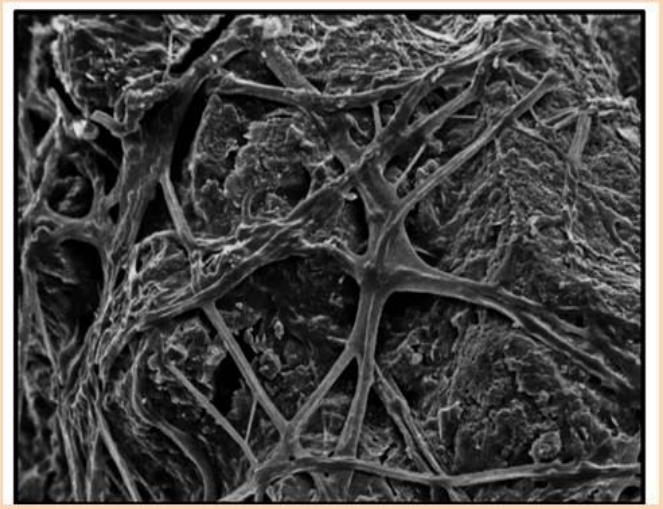
1. Efficient nutrient absorption mechanism
2. Mycorryzha and other microbes create soil structure
3. Increase in soil porosity
4. Greater water holding(+1 gm carbon -> +8 gm water)
5. Soil carbon sequestration

Soil structure and water conservation - building sub soil reservoirs

Soil aggregation

Non porous and non-permeable

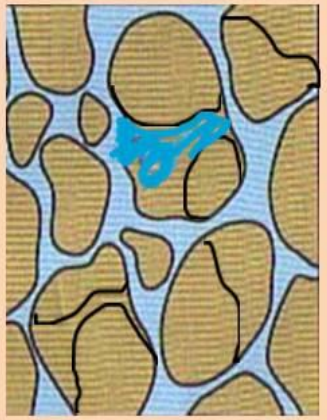




Fungal hyphae, bacteria & root exudates glue together the soil particles

(Electron microscopic image)

Porous and permeable with connected pore spaces



Soil Aeration

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

Universal Principles of 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

Crop diversity – poly cropping

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

Cow dung – 2 kg

Cow urine – 2 liters

Lime – 40 grams

Handful of chemical free soil

Water – 20 liters

Ingredients

Step 1

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

Step 2

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

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

Step 3

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 cakes and shadow dry for 5 – 7 days for fermentation

Step 3

Apply these cakes in the field at the time of sowing the crop

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

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 a mixture of sifted GJM, field soil, ash, with sprinkling of water.

The resulting pellet is 5 to 10 times the size of the original seed.

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

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

IMPACTS

1. Positive economic impacts – higher net incomes, lower costs, and similar or higher yields.
2. Farmers can get similar yields from the 1st season itself
3. Reduced water requirement
4. Resilience to floods and droughts
5. Greater biodiversity
6. Positive health and nutrition impacts

Summary Results For Kharif 2021-2022

Crop	Yields (quintals/ hectare)			Gross Income on Output (₹/hectare)			Paid out Costs (₹/hectare)			Net returns (₹/ hectare)		
	CNF	Non-CNF	% Change	CNF	Non-CNF	% Change	CNF	Non-CNF	% Change	CNF	Non-CNF	% 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 non-APCNF, percentage change over CNF is inappropriate.

Source*: IDSAP, Field Survey 2021-22

NF farmer – 2.2 years experience

**** CNF sample HH- 1380, Non - CNF sample HH -974***

*****CNF CCEs - 470, Non - CNF CCEs - 263***

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 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. Study Leader: Professor Harpinder Sandhu Report manager: Dr. Chiara Gastaldi	July 2023
2	Agro-industry vs agroecology? Two Contrasting Scenarios for 2050 in Andhra Pradesh, India		Bruno DORIN (Cirad/Cired, France) Anne-Sophie POISOT (FAO, Italy) 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, 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 , Sol Bermejo Mitjansa and Jules Pretty	
6	Investigating Pathways for Agricultural Innovation at Scale 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

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 for the Sustainable Development Goals 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

Contrast between natural farming and chemical farming

March 2024 – contrast between natural farming and chemical farming

https://www.youtube.com/watch?v=AKLypADy9K4

Resilience through natural farming

December 2023 : Resilience to Cyclone Michaung - 'natural' calamity or 'man-made' calamity

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


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

Greening the desert
Drought proofing through Natural farming - just 3 months of intervention

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

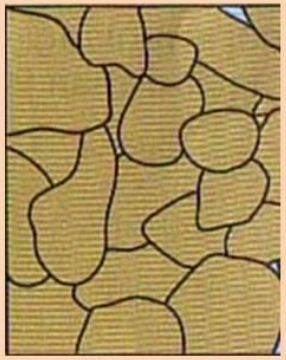
50 drops
run-off / evaporation

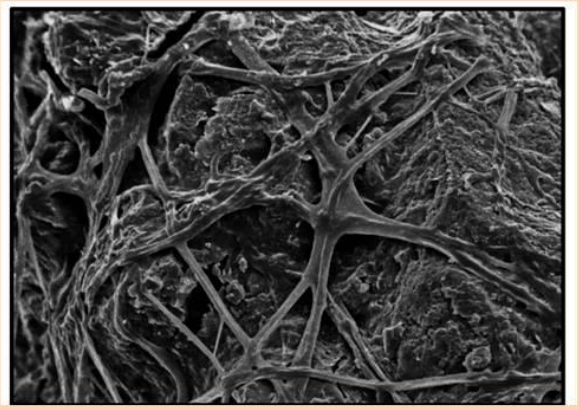
But there is an additional phenomenon triggered by Natural farming – harnessing water from the air.

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

Soil aggregation

Non porous and non-permeable

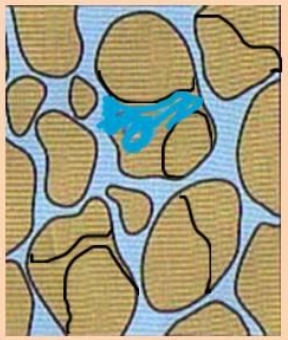




Fungal hyphae, bacteria & root exudates glue together the soil particles

(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

Harnessing water from the air through natural farming

April 2023 – PMDS + 365 days green cover – Maize model :
https://youtu.be/kZ9WZJImuU8

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‘

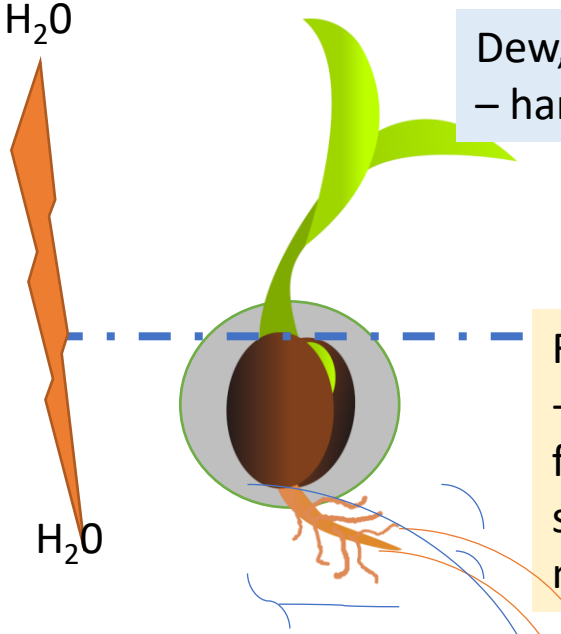
Sources of Water in harnessing water from air

Atmospheric water vapour – 50,000 ppm

H_2O

Dew, Haze after shoot emergence – harvesting water vapour

Fungal hyphae – can extend upto 25000 km per cubic meter of biologically healthy soil



H_2O

For germination - Biological water from Bio stimulant and mulch

For germination and plant growth -Uptake from soil films – below wilting point

Surface water

Mycorrhyzal fungal extensions

Greater porosity – roots can explore deeper water and fungal hyphae can draw from soil film – in dry spell

Deep water

Natural farming : a new paradigm for water

APCNF changes the paradigm where we look at 'crops' only as 'consumers' of water. Natural farming shows that 'crops' produce water and also consume water.

Reduces evaporation losses – the 365 days green cover and crop residue mulching reduces evaporation losses

Reduces water runoff – greater soil porosity reduces water and soil runoff

Increases water holding – increases in soil organic matter increase water holding capacities

Creates 'new' water – harnessing water from the air (never seen as a resource for crop growth)

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

Next game changer from APCNF – ‘A’ grade crop models

The A grade model showcases all the principles of natural farming –

- One major crop + 4 to 6 associated crops and 25 biodiversity crops (5% of the seed weight of the 5 – 7 main crops) – throughout the year
- 365 days green cover, diverse live plants at all times and in all seasons, relay cropping
- higher land equivalent ratios and higher cropping intensities
- minimizing tillage, crop residue mulching
- Sowing pelleted seeds in dry conditions
- use of bio stimulants to activate soil biology, use of indigenous seeds, etc.

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

A grade models – prosperity of farmers, health of citizens and climate resilience

1. 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)
   (90% of households in India have less than this income)
2. To develop 100,000 such farmers in Andhra Pradesh in the next 3 years.

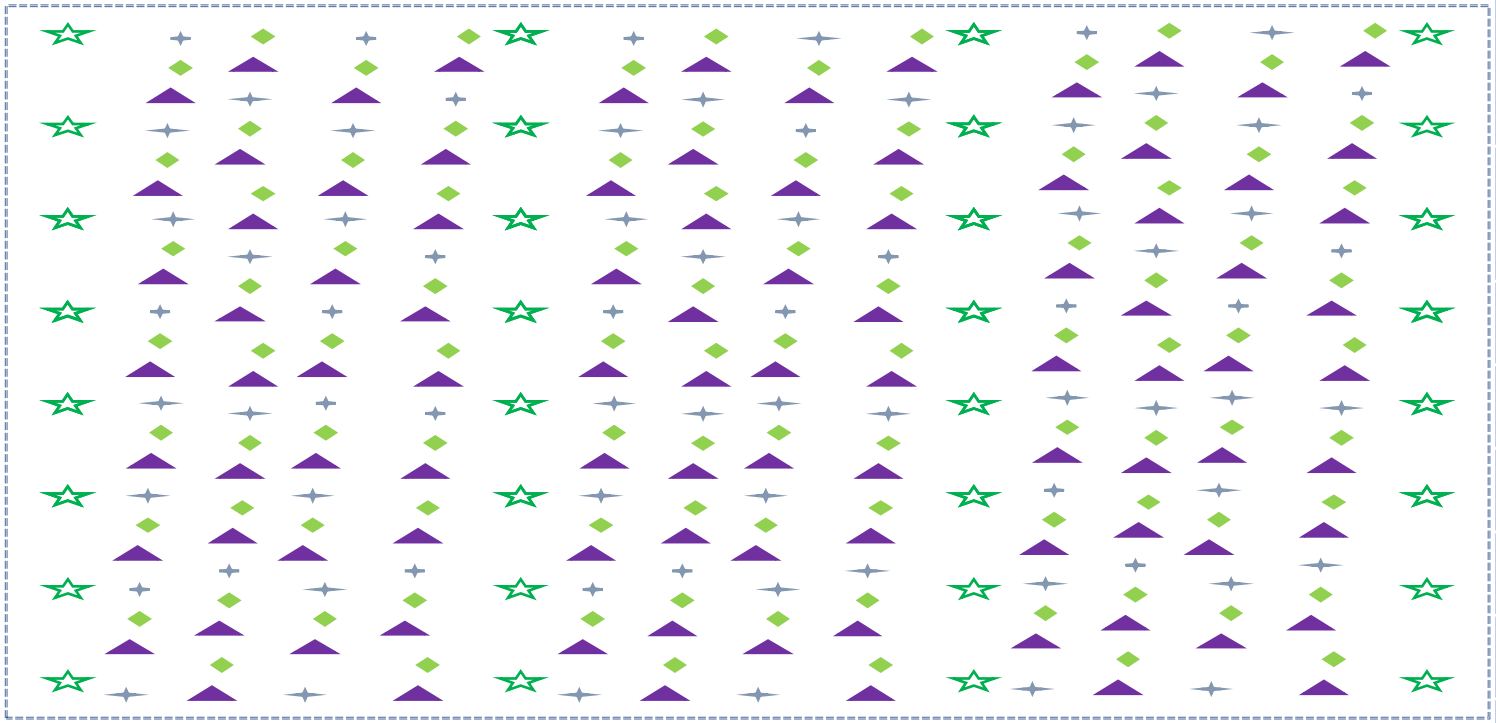
3. At present 'A' grade Farmers are getting incomes, on a monthly basis through out the year, even from semi arid, rainfed lands.

4. Food produced in A grade, diverse crops situation has better nutrition density

5. Most important they are critical for enhanced climate resilience

6. **Move towards : A+ and A++ - incorporating trees in the A grade plot.**

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)

S No	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

A grade model in cotton

Crop Geometry and Seed rate (October to June)				
S No	Name of the crop	Crop Geometry Spacing (cm)	Seed Rate (Kg/Acre)	Remarks
1	Cotton	Perennial – continuation		Perennial
2	Tomato	90 x 60	0.05 to 0.06	Biennial
3	Sesamum	30 x 30	1.00 to 1.20	90 days
4	Brinjal	90 x 60	0.070 to 0.080	Perennial
5	Field bean	150X150	1.00 to 1.25	120 days
6	Castor	2000 x 2000	0.500	Perennial
7	Pearl Millet	120X120	0.400	every 90 Days
8	Okra	120X120	1.00 to 1.25	every 120 Days
9	Greengram	120X120	1.00 to 1.25	every 90 Days
10	Biodiversity 25 crops	Randomised	5 % Seed rate	for 365 days

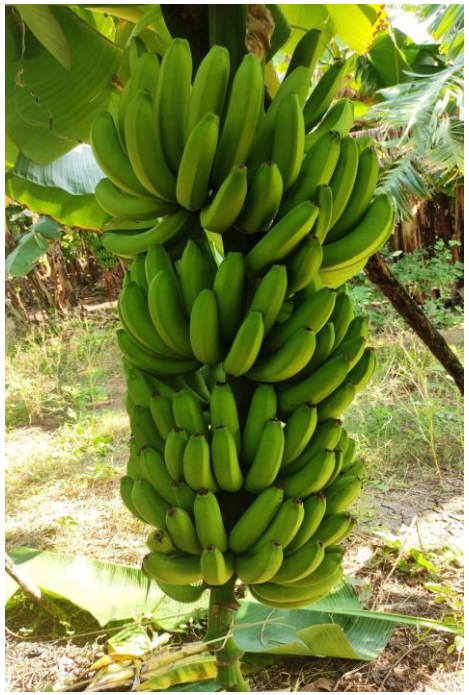
25 DAYS CROP

45 DAYS CROP

180 DAYS CROP

365 DAYS CROP

BANANA PMDS MODEL



Smt S. Saraswathi, Tadipatri, Ananthapuramu

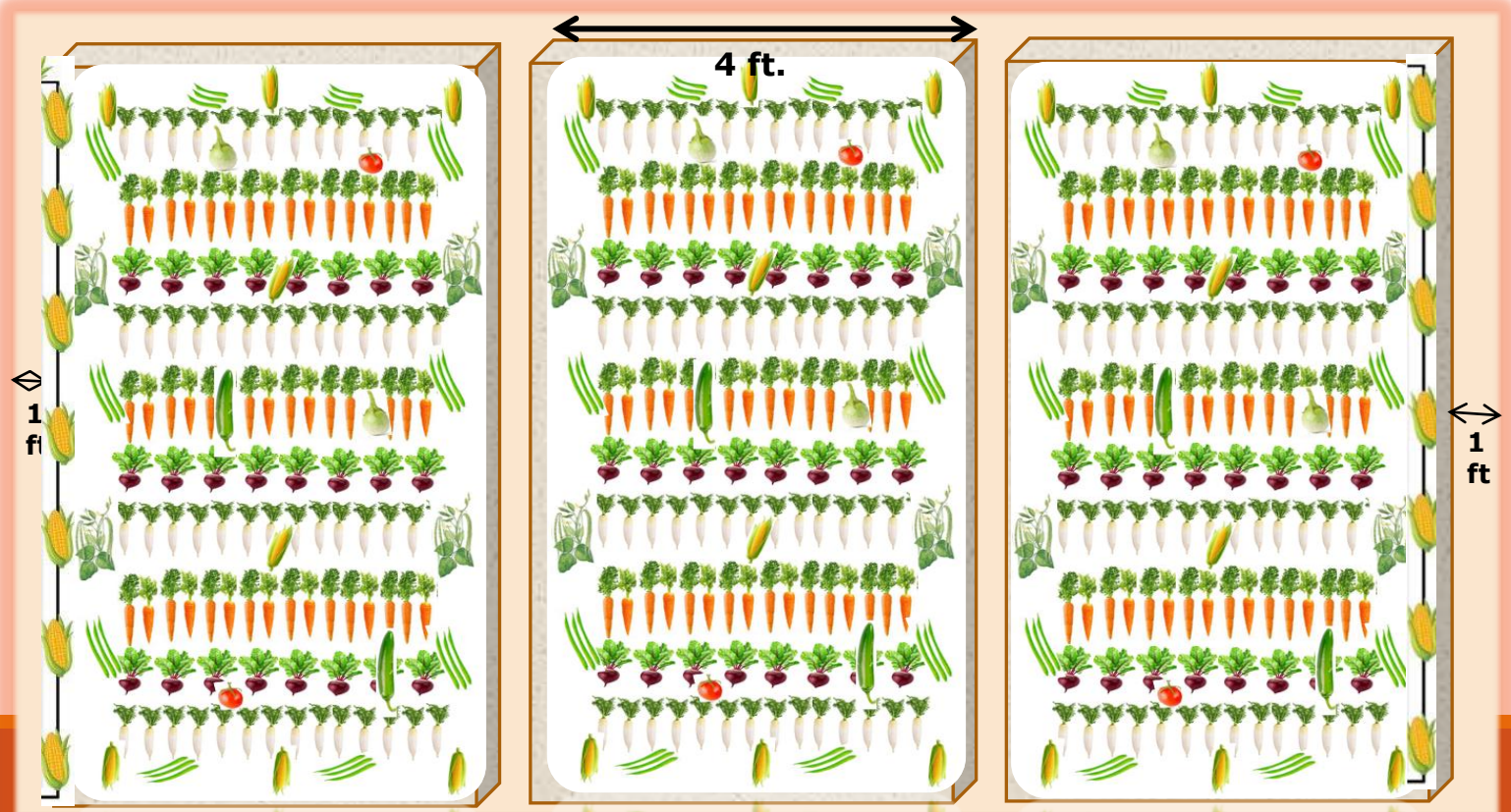
6 acres owned farm with Banana as main crop along with Marigold, Cowpea, Cluster bean

DATA OF 365 DAYS BANANA MODEL UNDER NATURAL FARMING			
PMDS Abstract for 3 years			
Year	**2020-21 (6 acre)**	**2021-22 (6 acre)**	**2022-23 (6 acre)**
Total Expenditure(Rs)	2,01,000	1,98,000	1,86,000
Total Gross income(Rs)	16,11,000	17,17,000	19,03,000
Total Net Income(Rs)	**14,10,000**	**15,19,000**	**17,17,000**

ATM model suited for landless farm workers and small farm holders

It is a 20 cents plot (0.20 acres) model with 15 – 18 vegetable crops, and continuous relay cropping of vegetables.

Farmers start getting 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.150,000 per annum.



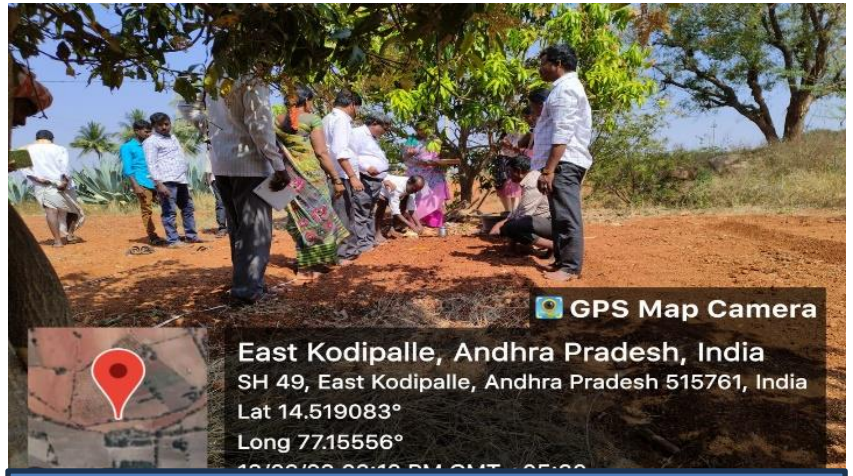
Any Time Money Model (ATM)

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

ATM Model in Mango orchard

M.Narayana, Champion Farmer, Kalyanadurgam, Anantapur

- 0.40 acres
- Red soils, Rain fed
- Date of sowing: 13 February 2023 ATM
- Date of Germination: 21 February 2023
- Crops Radish, Beetroot, Carrot, Cluster bean, Cowpea, Maize, Bajra, Marigold, Chilli, Brinjal, Tomato, Leafy Vegetables in Mango orchard
- No of germinated crop seeds: 18
- Live Mulching



Sowing 13 February 2023


Bed preparation


Variety of seeds

Field evaluation 13 March 2023

Harvesting Radish and cluster beans

DATA OF 365 DAYS MULTI CROPPING ATM METHOD UNDER NATURAL FARMING		
PMDS Abstract for 1 year		
Year	**2022-23 (0.40 acre) Mango – multiple harvests**	**2022-23 (0.40 acre) ATM Model**
Total Expenditure(Rs.)	1,500	9,000
Total Gross income(Rs.)	48,000	145,000
Total Net Income(Rs.)	**46,500**	**136,000**

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

The Government of AP initiative

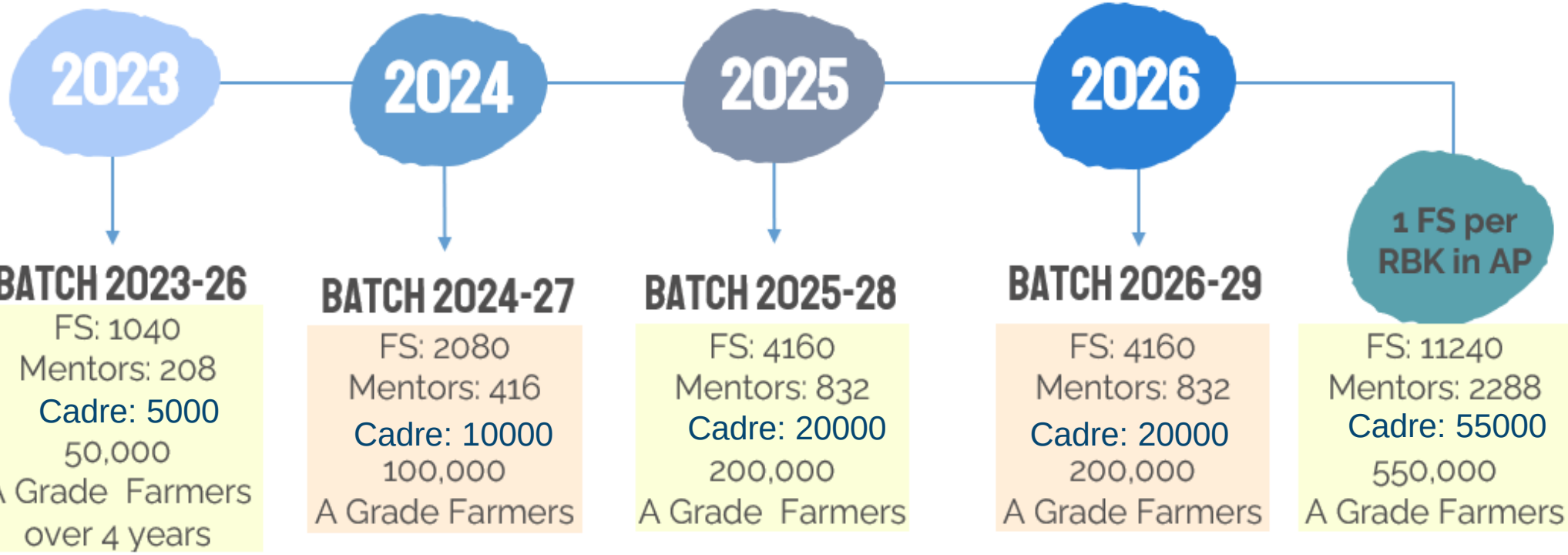
Indo-German Global Academy for Agroecology Research and Learning has been launched in collaboration with the Government of Germany

The Academy Portfolio

- **Graduation for Farmer Scientists; PG for Mentors; Diploma/PG Diploma for Learning Facilitators/cadres; Certificate for farmers**
- **Self-learning and Assisted Learning Courses; Certifying Learning Facilitators**
- **Knowledge Repository**
- **Farmers' Learning/Living Landscapes**
- **Global *and Local Research Partnerships - Collaborations, and***
- ***Upscaling Partnerships/Consulting Support***
- ***NF Congress, NF Journal***

One farmer scientist per RBK

PLAN TO DEVELOP ~10,000 FARMER SCIENTIST GRADUATES & ~2000 MENTORS



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

Natural farming science - paradigm shifts

1. Soil is a living entity. It is not a mere substrate. Role of microbes critical.
2. Plants feed the soil
3. No external inputs required – synthetic or organic.
4. Crop diversity critical. Different species help each other and do not compete.
5. Weeds – misunderstood. Role of microbial densities and ratios.

Natural farming science - paradigm shifts

6. All plants fix nitrogen - they have to. MYTH - *Only legumes fix nitrogen*
7. Nutrient acquisition by plants is quite complex. Soluble inputs, Microbially mediated, Rhizophagy and endophytes.
8. Water paradigm. Plants are not mere consumers of water, but, also produce water
9. Pest management – IPM – NPM – ZPM. Role of Soil health and crop diversity, plant health pyramid
10. Will Food and nutrition security – possible only through

Natural farming science - paradigm shifts

Will Food and nutrition security be compromised if we all shift to natural farming .

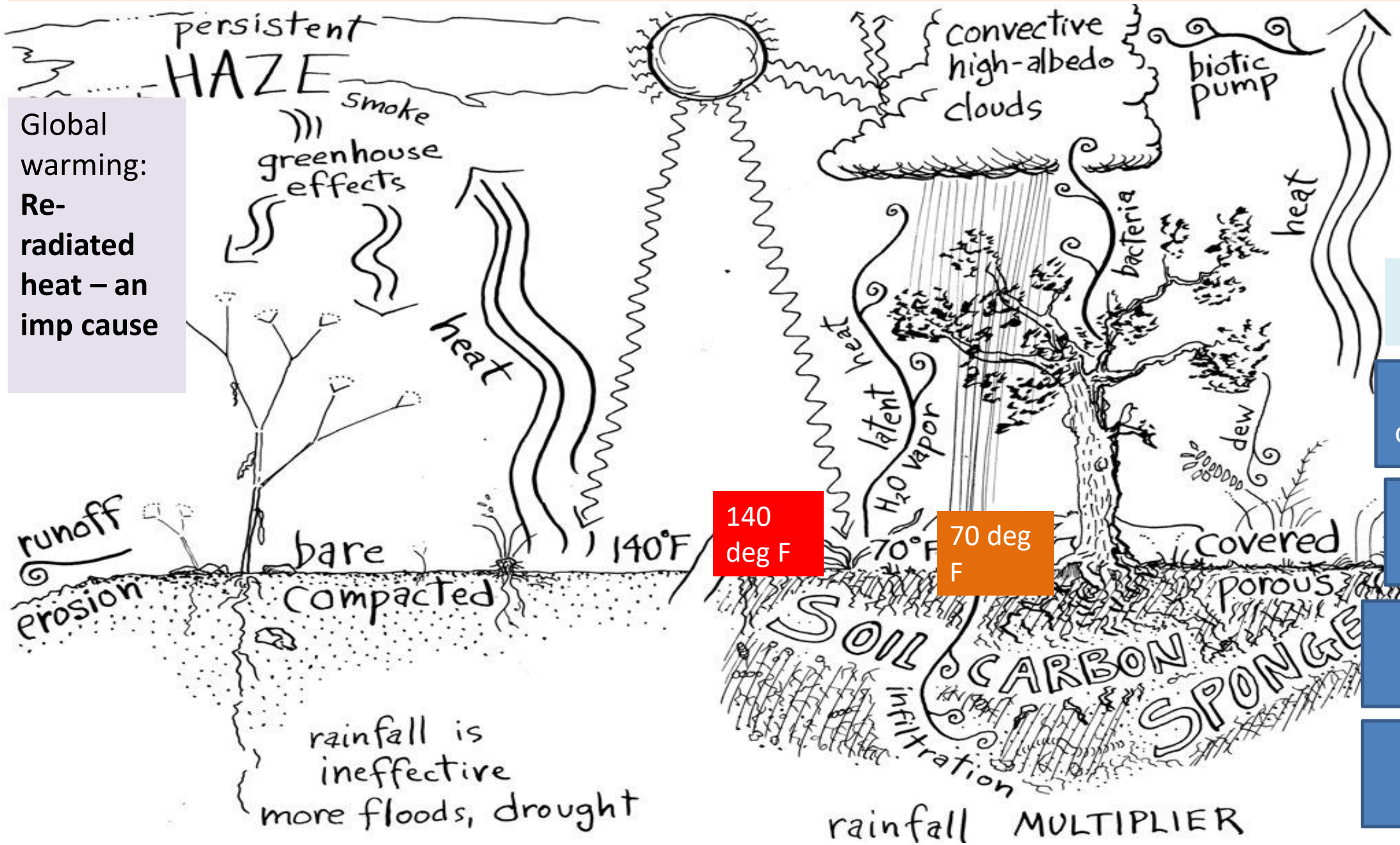
NO.

It is only through natural farming that it will be possible to provide adequate, safe and nutritious food for all. And, protect ourselves from an apocalypse.

Conventional agriculture is pushing us into a grave danger.

Natural farming and 365 days green cover can cool the planet

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



NF + 365 DGC

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

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

LET US ALL ACT NOW

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