Andhra Pradesh 'Community Managed' Natural Farming

Vision 2027: A Systemwide Transformation

50 million people | 6 million farmers | 8 million hectares

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Agriculture and Food Crisis

Farmer Distress

High Costs of Cultivation (Seeds, Fertilizers, Pesticides)

Prolonged Dry Spells, Droughts, Crop Failures

Acute water shortages, Drying of Borewells

Problems faced by Tenants,

Rural-Urban Distress Migration

Unseasonal Rain, More Frequent Cyclones

Market Uncertainty

Consumer Food Plate

Food Scarcity

Chemical Residues

Lack of Nutrients

Health Hazards

Soil degradation,

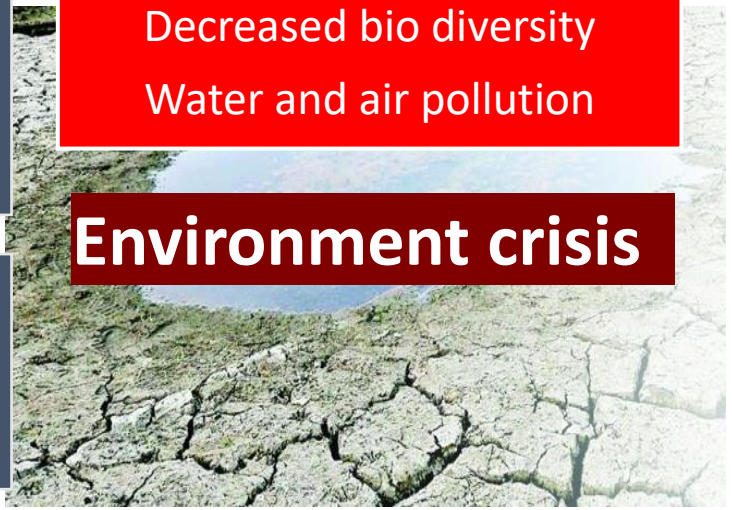
Continuous loss of soil organic matter

Water stress

Heatwaves – global warming

Decreased bio diversity

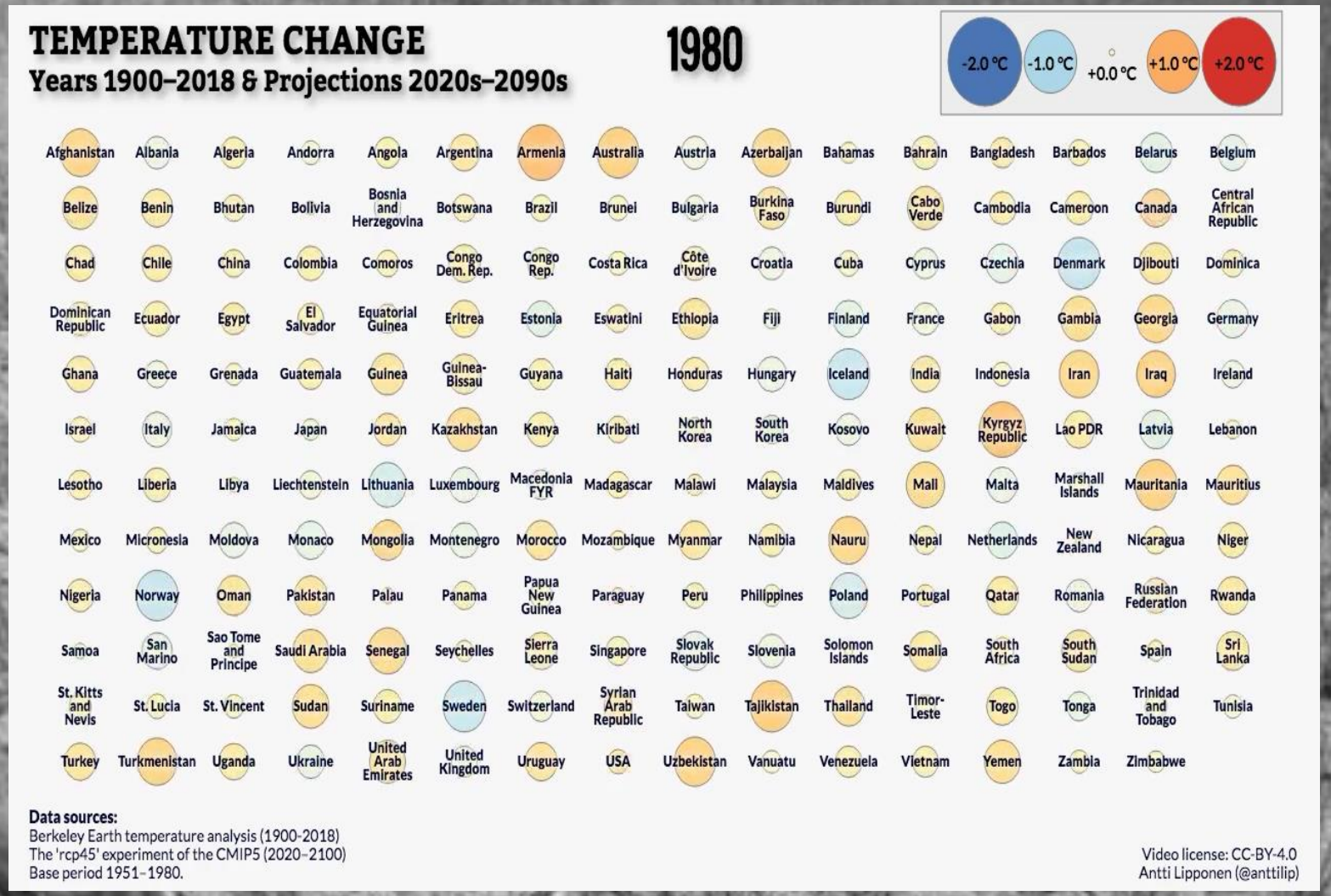
Water and air pollution



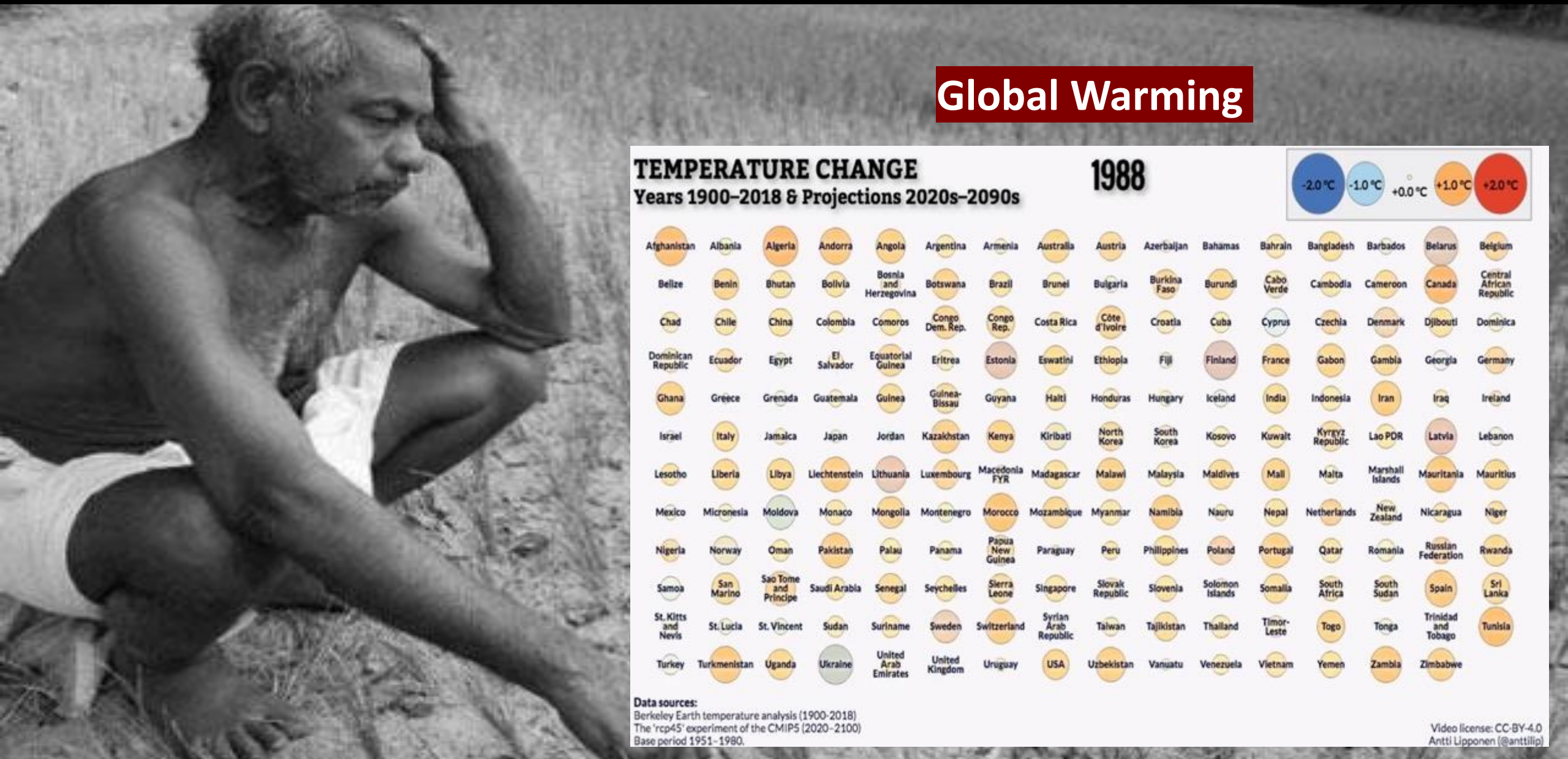
Environment crisis

Climate Crisis

Global Warming



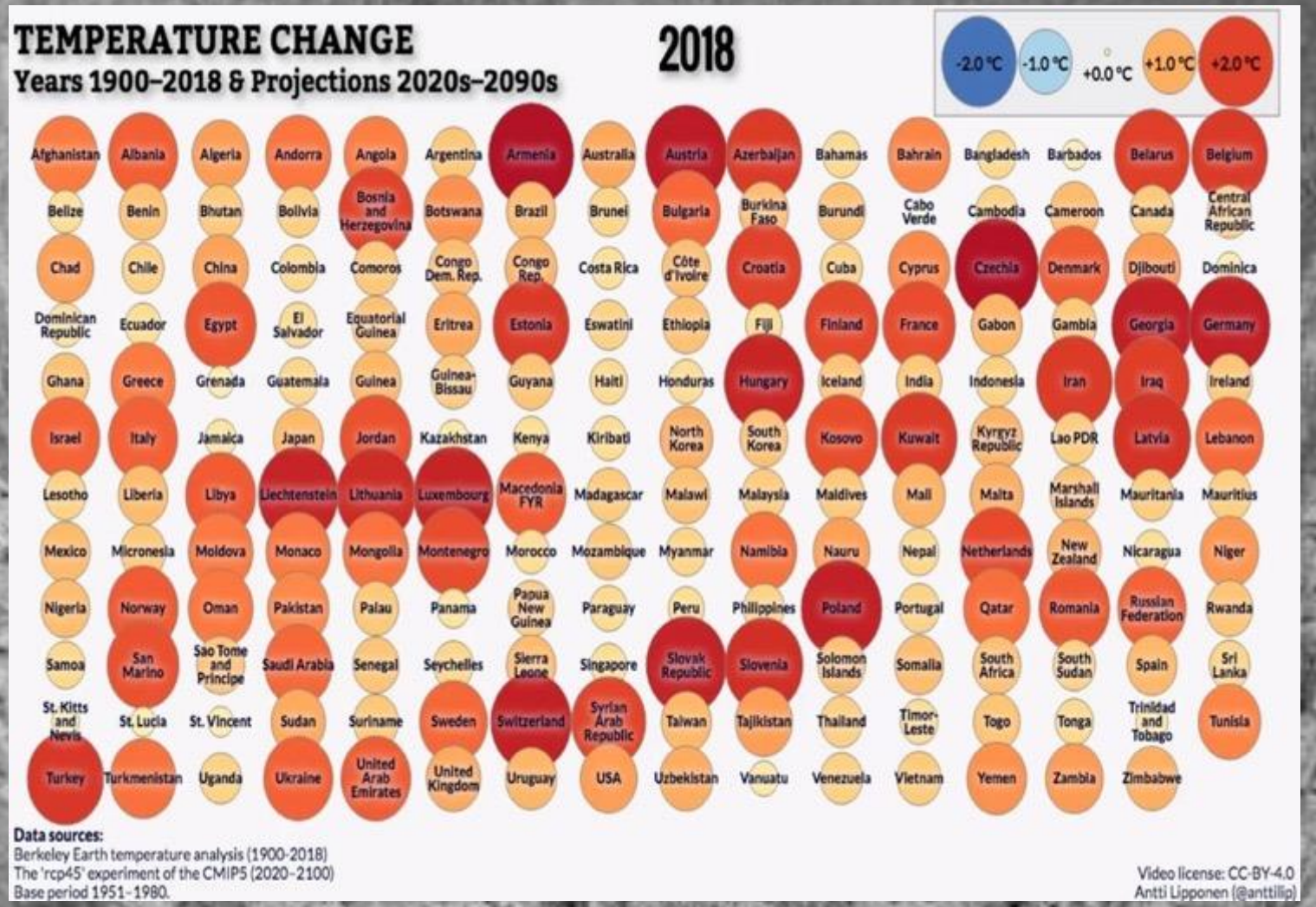
Climate Crisis



Global Warming

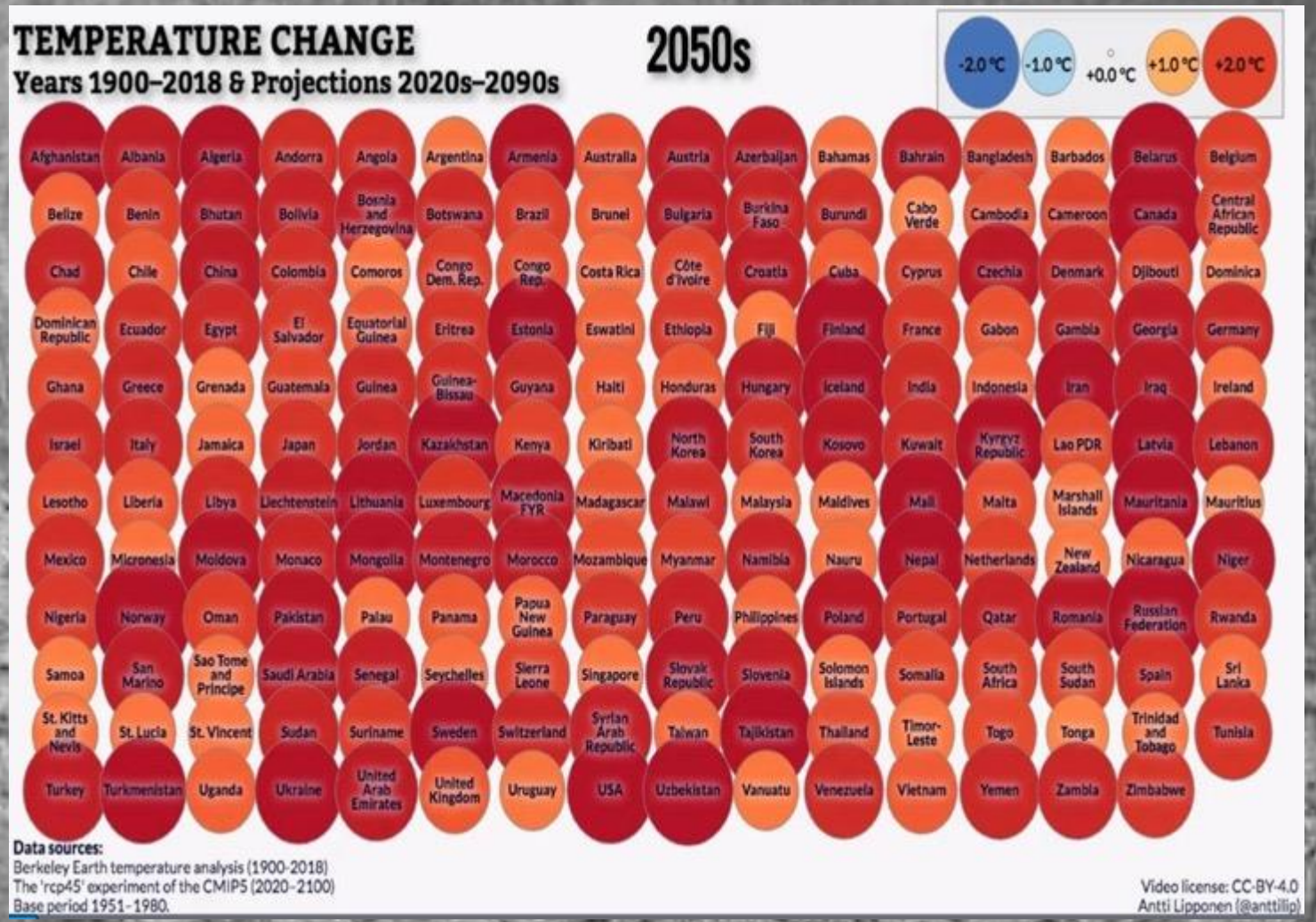
Climate Crisis

Global Warming



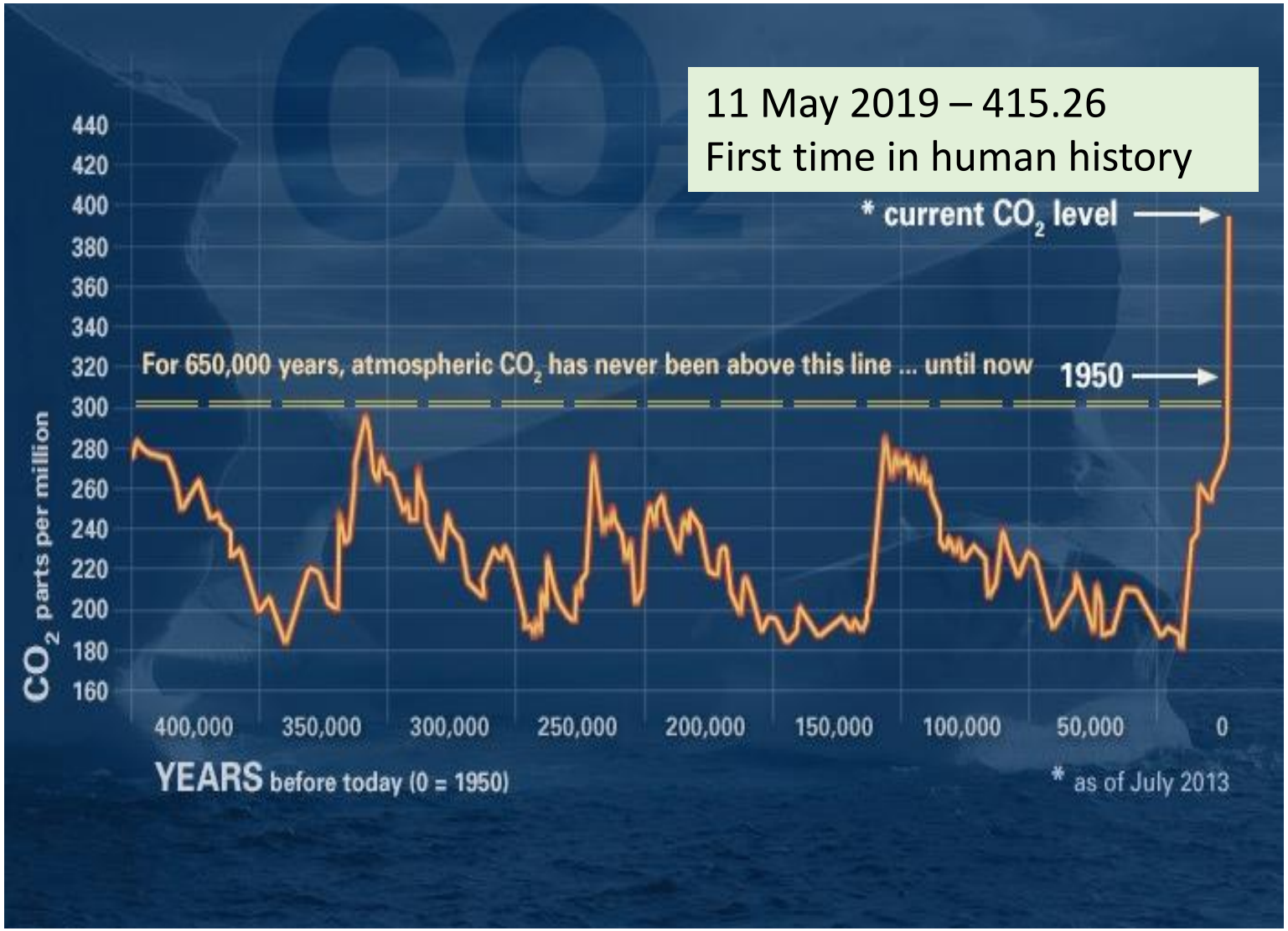
Climate Crisis

Global Warming

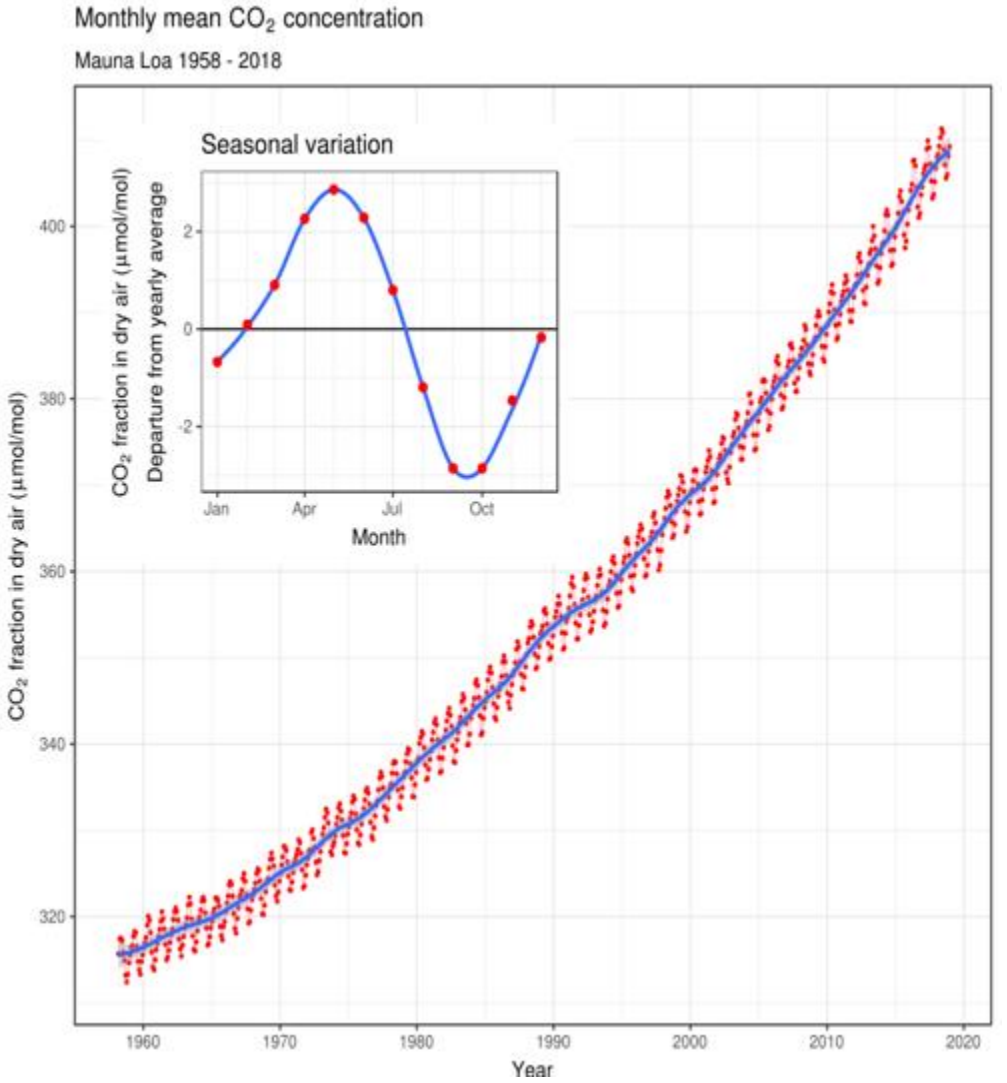


Climate crisis

The relentless rise of carbon dioxide



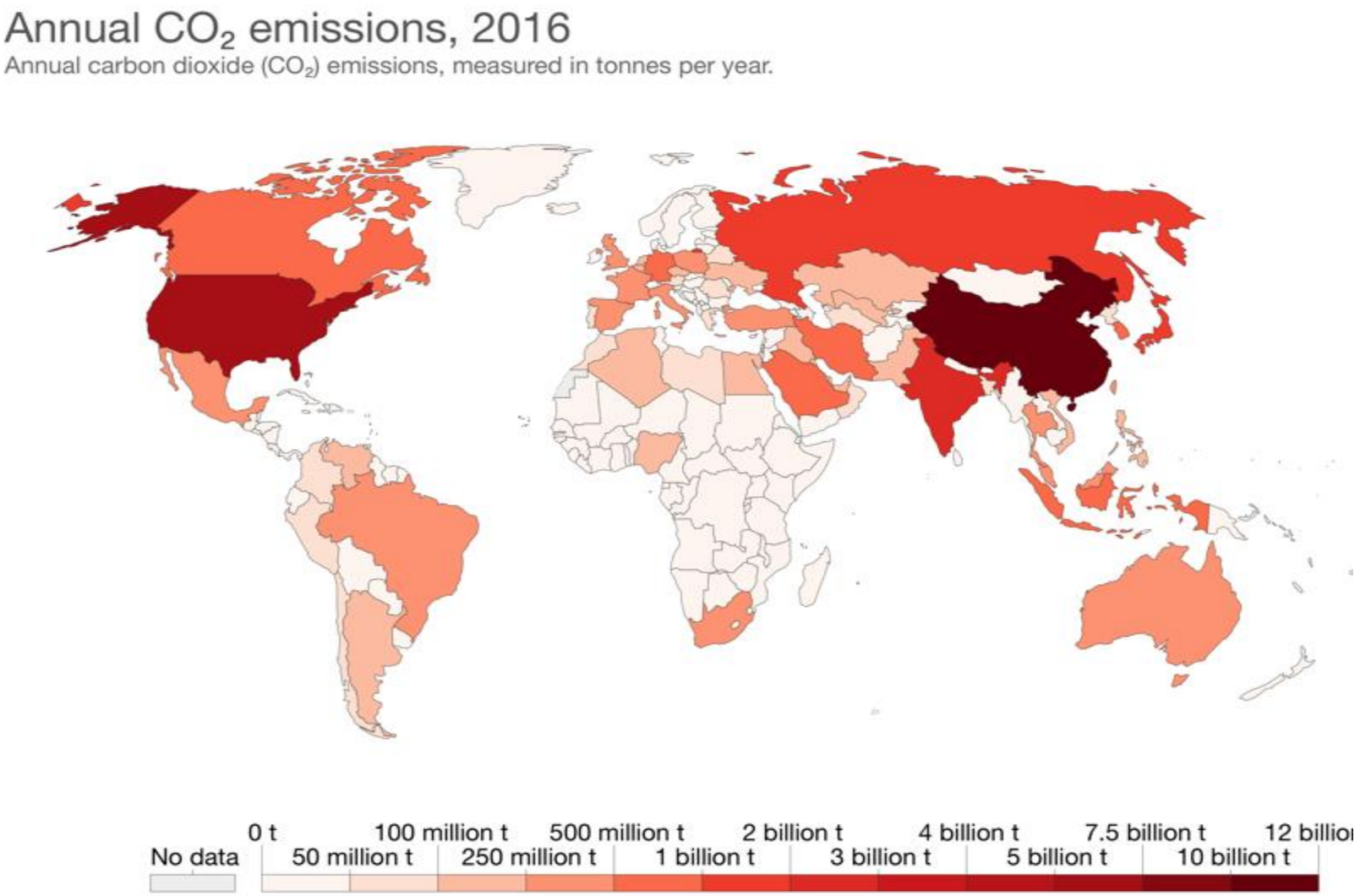
Source: NASA, Global Climate Change



Source: R F Keeling, S. J Walker, S.C Piper, A. F Bolienbacher

Role of Agriculture in GHGs – 24%

Steady loss of soil organic matter - only 60 harvest years



- Deforestation
- Burning forests and Crop residues
- Ploughing
- Keeping lands Fallow
- Excess Irrigation
- Wind and Water Erosion
- Biocides – Chemical fertilizers and pesticides

Climate injustice - disproportionate burdens

*Stealing the **future of children** in front of their very eyes*

Children

Farm Workers

Women

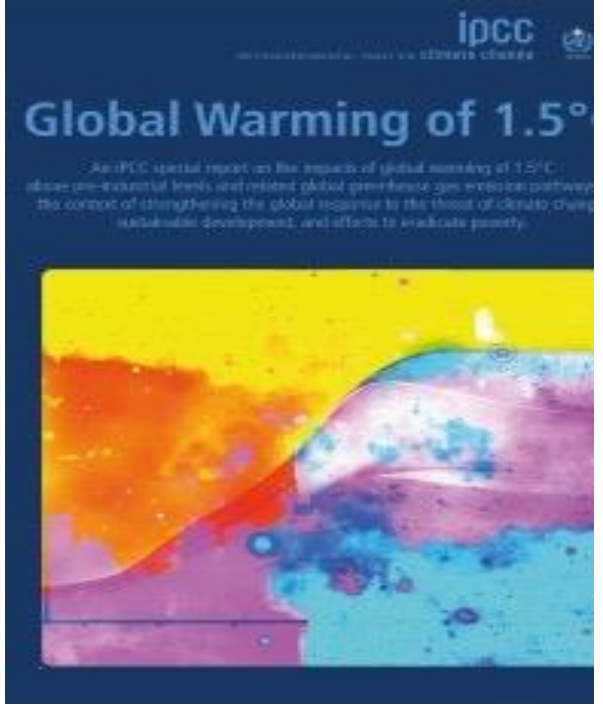
Tribal and indigenous communities

IPCC 1.5 SR: Warning

Intergovernmental Panel on Climate Change, Oct 2018

To limit warming at 1.5°C, governments and private businesses **must make unprecedented changes,** on a sweeping **global scale,** in:

- *energy systems*
- ***land management***
- *building efficiency*
- *industrial operations*
- *shipping and aviation*
- *city-wide design*

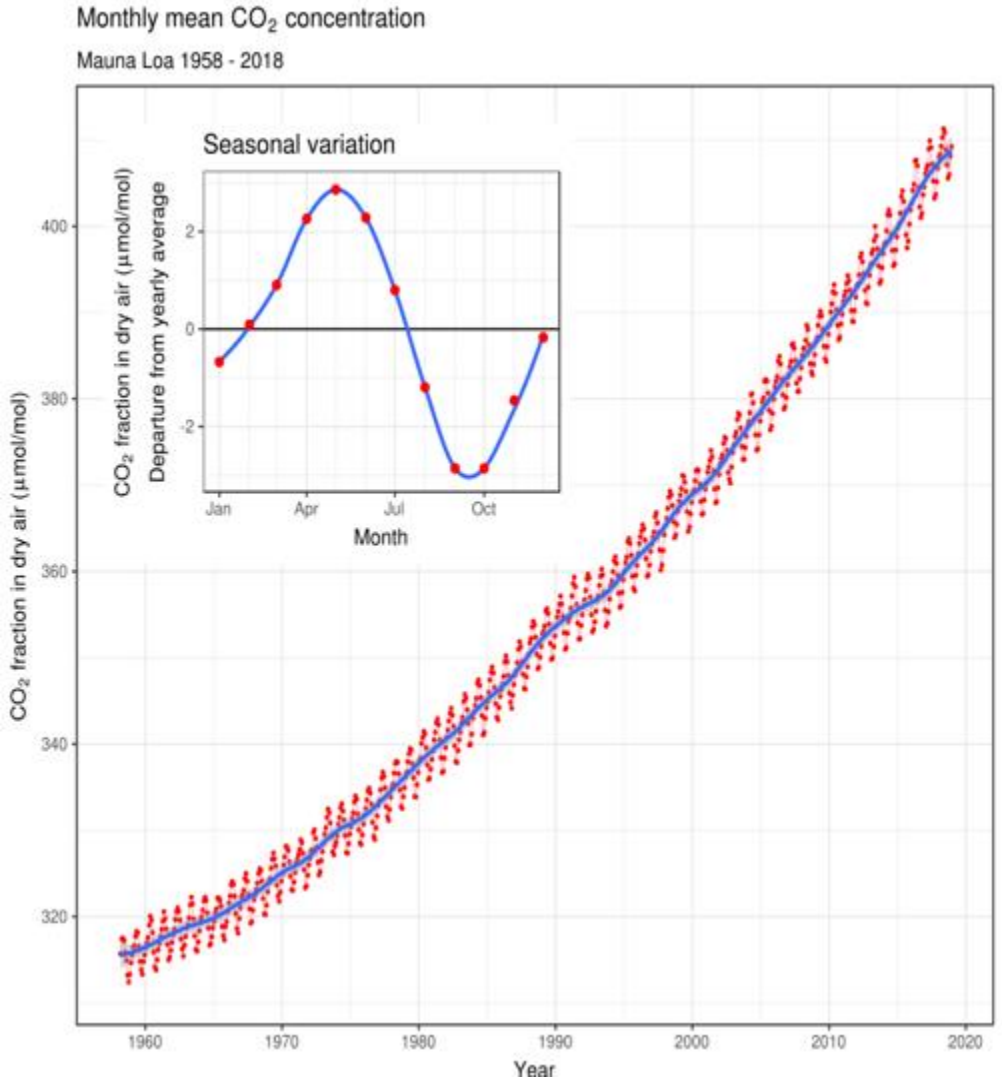


UN Chief Executives Board Meeting, 09 May 2019

Joint Appeal: UN Calls Upon Member States to Pursue Ambitious Climate Action

We have **12 years** to limit climate change catastrophe, warns UN

Climate solution - drawdown

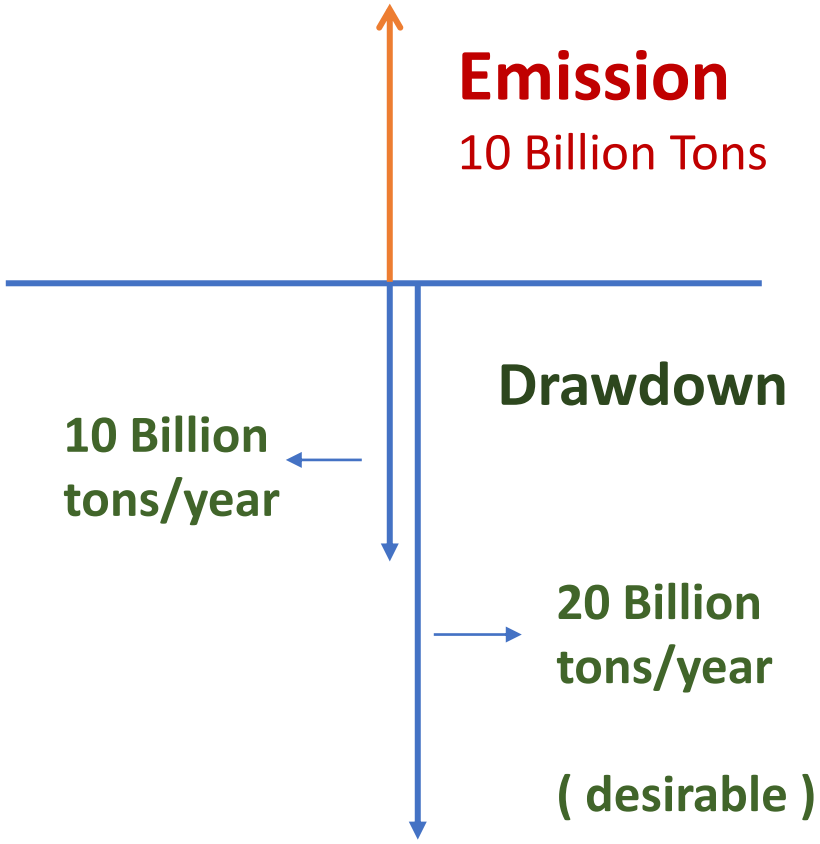


Source: R F Keeling, S. J Walker, S.C Piper, A. F Bolienbacher

CO_2
Half Life
100 years

Humus
Stable Carbon
500 to 2000 years

Carbon: emissions and drawdown



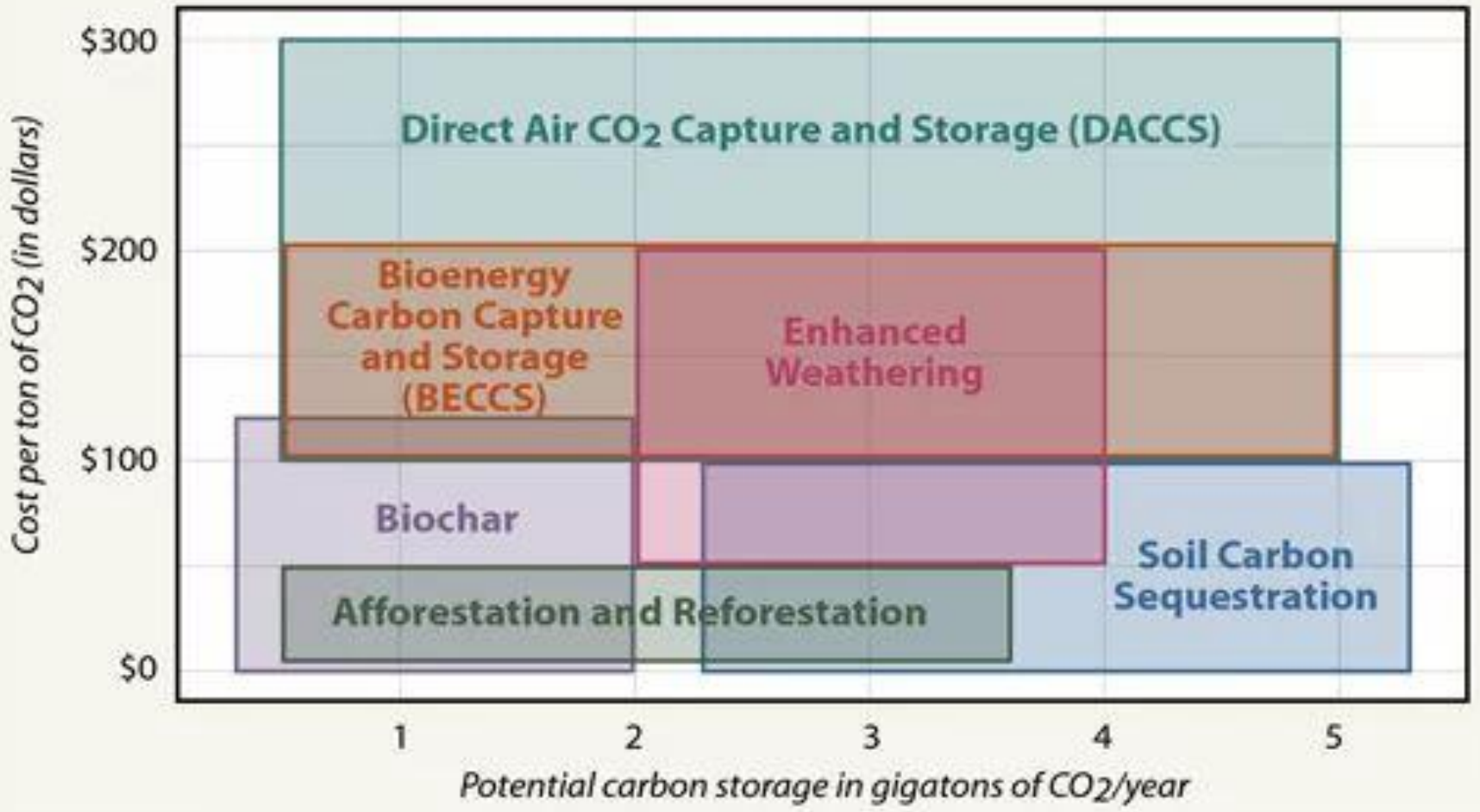
Intergovernmental Panel on Climate Change (IPCC)

WMO UNEP

Nobel 2007 PEACE PRIZE © THE NOBEL FOUNDATION

How Do Carbon Storage Techniques Stack Up?

To meet the goals of the Paris climate agreement and keep global warming under 1.5 degrees Celsius, the world will have to increase the amount of carbon dioxide pulled from the atmosphere, the IPCC reports. It compared the costs and storage potential of six key methods of carbon dioxide removal. Soil carbon sequestration is one of the cheapest with the most potential.

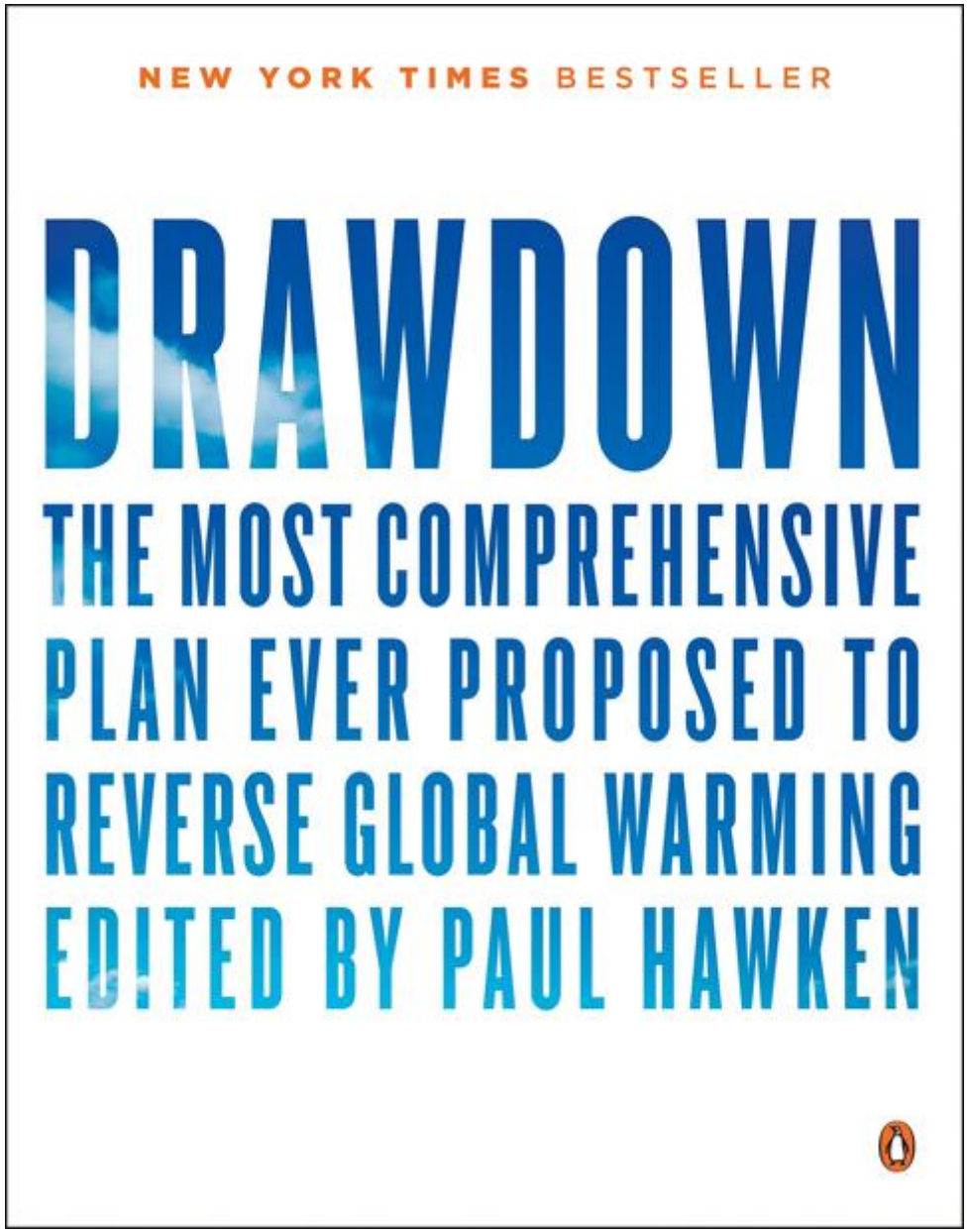


SOURCE: IPCC

InsideClimate News

80 calibrated solutions to reverse global warming

Regenerative Agriculture could result in *reduction of 23.2 gigatons of carbon dioxide, from both sequestration and reduced emissions.*



Best Agriculture practices to Reverse Global Warming

In international classification, Z.B.N.F comes under climate change resilient, **Agroecology,** more specifically under “Regenerative agriculture”.

Regenerative Agriculture is a holistic land management practice that leverages the power of photosynthesis in plants to close the carbon cycle, and build soil health, crop resilience and nutrient density.

Regenerative Agriculture

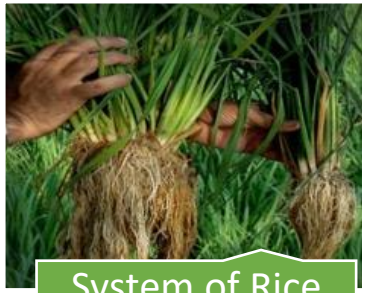
Conservation Agriculture

Silvopasture

Tree intercropping

Multistrata Agroforestry

Farmland restoration



System of Rice Intensification

Nutrient Management

Farmland Irrigation

Regenerative agriculture

Nature's Sophisticated Carbon Capture Mechanism

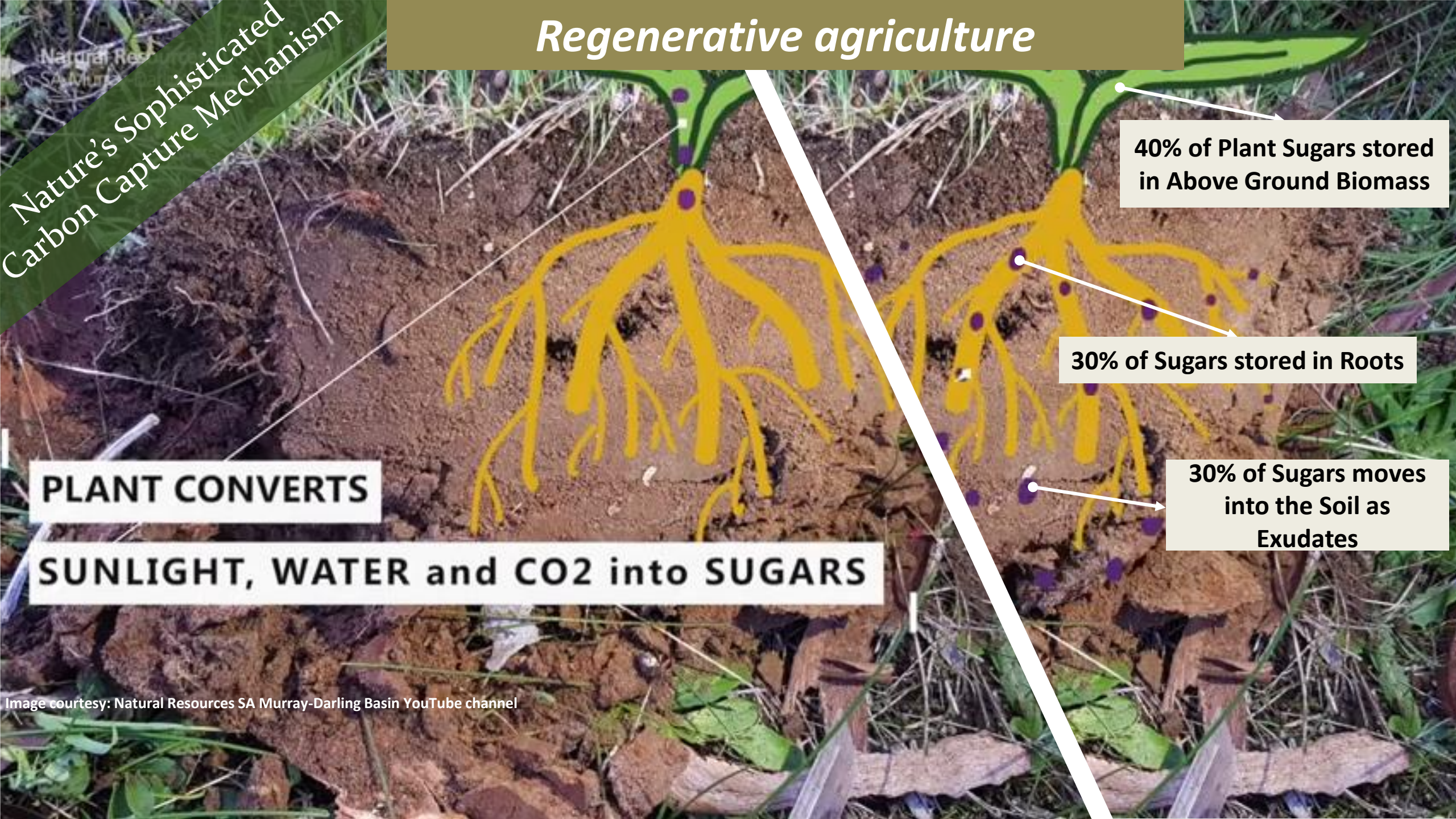
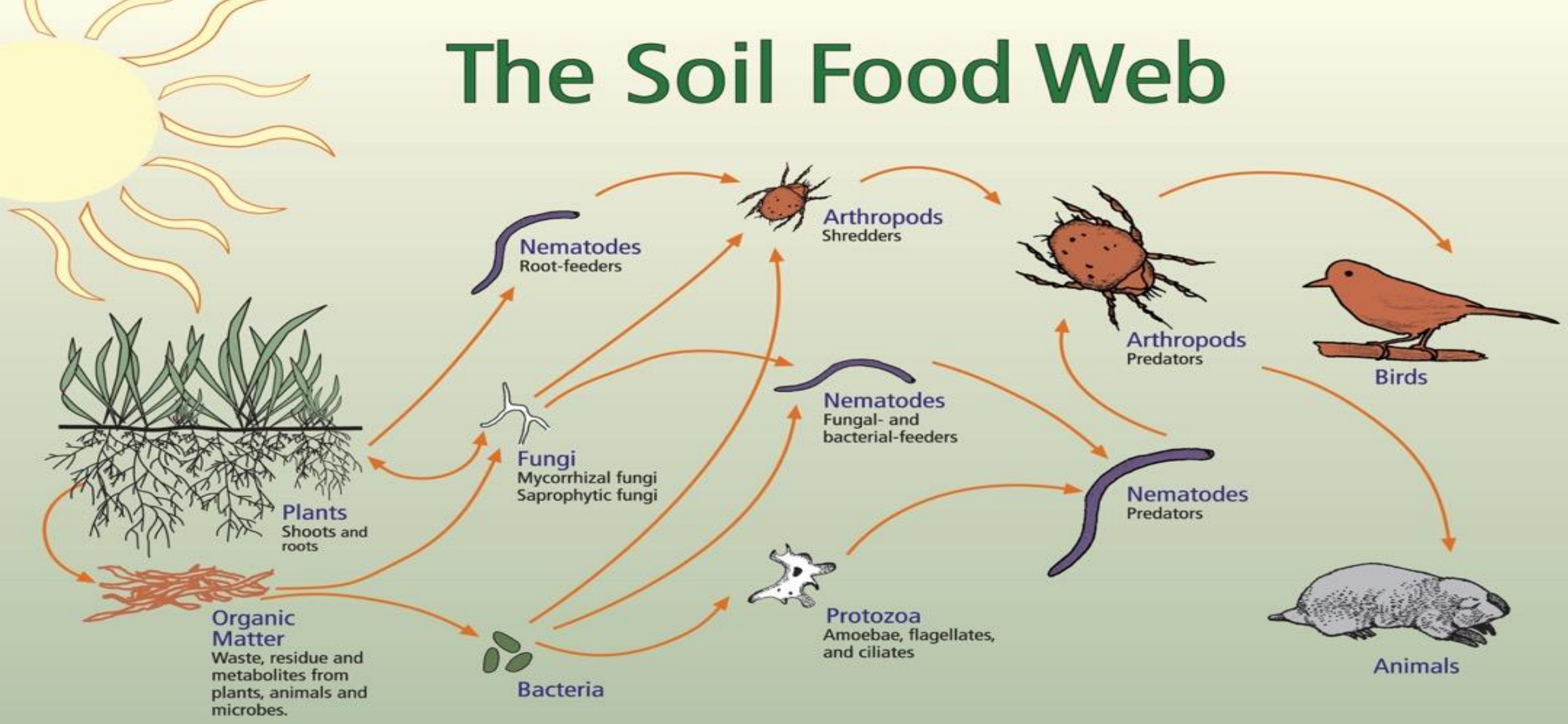


Image courtesy: Natural Resources SA Murray-Darling Basin YouTube channel

The Soil Food Web



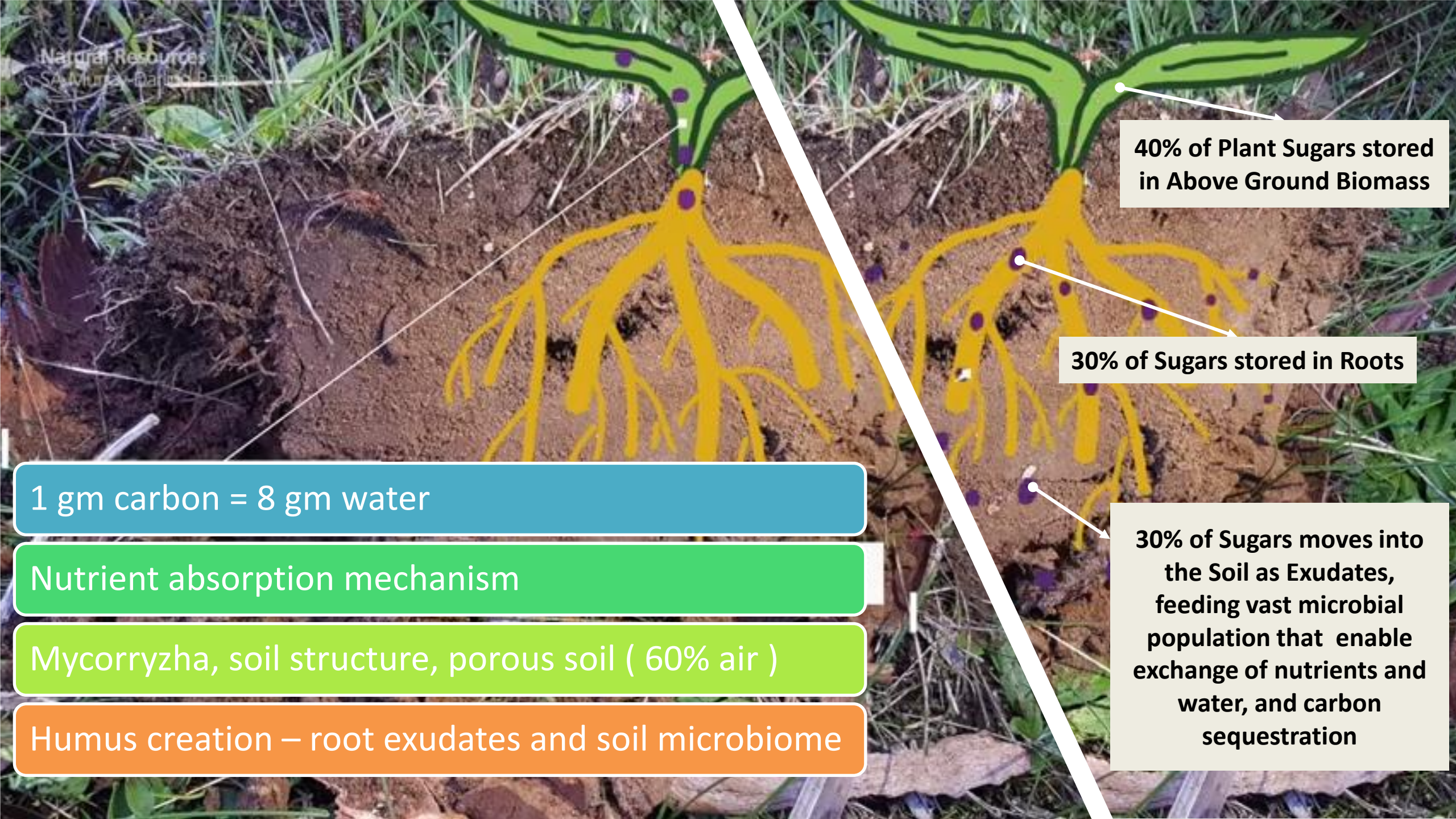
First trophic level:
Photosynthesizers

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



1 gm carbon = 8 gm water

Nutrient absorption mechanism

Mycorryzha, soil structure, porous soil (60% air)

Humus creation – root exudates and soil microbiome

Z.B.N.F core principles

Beejamrutham

Microbial seed coating - cow urine, cow dung, and lime – fermented

Jeevamrutham

Enhance soil microbiome through bio stimulant - cow dung, cow urine, soil, jaggery, pulses flour – mixed and fermented

Achhadana

Ground to be kept **covered with diverse crops** and crop residues as **mulch**

Waaphasa

Fast buildup of soil humus through ZBNF leading to **soil aeration** and **water vapor harnessing**

Soil Food Web

ZBNF –farming in harmony with nature – to create soil carbon sponge

All Elements of Agroecology

ZBNF has a critical role in creating soil carbon sponge

Locally made, cow-dung based formulations and botanical extracts

Beejamrutham

- Cow dung
- Cow urine
- Lime
- Water

Ghana Jeevamrutham

- Cow dung
- Cow urine
- Jaggery
- Uncontaminated Soil
- Pulse flour

Drava Jeevamrutham

- Cow dung
- Cow urine
- Jaggery
- Uncontaminated Soil
- Pulse flour
- Water

Neemastram

Agniastram

Brahmastram

Botanical extracts for Pest management

How do various principles of Z.B.N.F operate

1.Applying traditional inoculants as seed coating to stimulate profuse microbial growth.

Bio stimulants are stimulating natural beneficial microbes around the root zone to aid its growth.

Protecting the soil surface with mulch prevents evaporation losses.

Growing diverse crops is the key – root exudates from diverse crops enhance soil microbial diversity and lead to overall healthy crop growth and protection during dry spells or floods

Healthy Soil microbiome leads to soil structure and aeration – which fosters deep root growth, water holding, and access to water at greater depths

Other Principles and Practices in ZBNF

Botanical extracts – for pest management

Minimal tillage

All inputs to be made within the village

ZBNF is farming in harmony with nature – it is a transformational technology

Farmers' welfare

•Reduced **costs** and **risks,** increased **yields,** regular income, **climate change resilience**

Freedom from hunger

•More food, safe food and nutritious food

Youth welfare

•Reverse migration to villages

Environment

•Enhanced soil health, water conservation, regenerated coastal ecosystem, biodiversity.

Safeguarding our collective ***future***

AP Z.B.N.F Programme at a glance

ZBNF extension in villages
- **Farmer driven extension**
- **Women Self Help Groups**
- **Natural Farming fellows**

Particulars	2018-19	2019-20	Coverage
No. of Mandals covered	664	664	100%
No. of G.Ps	3011	3011	25%
No. of Women SHGs	1,41,361	1,61,296	22%
No. of Farmers enrolled	5,23,000	5,80,000	8%
No. of landless, farmworkers		3,00,000	
Total		**8,80,000**	

40,656 farmers
704 villages
2016-17

163,000 farmers
972 villages
2017-18

523,000 farmers
3011 villages
200,000 Ha
2018-19

580,000 farmers
3011 villages
260,000 Ha
2019-20

Coverage of farmers
SC 17% | **ST** 11% | **OBC** 46% | **OC** 24% | **Minority** 2%

Lower cost | Higher Yields | Improved soil and human health

Funds Received (Rs.Crores)			
Year	**RKVY**	**PKVY**	**Total**
2015-16	34.04	18.34	52.38
2016-17	45.91	13.3	59.21
2017-18	38.38	10.93	49.31
2018-19	63	90.32	153.32
2019-20	40.03	27.5	67.53
Total	221.36	160.39	381.75

Funds from APPI: Rs. 22.88 cr has been released out of 100 cr committed over 5 years

ZBNF Coverage in Andhra Pradesh – 2019 -20

5.80 Lakh
Enrolled Farmers

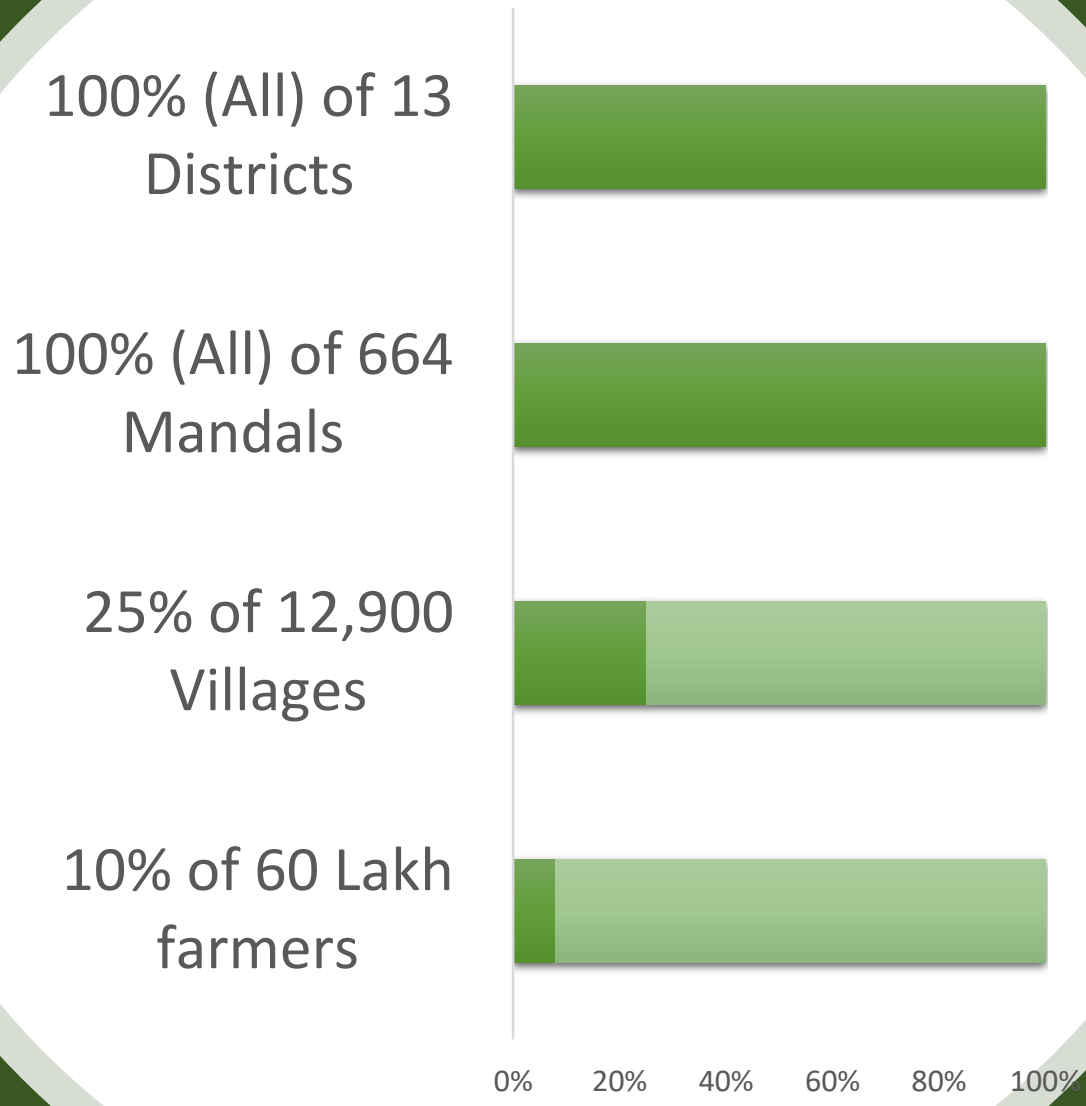
3,011
Villages

1.62 Lakh
Self-help Groups

2.60 Lakh
hectares

Programme commenced in 2015 -16.

Funds from Ministry of Agriculture, Paramparagat Krishi Vikas Yojana



ZBNF IMPACTS

Centre for Economics and Social Studies – Crop Cutting Experiments

Independent Evaluation

Net Income (Rs/Ha.)

Net Income ZBNF Vs Non ZBNF				
Crop	Condition	Net Income ZBNF (Rs/Ha.)	Net Income Non ZBNF (Rs/Ha.)	Percentage increase (%)
Paddy	Irrigated	47859	43327	10%
Groundnut	Rainfed	9245	8341	11%
Maize	Irrigated	45906	21709	111%
Cotton	Irrigated	72046	41119	75%
Bengalgram	Rainfed	55197	47042	17%

Yields Kg/ha

Yield Comparison ZBNF Vs Non ZBNF				
Crop	Condition	ZBNF Yield in Kg/Ha.	Non ZBNF yield in Kg/ha.	Percentage Change (%)
Paddy	Irrigated	4724	4948	-5%
Groundnut	Rainfed	609	723	-16%
Maize	Irrigated	5204	3987	31%
Cotton	Irrigated	2183	1652	32%
Bengalgram	Rainfed	1769	1720	3%

Cost of cultivation (Rs/Ha)

Cost of cultivation ZBNF Vs Non ZBNF				
Crop	Condition	Cost of Cultivation ZBNF (Rs/Ha.)	Cost of cultivation Non ZBNF (Rs/Ha.)	Percentage Change (%)
Paddy	Irrigated	37742	43380	13%
Groundnut	Rainfed	22496	26979	17%
Maize	Irrigated	32590	32837	1%
Cotton	Irrigated	37197	40715	9%
Bengalgram	Rainfed	28611	33326	14%

Best Cases in 2019

Crop	ZBNF Yield (Kgs/acre)	Non-ZBNF Yield (Kgs/acre)	Percentage Change	Notes
SRI Samalu	525	320	61	Kilo Narsinga Rao, Killaguda , Sagar, Visakhapatnam
SRI Udalu	1200	200	500	D Kondamma, D Chintalaveedi, Kuntarla cluster, Visakhapatnam
SRI Ragi	1820	300	507	P Govindu, Vanugupittu, Visakhapatnam
Cotton (irrigated)	750	450	66	K Bodinaidu, Mirthivalasa, Vizianagaram
Cotton (rainfed)	715	400	79	Mamidi Neelamma, Beemanandaravalasa, Vizianagaram

Single woman farmer

2 acres of land

ZBNF since 3 years

Converted 25 farmers

Name: J Malleswari
Village Name: Pedda mallapuram
Cluster Name: Shankavaram
District Name: East Godavari

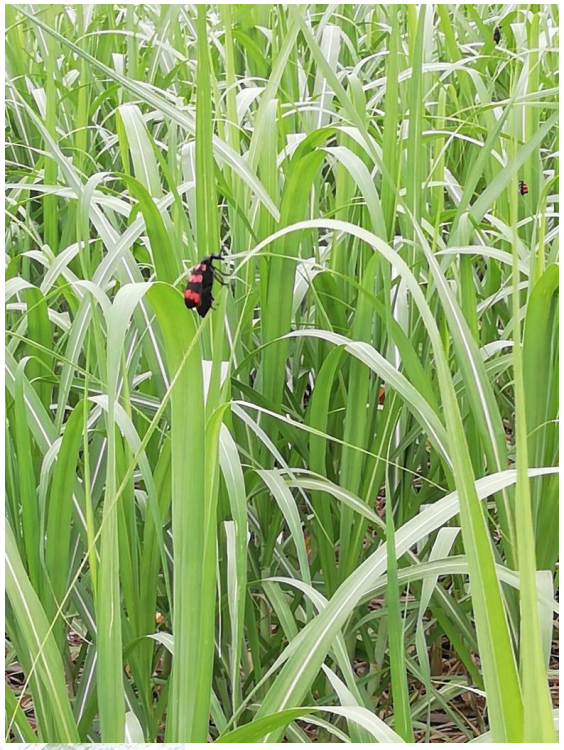
- Sole earning member for family
- Local CRP encouraged towards ZBNF
- Naturally grows rice; good in quality and taste well
- Voluntarily prepared ZBNF inputs to SHG women

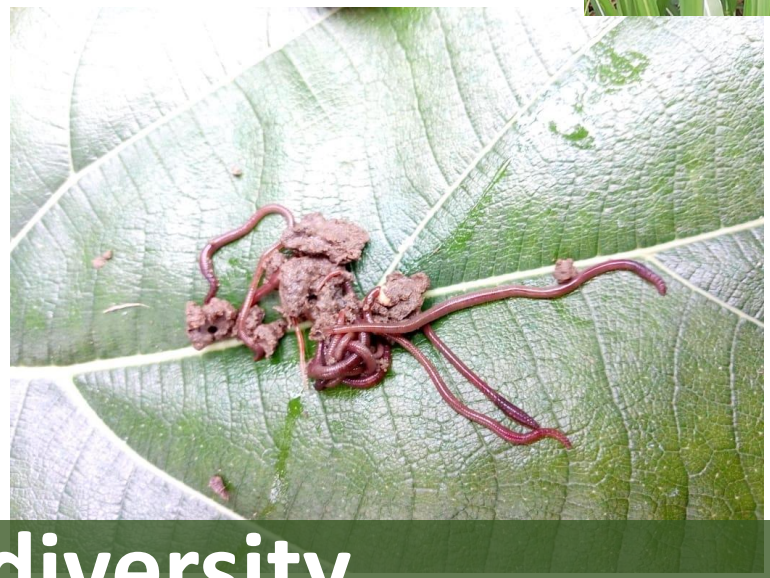
ZBNF YIELD- PADDY + MULTI CROPS (2 acres)

Crop	Yield	Income
Paddy	14 bags	Rs. 21,000
Groundnut, Finger millet, Black gram, Cowpea and Red gram	10 bags	Rs. 23,000
	Cost of cultivation: Rs.16,700	
	Net income: Rs. ***27,300***	

- Doesn't depend on external inputs for Cultivation of crops
- Started NPM shop
- Followed multi-cropping pattern
- High demand for produce at local market
- Encouraged by this and started ZBNF in leased land also
- Shared knowledge with SHG women

Impact on Health

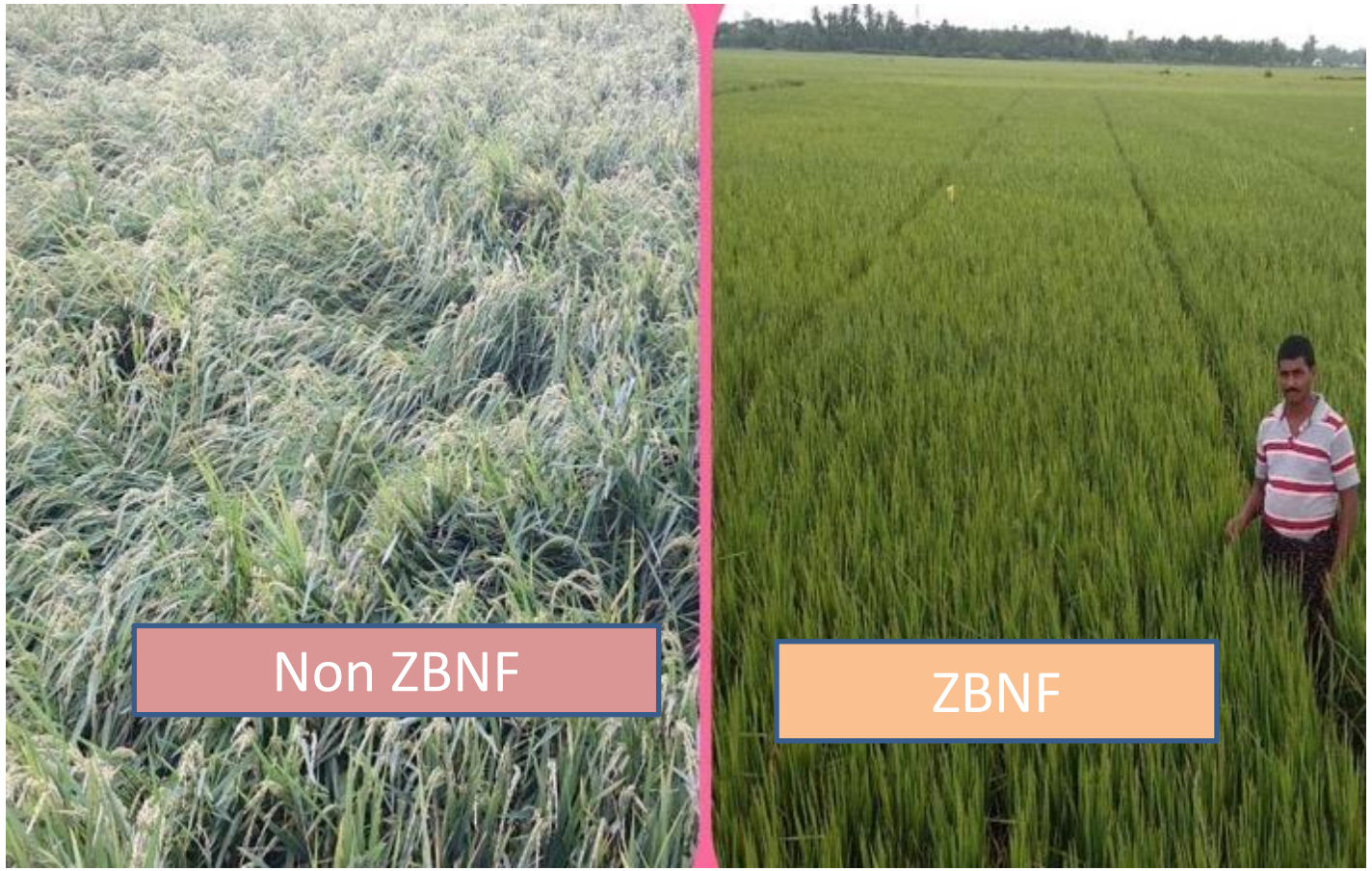




Improved Biodiversity

Climate Change Resilience: Titli Cyclone, Oct 2018

Paddy fields during Titli cyclone



Climate Change Resilience: Pethai Cyclone, Dec 2018

ZBNF

Banana

Non ZBNF

ZBNF

Chillies

Non ZBNF

Paddy

Cost Benefit Analysis of ZBNF Programme

$ 1 investment

Rs.25000 over 5-6 years per farm family to adopt ZBNF

$ 13 worth direct benefits

- ✓ Cost Reduction
- ✓ Risk reduction
- ✓ Higher Yields
- ✓ Better Prices

- Food, Nutrition and Health Security
- Employment
- Soil Health and Water Security
- Coastal Ecosystem Regeneration
- Climate Resilience
- Biodiversity

Ecosystem and Health Benefits to Citizens

CB – 73%; Institutions – 17%; Tracking – 8%; Management – 2%

Sustainable Development Goals addressed by APZBNF

Biodiversity impact in ZBNF

Increase in earthworm movement

Presence of beneficiary insects

Increased number of honey bees

Increase in birds and birds nest

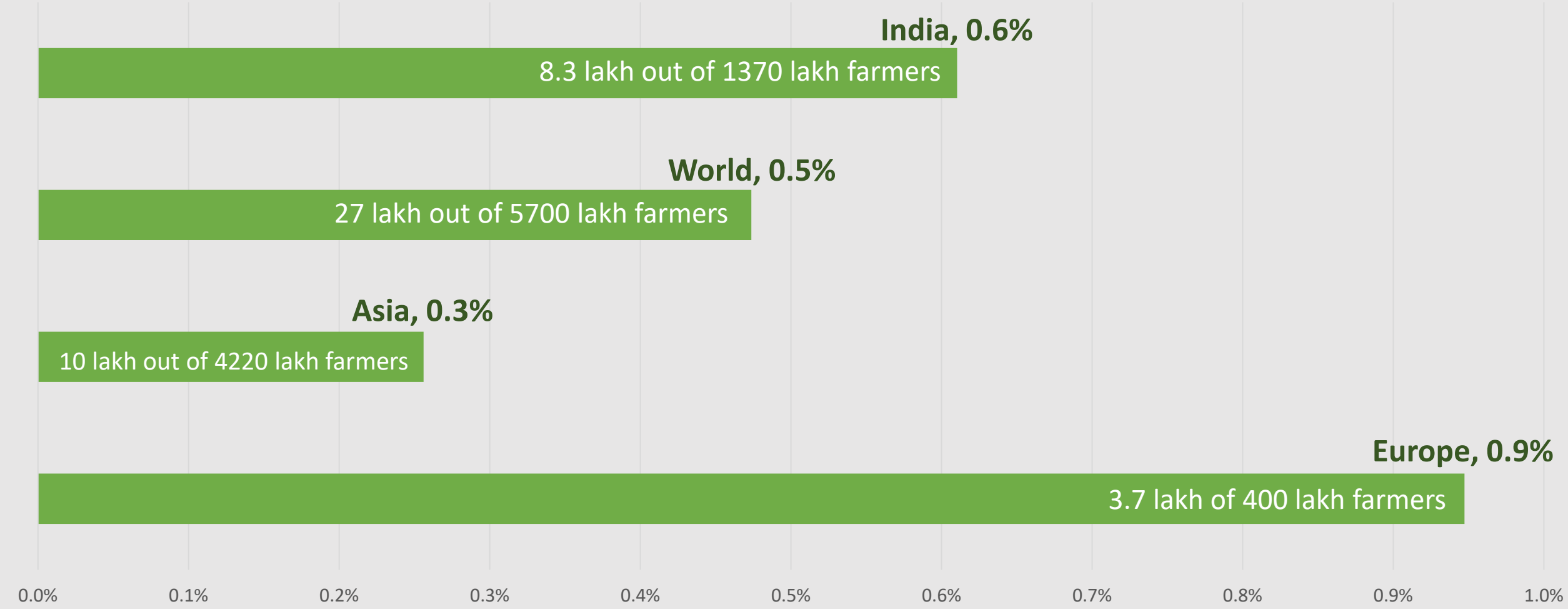
Cost Structure in 6 years (5 years implementation + 1 year preparatory) for one farmer

#	Categories	COSTS (in Rs.)	%
1	ZBNF Capacity building	18,350	73.40%
2	Support to Community Institutions	4,150	16.60%
3	PGS Certification, Quality Assurance, Tracking and Monitoring	2,000	8.00%
4	Technical Support and Overall Programme Management at the District and State levels	500	2.00%
	TOTAL	**25,000**	

Cost to convert one farmer: 25,000 over 5-6 years

Why is AP attracting global attention?

*Source: IFOAM, FAO
Data as at 2016



Even after two decades, Organic Producers are still a small proportion in the world, whereas in Andhra Pradesh, **10 % of farmers** are already enrolled in the programme, in a span of 4 years

A.P Govt - overcoming critical obstacles to scaling

Challenges

- Mindset - CHEMICAL ADDICTION of the last 60 years
- VESTED INTERESTS
- Taking it to every farmer
- Handholding until full adoption
- kno wled e — Poor extension system
- Self sustaining, long-lasting

4 critical Innovations in A.P model

State Government

Knowledge

Extension Champion Farmers

Ownership Women SHGs

ICT for Knowledge, Tracking, Traceability Collective Action for Inputs, Models, Marketing

Saturation: Farmers » Farms » Practices

ChampionFarmers

5,600 **Community Resource Persons**
@ 1 per 100 famers

150 **Young Agriculture Graduates** as Natural Farming Fellows

- Inspiration
- Knowledge Transfer
- Handholding
- Video Dissemination

Women in Natural Farming: Our biggest Strength

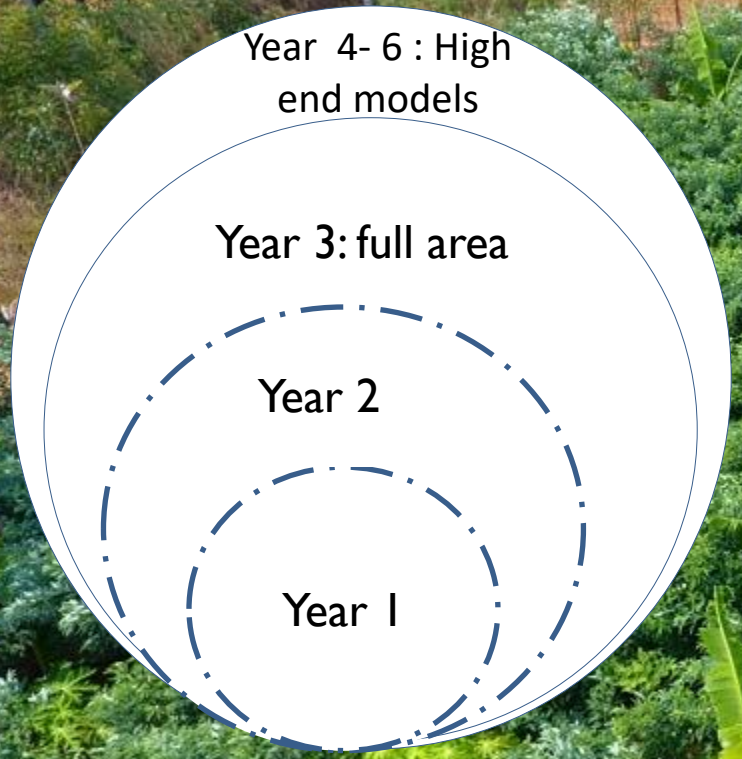
1,62,624 women SHGs and their **7,106 Federations** are in charge

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

Changing a farmer means changing entire village

All Villages | All Farmers | All Farms | All Practices

Farmer Transformation



Each farmer takes 3-6 years to cover the entire holding.

Village Transformation

Other Innovations in the programme

Mainstreaming Poorest of Poor

Special Plan for 1.52 lakh Landless Agriculture Labour

Target: Household food and nutrition security incomes: At least Rs.10,000 per month

Kitchen Garden

Facilitate Land Lease

Development of Assigned Lands

Special Roles (ZBNF shops, Seed Supply, Services)

Off-farm (backyard poultry, fish-farm ponds)

Ultra poor livelihoods

Health and Nutrition

Health and Nutrition

Community Marketing

Community Marketing

Farmers Field School

Engaging school children in farming

Engaging school children in farming

Highest number of Jobs are in Agriculture – how to make Agriculture aspirational

Worldwide Employment opportunities

150 crore jobs in Agriculture

1.4 crore jobs in IT

1.2 crore jobs in Automobiles

Youth employment through profitable agriculture and from off farm opportunities

Better employment for Youth in ZBNF

Hi return MODELS

5-layer model (dry and irrigated)

Paddy-Fish-Horticulture

Sugarcane and Jaggery

ZBNF enterprises

Young farmers can earn Rs.10,000 – Rs. 25,000 per month

Tapping the demographic dividend in the rural areas

Progressive young farmer

Sreenath Reddy

Graduate turned ZBNF Farmer Kadapa Dist, Ramapuram Mandal Kadapa District

5 Layer model

Total Expenditure- Rs.34,280

Income from existing Mango orchard: Rs.36,000

Income from 5th layer (first picking): Rs.92,031

Total income: Rs. 1,28,031

Collaborations for Establishing the Science behind ZBNF

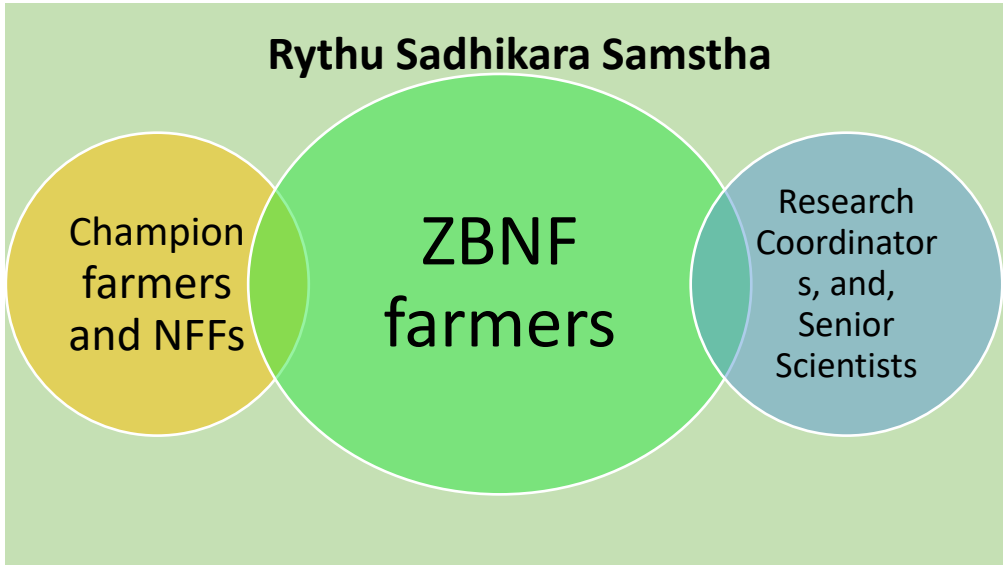
Food and Agriculture Organization of the United Nations

UN environment

World Agroforestry

cirad

Walter Jehne – Regenerate Australia

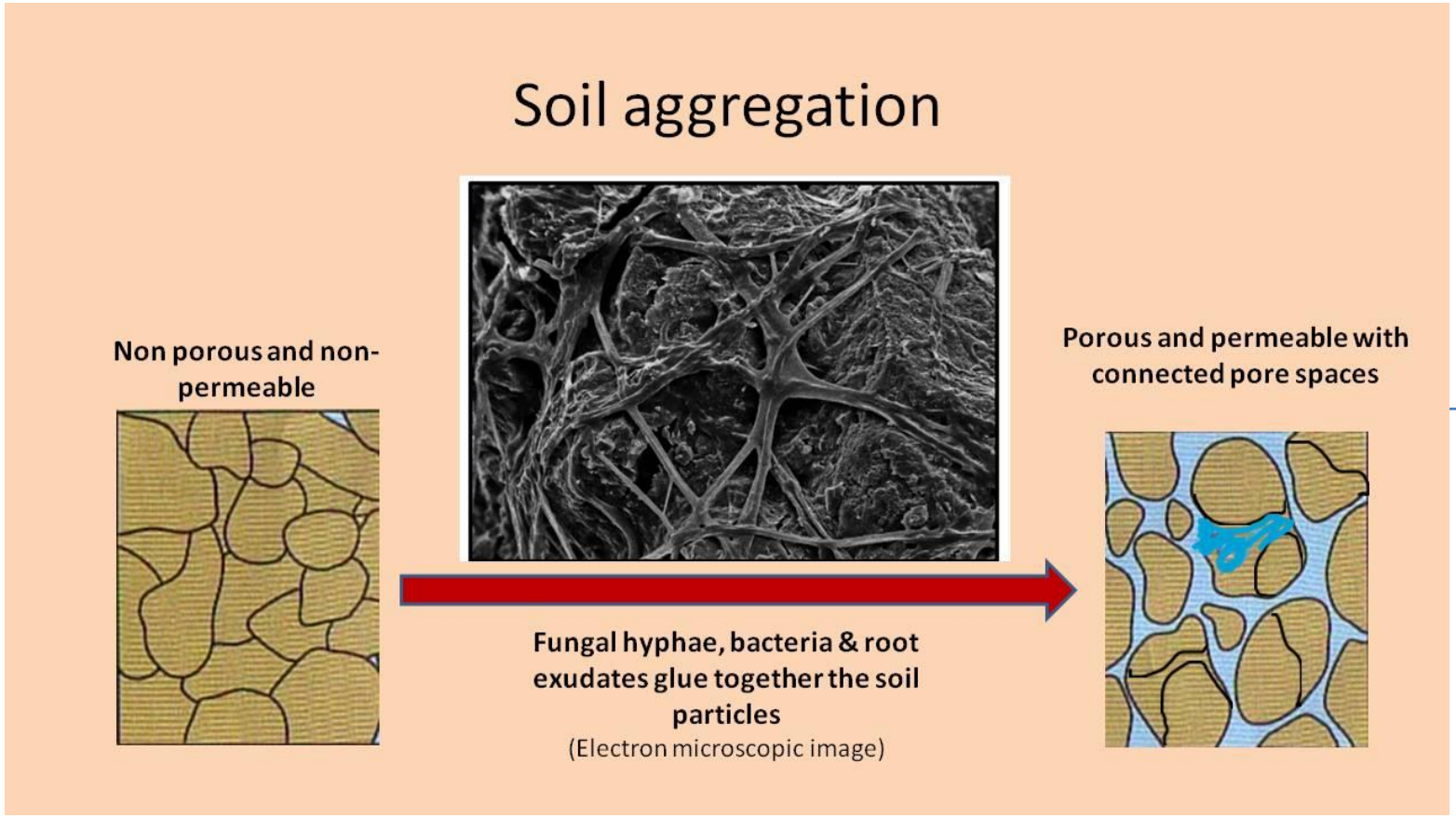


University of Reading

National Institutions
CEEW, CSTEP

- Soil organic matter increase
- Water saving & Harnessing water vapor
- Savings in Energy
- Resilience to Droughts & Cyclones
- Nutrient and Carbon Dynamics
- Microbial diversity in inoculants

ZBNF enables drought proofing by better water infiltration and harnessing the rivers of water in the air



Soil Aeration

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

there are Rivers in the air – air contains 10 times the water in the rivers – 50,000 ppm

What happens to the raindrops falling on soils – Global averages

100 rain drops falling on soils

2 drops stored in dams

12 drops in streams

Back to atmosphere

36 drops
transpiration and green growth

86 drops?

50 drops
run-off / evaporation

How to minimize runoff and evaporation losses ? How to convert these into Green growth

Can we tap the moisture in the air for Green growth

Drought proofing through ZBNF

Pre-monsoon sowing

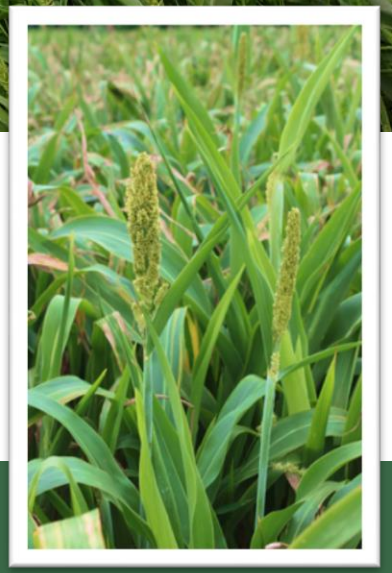
- Sowing before Monsoon
- April onwards
- Effectively utilize the moisture available in the atmosphere

Dry sowing

- Sowing during dry-periods – throughout the year
- Dry situations regardless of regular monsoon
- Helps to maintain year-round ground cover in all districts

Pre-monsoon Sowing

Drought Proofing through ZBNF



Farmers took up pre monsoon sowing between April to June. Dry sowing in the months of July, Aug, Sep.

Dry sowing in Rabi – so that we can establish a 365 days green cover – **3 crops, even in dry lands of the state**

About half of the farmers experimenting Pre-monsoon sowing in AP are from four drought prone districts.

Large scale successful implementation by Farmers, Champion Farmers (CRPs) and Natural Farming Fellows (NFFs)

1800+	4,307	All 13
villages	acres	districts

12,549 Farmers took up PMDS

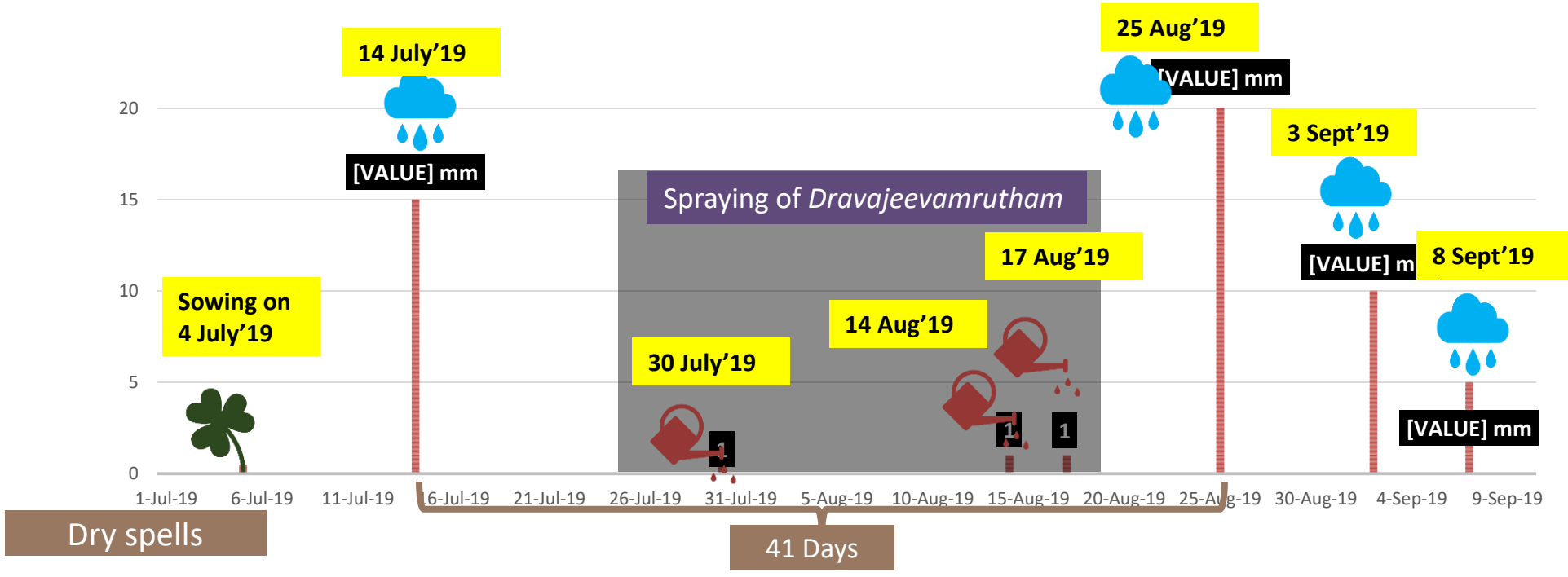
One of its kind initiative, in the world

Pre-Monsoon Dry Sowing

Date of sowing: 4 July 2019

K Padmanabhan, Basamapalli cluster, Anantapur

29 Types of Seeds | 200 Kgs of *Ghanajeevamrutham* applied | Mulch Material: Paddy husk



Rainfall

July – 15 mm

Aug – 20 mm

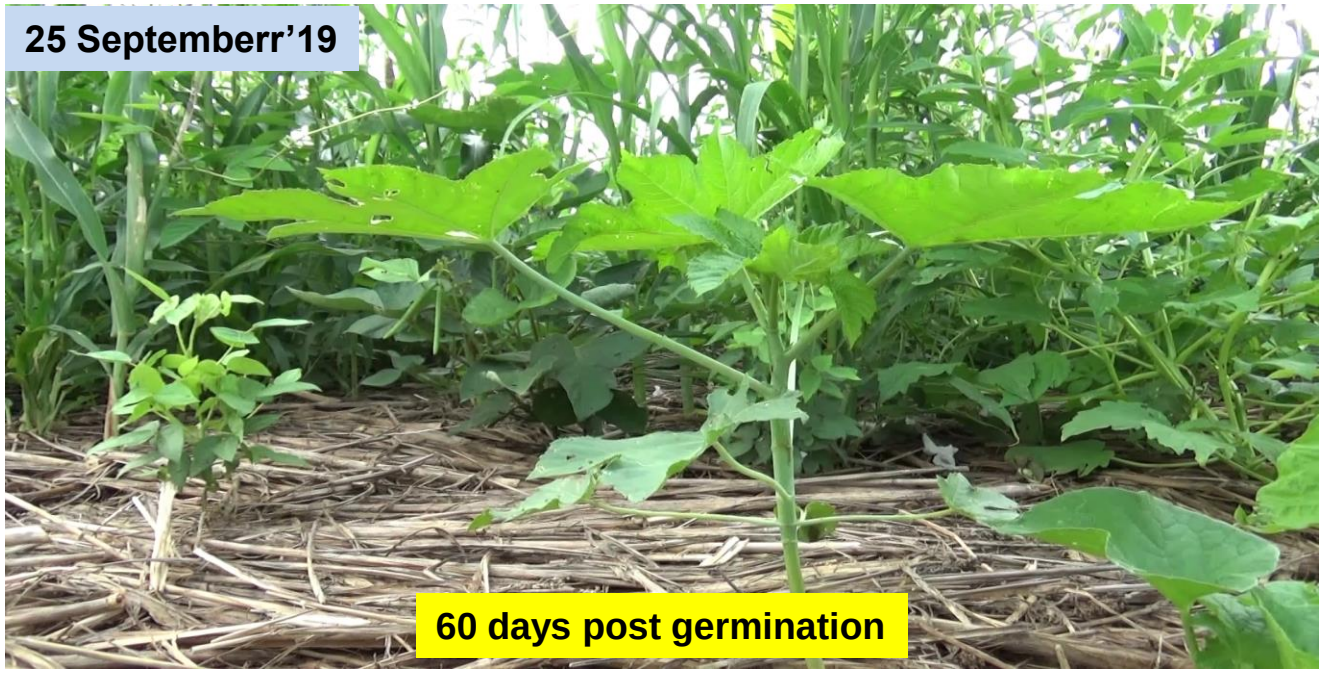
Sept – 233 mm

Oct – 130 mm

Nov – 4

Total - 402


25 August'19
45 days post germination


25 Septemberr'19
60 days post germination


15 October'19
75 days post germination


30 November'19
110 days post germination


10 November'19
90 Days post germination
Harvested Green Gram and
Bajra (sundried)


15 November'19
95 Days post germination
harvested Foxtail millet


Harvested Castor


30 November'19
Harvested Gingelly

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

PMDS is a global breakthrough

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 accounts for only 4000 tons of water.

Walter Jehne in his lecture in NITI Aayog on 25th Nov, 2019

‘ PMDS through ZBNF in A.P is a Global breakthrough. It is India‘s unique contribution to the world‘

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

Types of water

Atmospheric water vapour – 50,000 ppm

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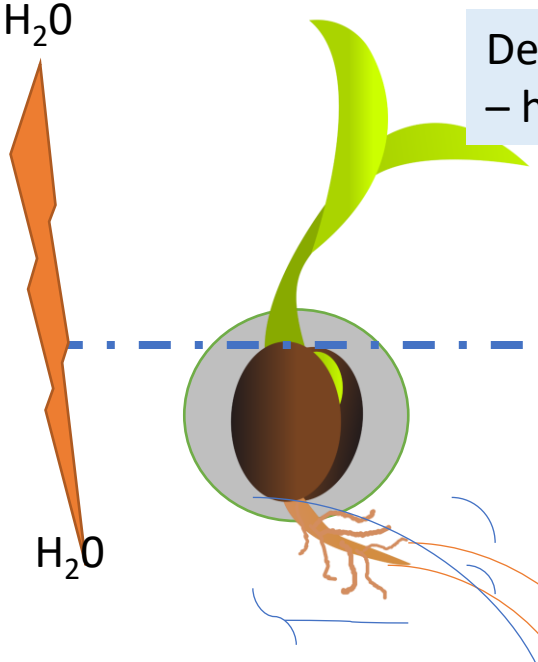
Dew, Haze after shoot emergence – harvesting water vapour

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



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For germination - Biological water from Bio stimulant and mulch

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

Surface water

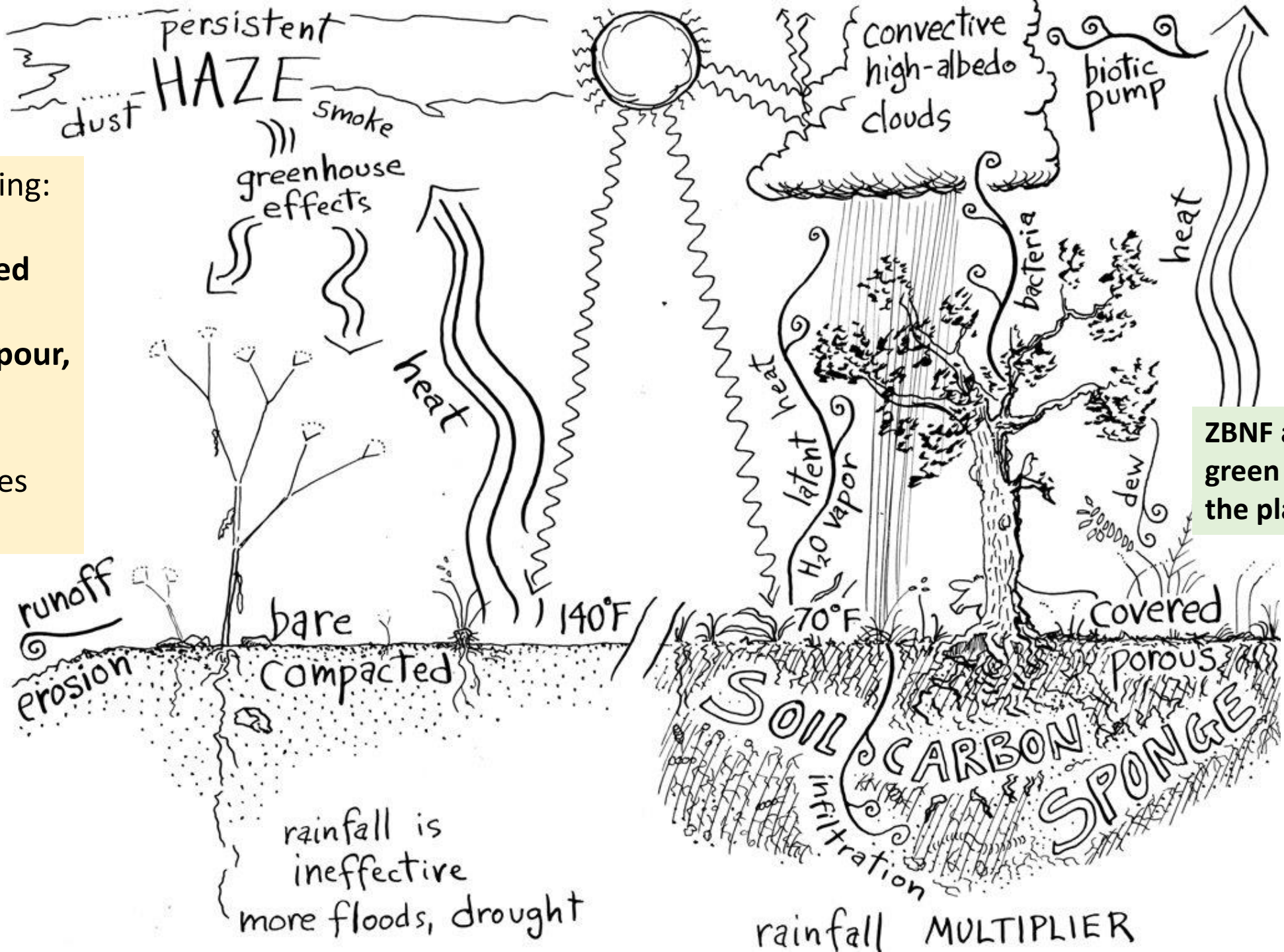
Mycorrhyzal fungal extensions

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

Deep water

Global warming:

1. **Re radiated heat**
2. **Water vapour, 80%**
3. CO2 and other gases



ZBNF and 365 days green cover can cool the planet

The Vision - Farmers Outreach and Transformation

2019
- 50% GPs entered

2020
- All GPs entered

2021
- 350 Bio villages emerge

2022
- ***Enrolling all farmers in the state***
- 1,000 Bio villages emerge

2024
- 3,000 bio villages emerge

2027
- All bio villages
- ***Transforming all 60 lakh farmers to ZBNF***

All Villages | All Farmers | All Farms | All Practices

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

It is critical we return to our loved ones, a Better Earth than we borrowed

Thank You

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