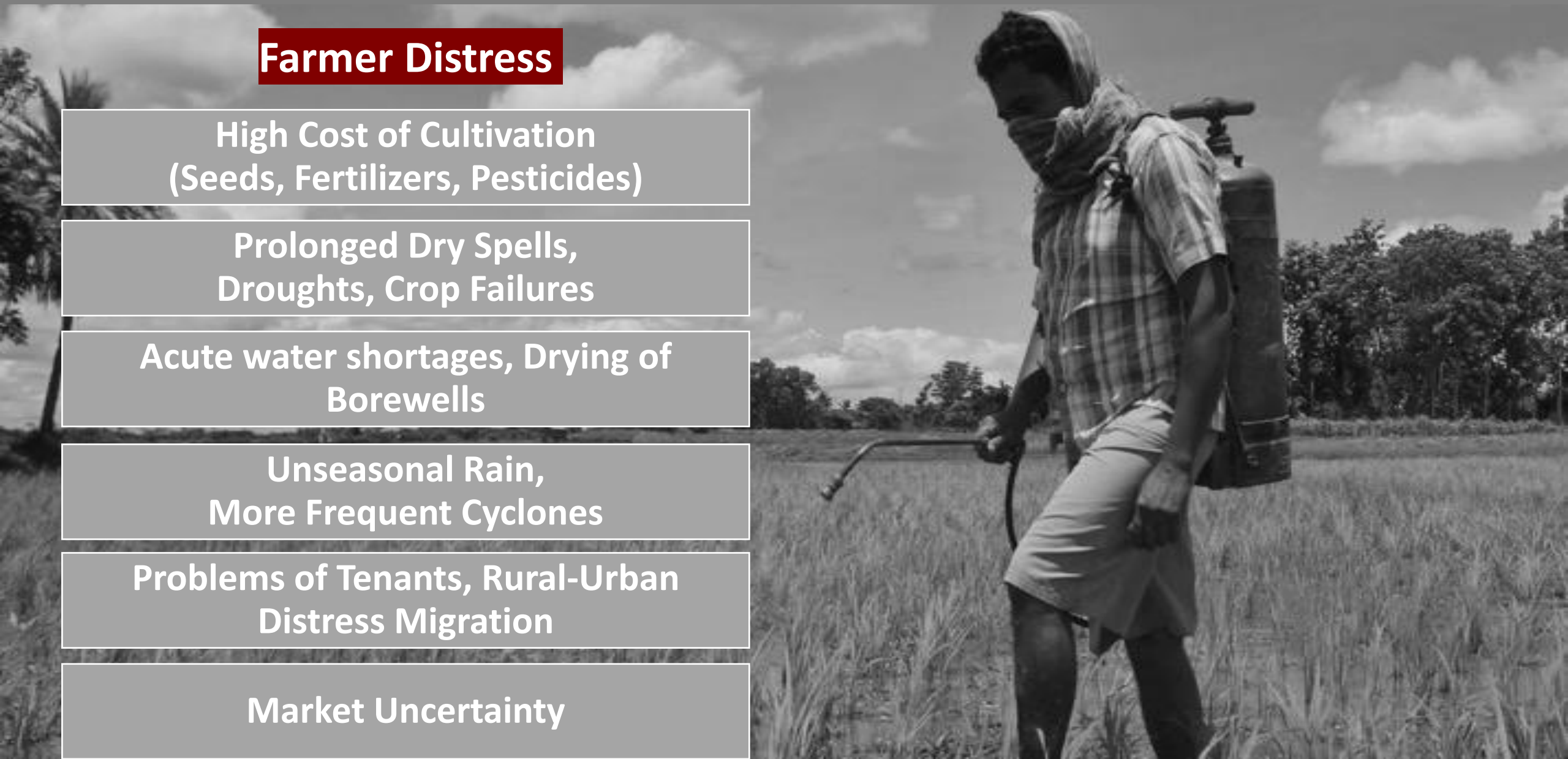
Andhra Pradesh ‘Zero-Budget’ Natural Farming

Vision 2024: A Systemwide Transformation

50 million people | 6 million farmers | 8 million hectares

Agriculture and Food Crisis



Farmer Distress

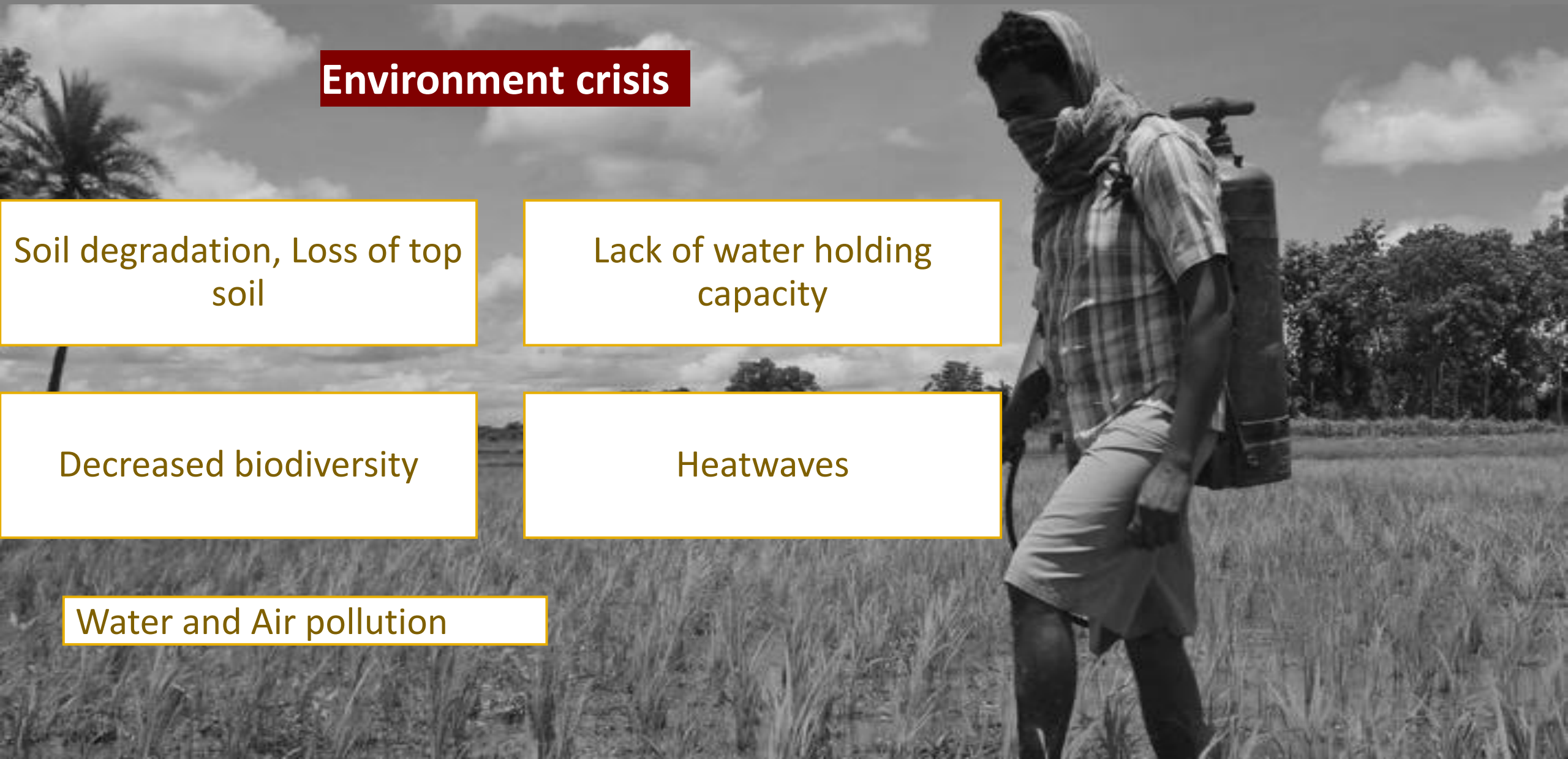
- High Cost of Cultivation (Seeds, Fertilizers, Pesticides)
- Prolonged Dry Spells, Droughts, Crop Failures
- Acute water shortages, Drying of Borewells
- Unseasonal Rain, More Frequent Cyclones
- Problems of Tenants, Rural-Urban Distress Migration
- Market Uncertainty

Agriculture and Food Crisis

Consumer Food Plate

Food Scarcity
Chemical Residues
Lack of Nutrients
Health Hazards

Agriculture and Food Crisis



Environment crisis

Soil degradation, Loss of top soil

Lack of water holding capacity

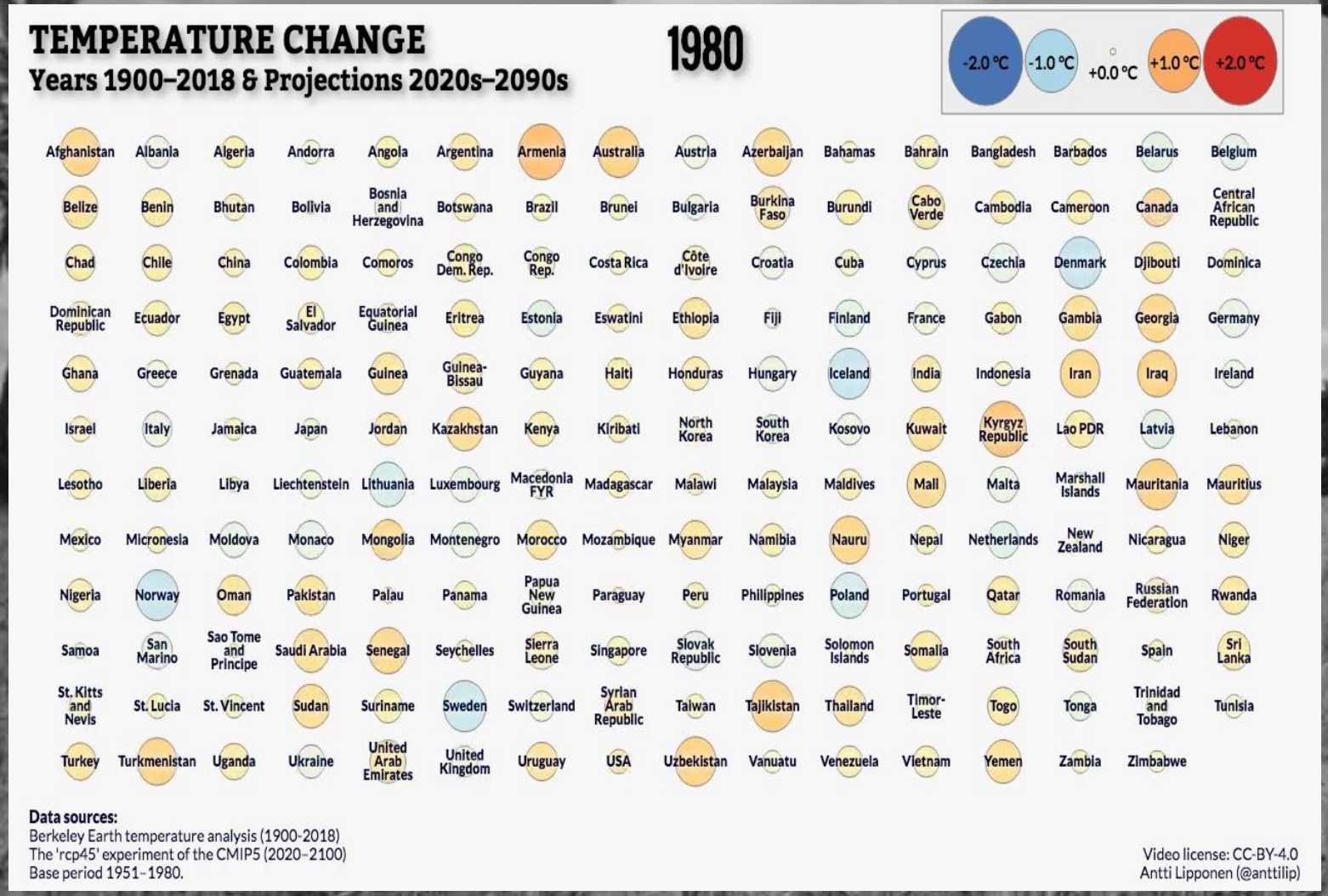
Decreased biodiversity

Heatwaves

Water and Air pollution

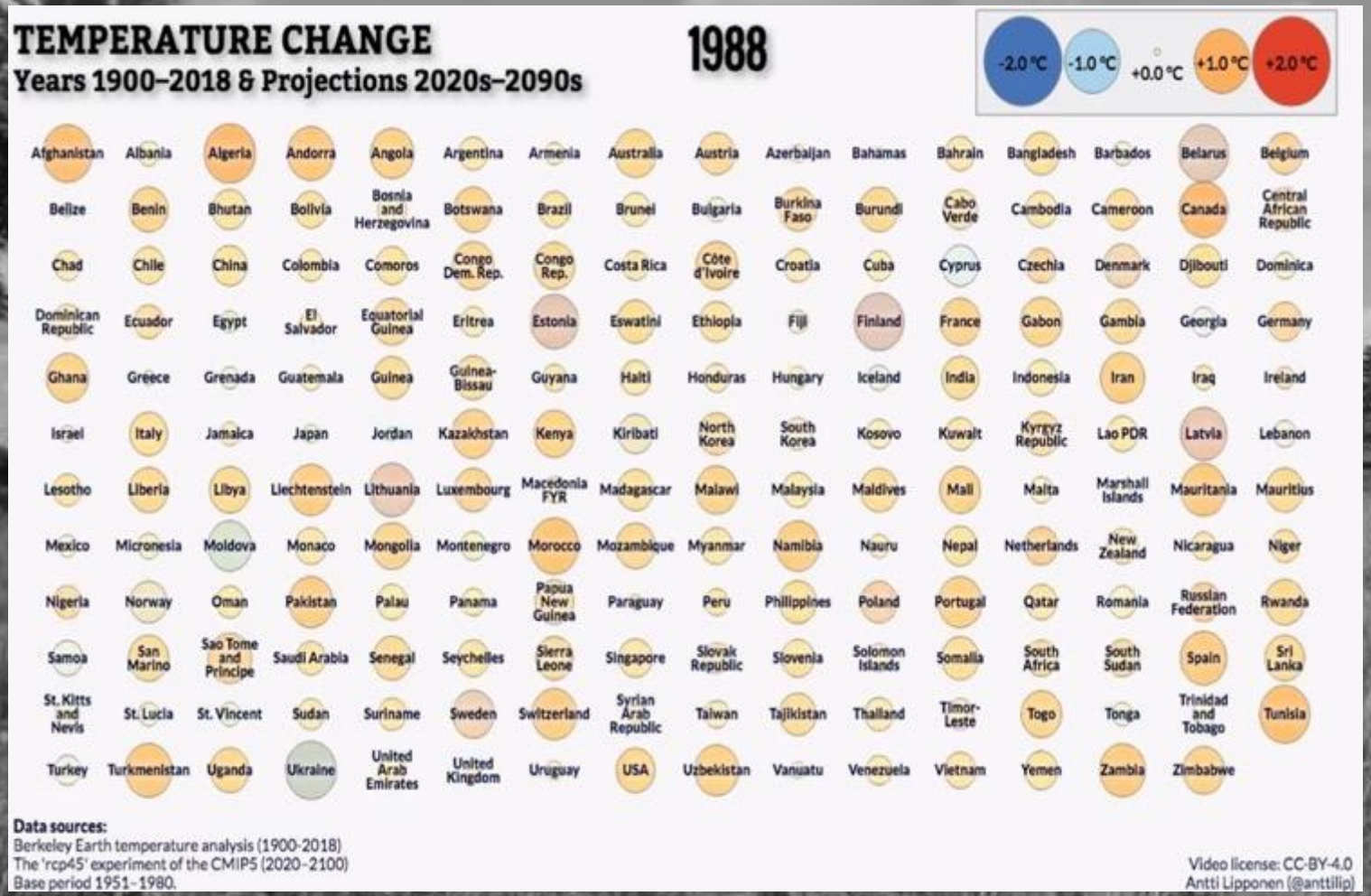
Climate Crisis

Global Warming



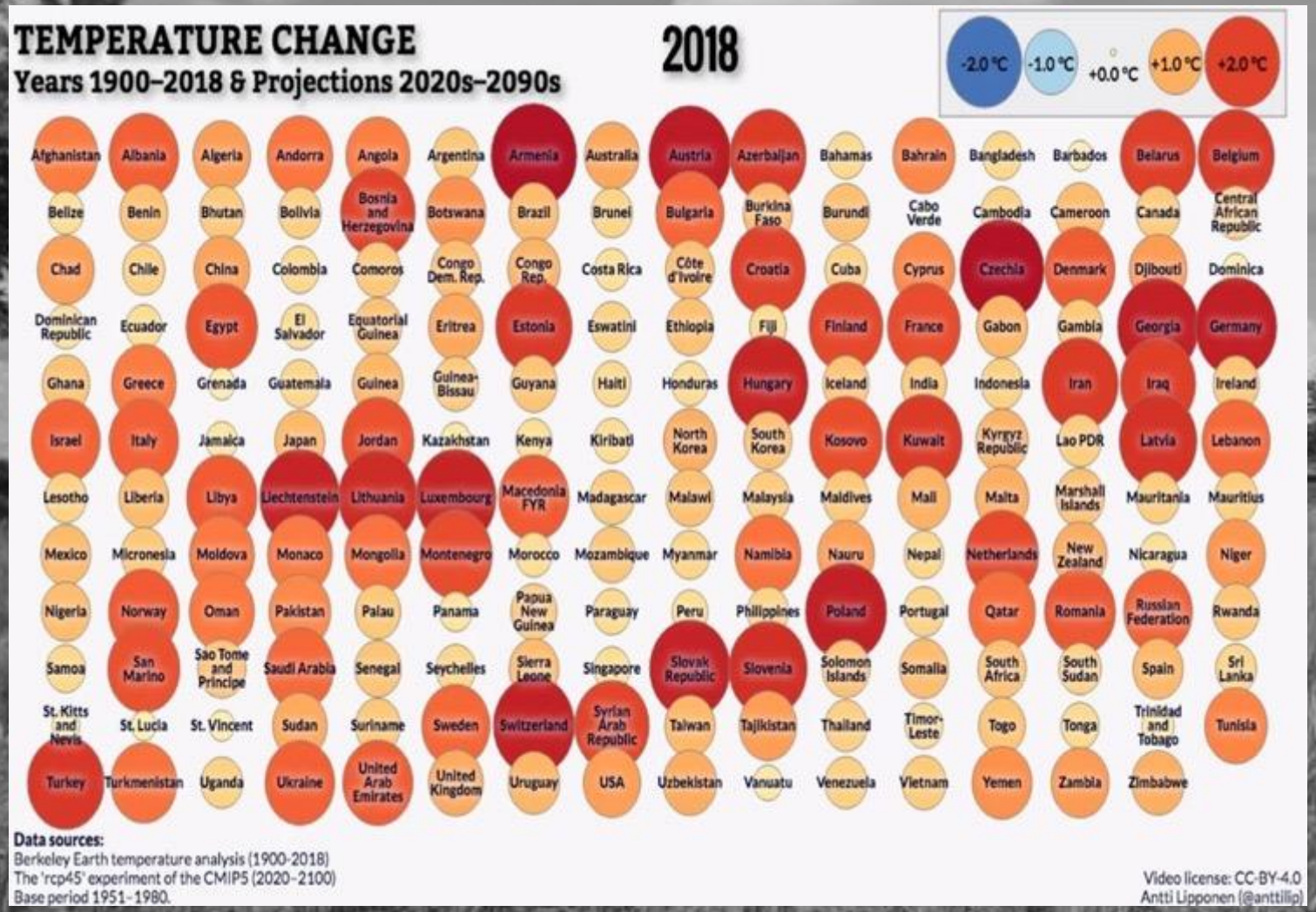
Climate Crisis

Global Warming



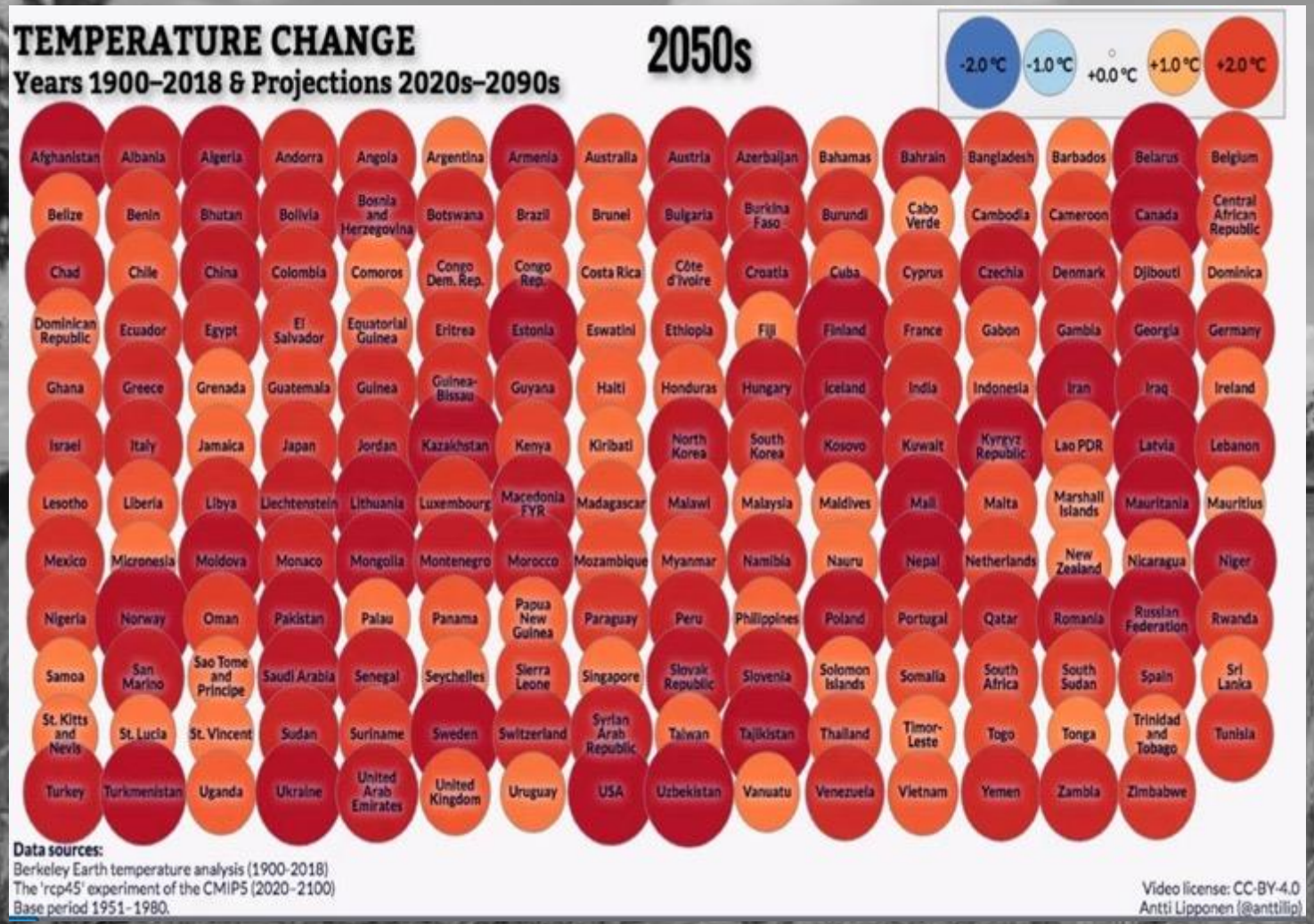
Climate Crisis

Global Warming



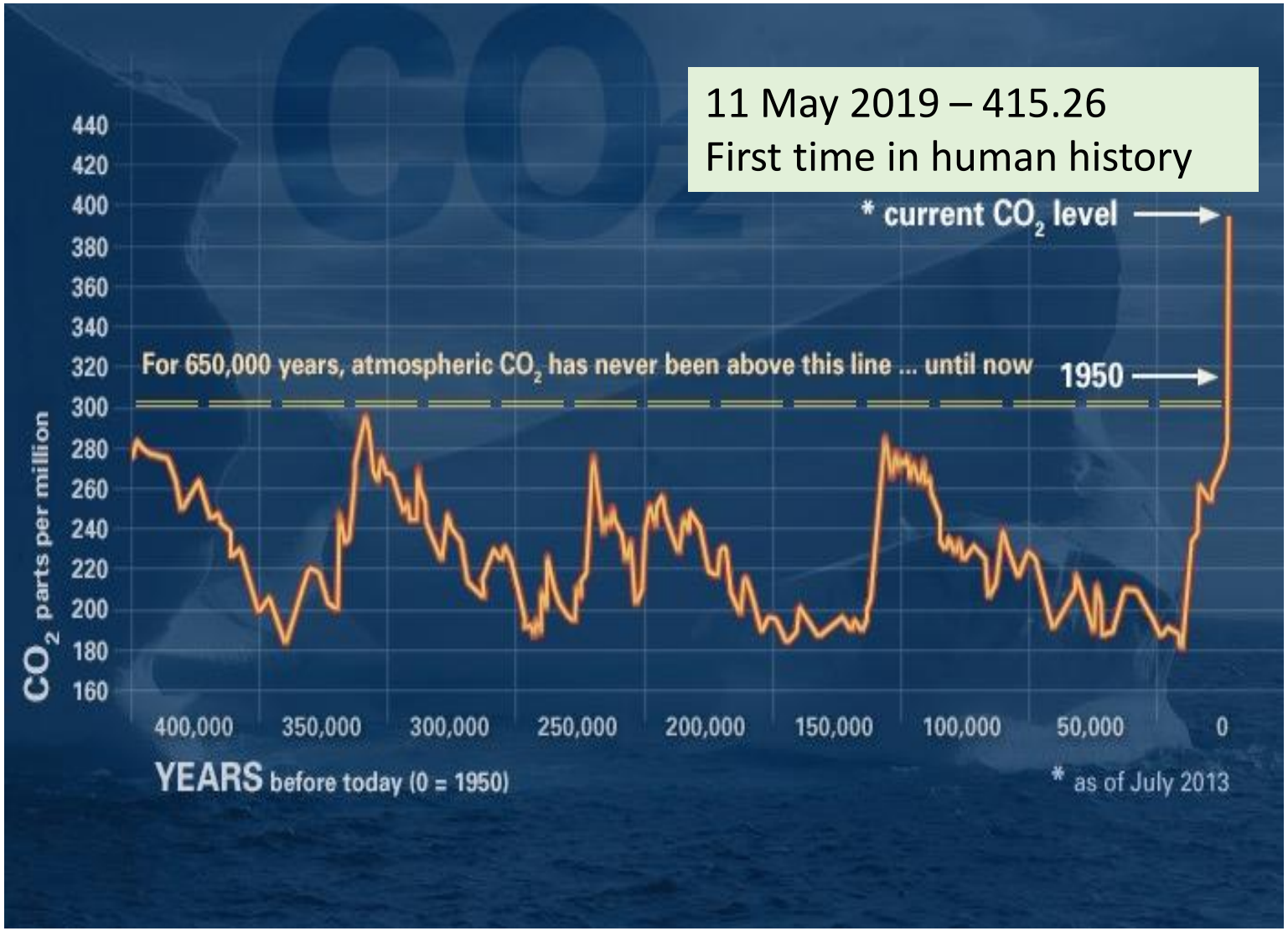
Climate Crisis

Global Warming

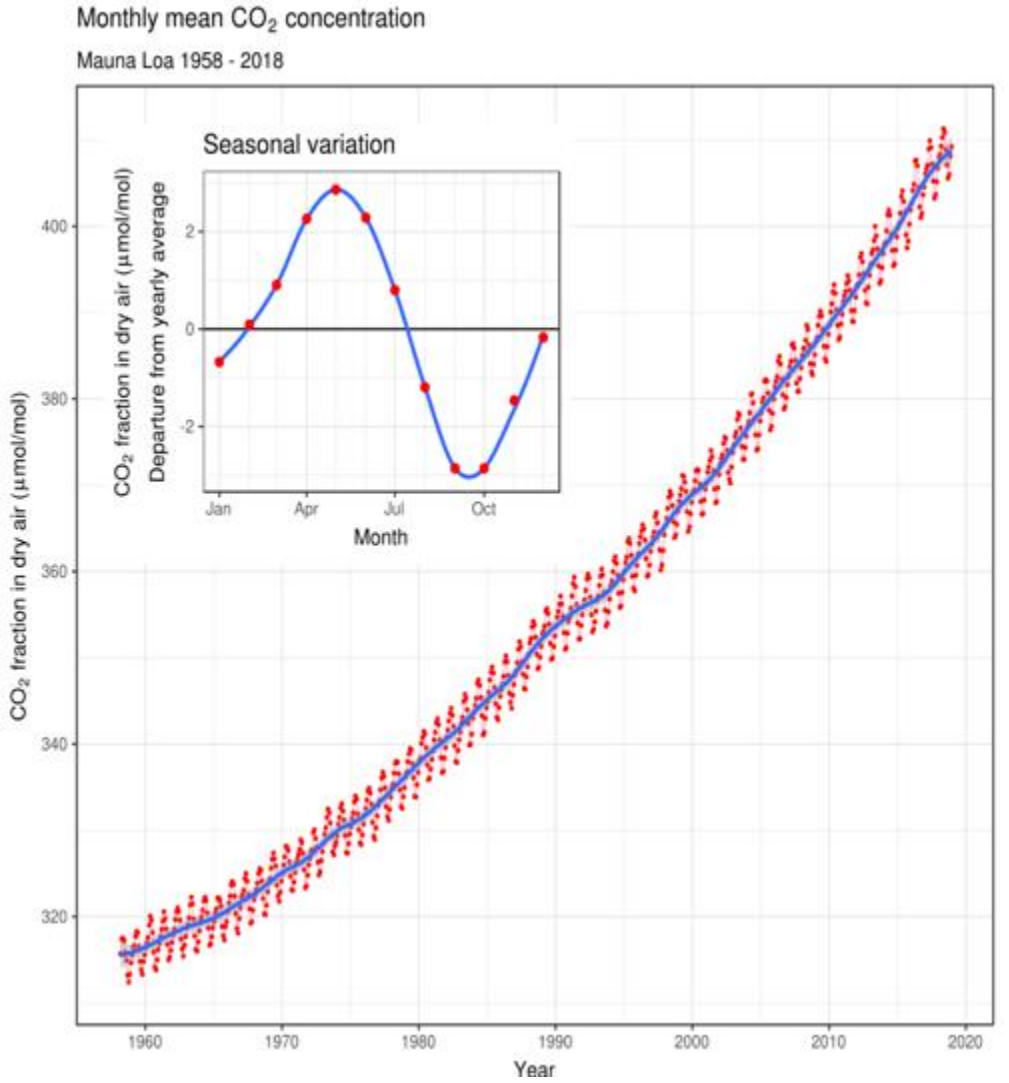


Climate crisis

The relentless rise of carbon dioxide



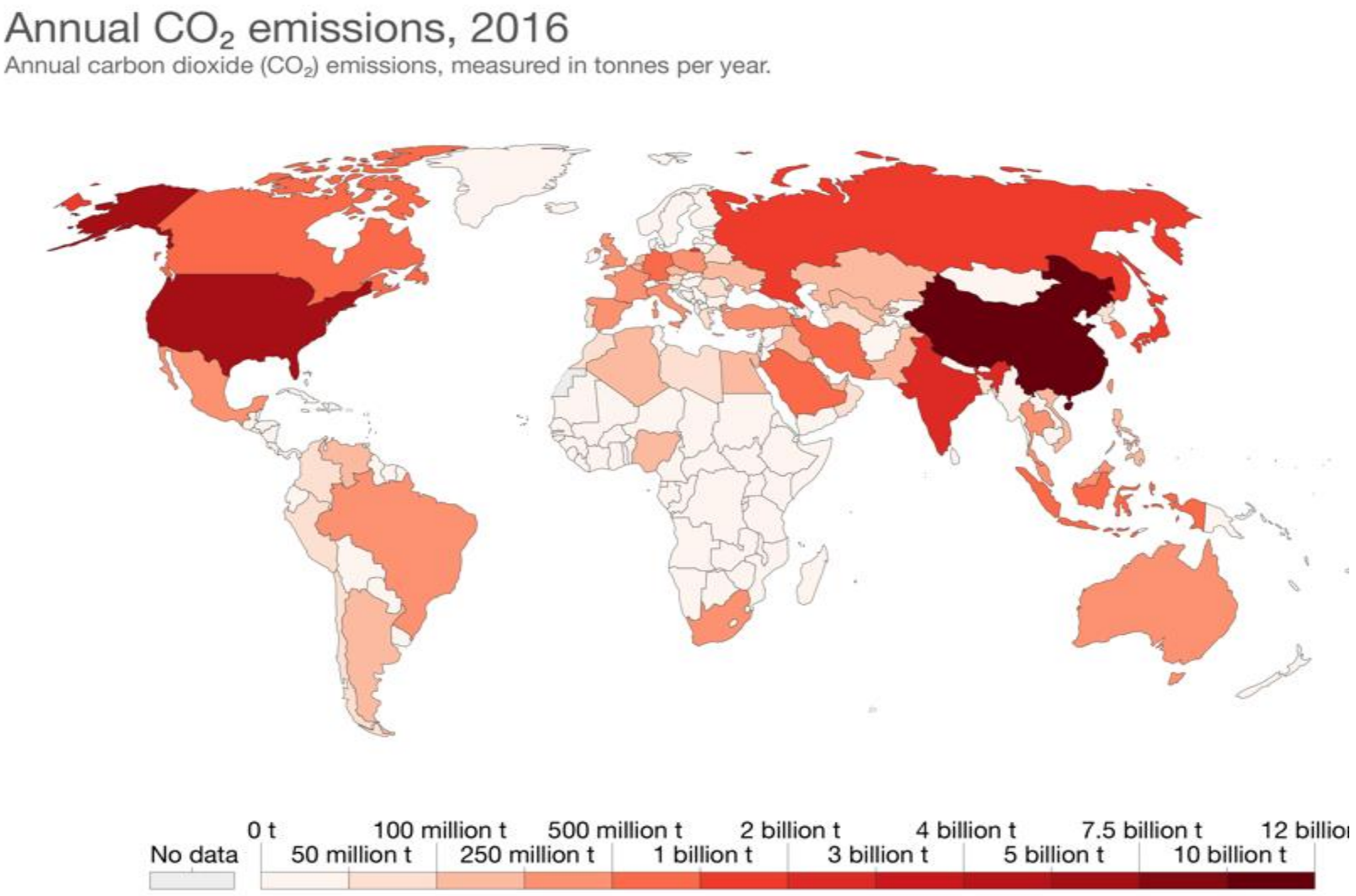
Source: NASA, Global Climate Change



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

Children

Farm Workers

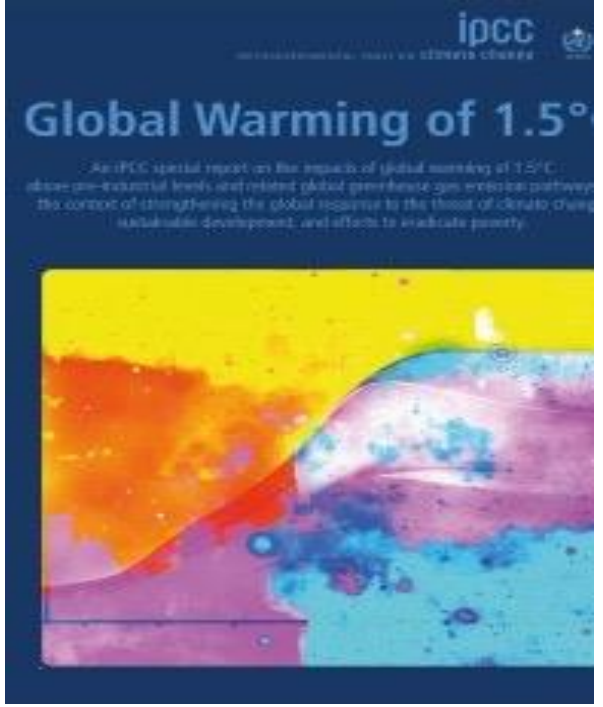
Women

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*

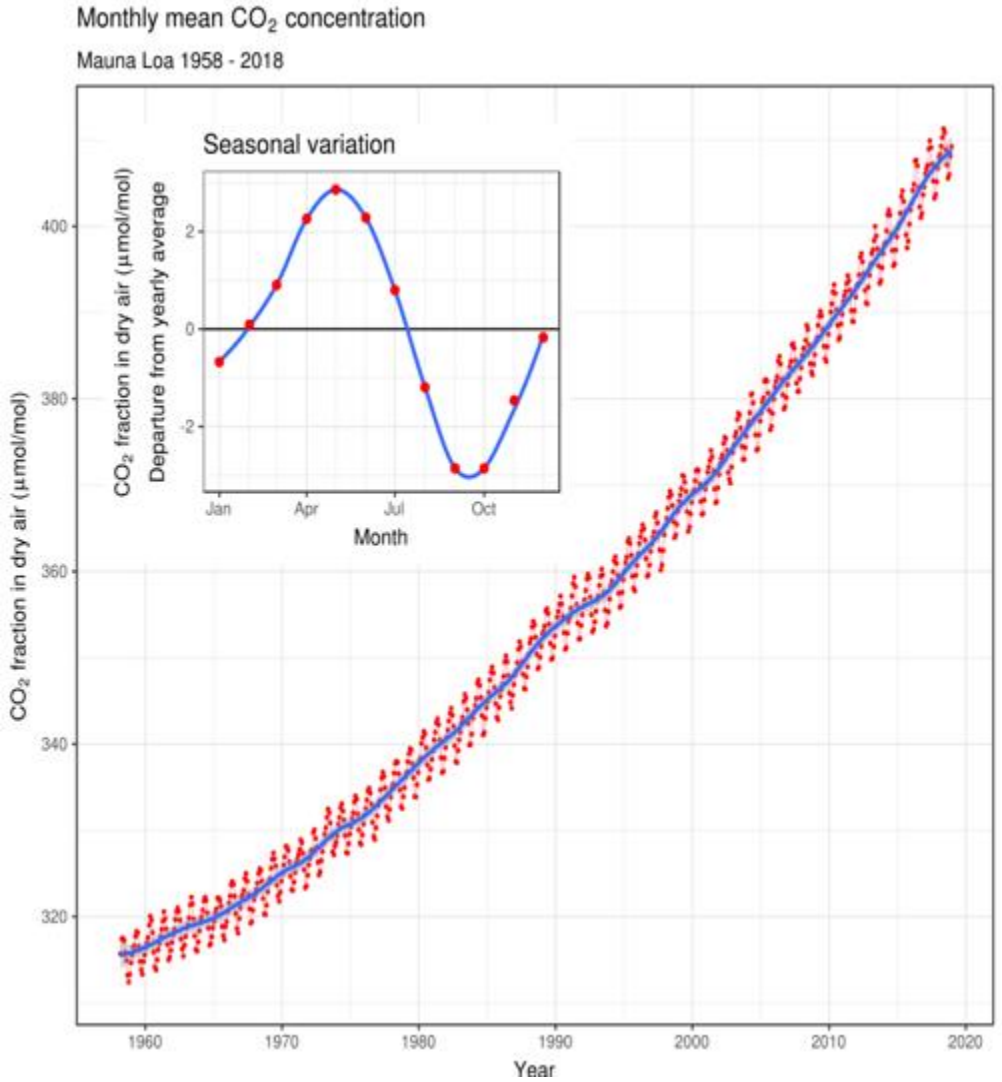


UN Chief Executives Board Meeting, 09 May 2019

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

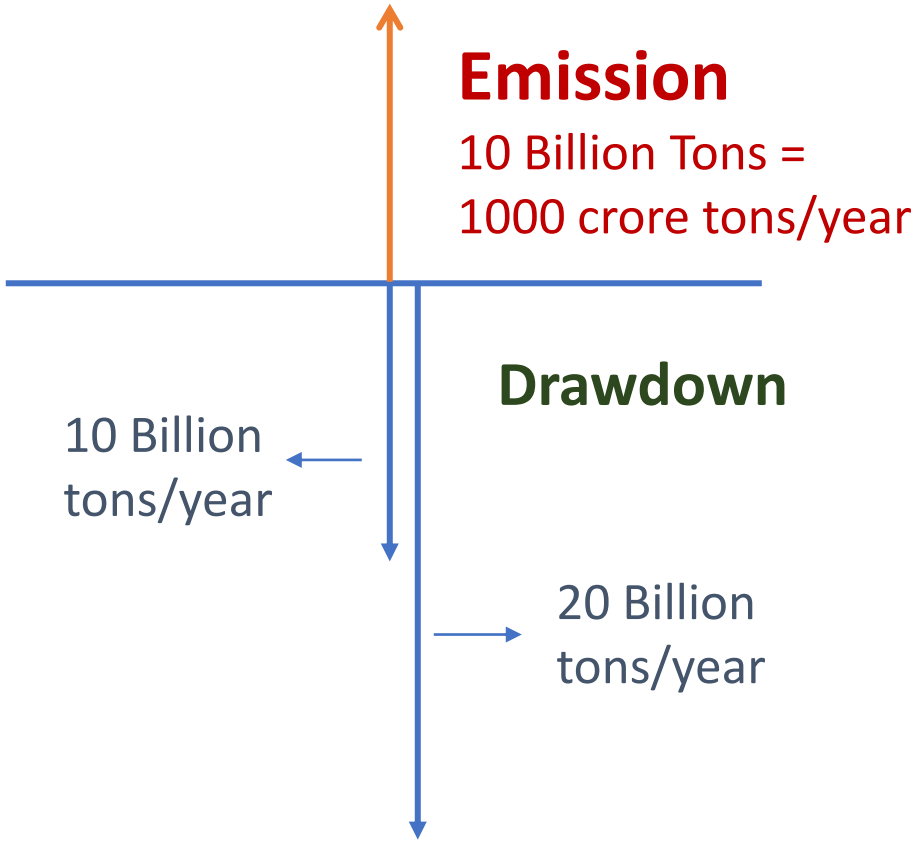


Source: R F Keeling, S. J Walker, S.C Piper, A. F Bolienbacher

Carbon: emissions and drawdown

CO_2
Half Life
100 years

Humus
Stable Carbon
500 to 2000 years



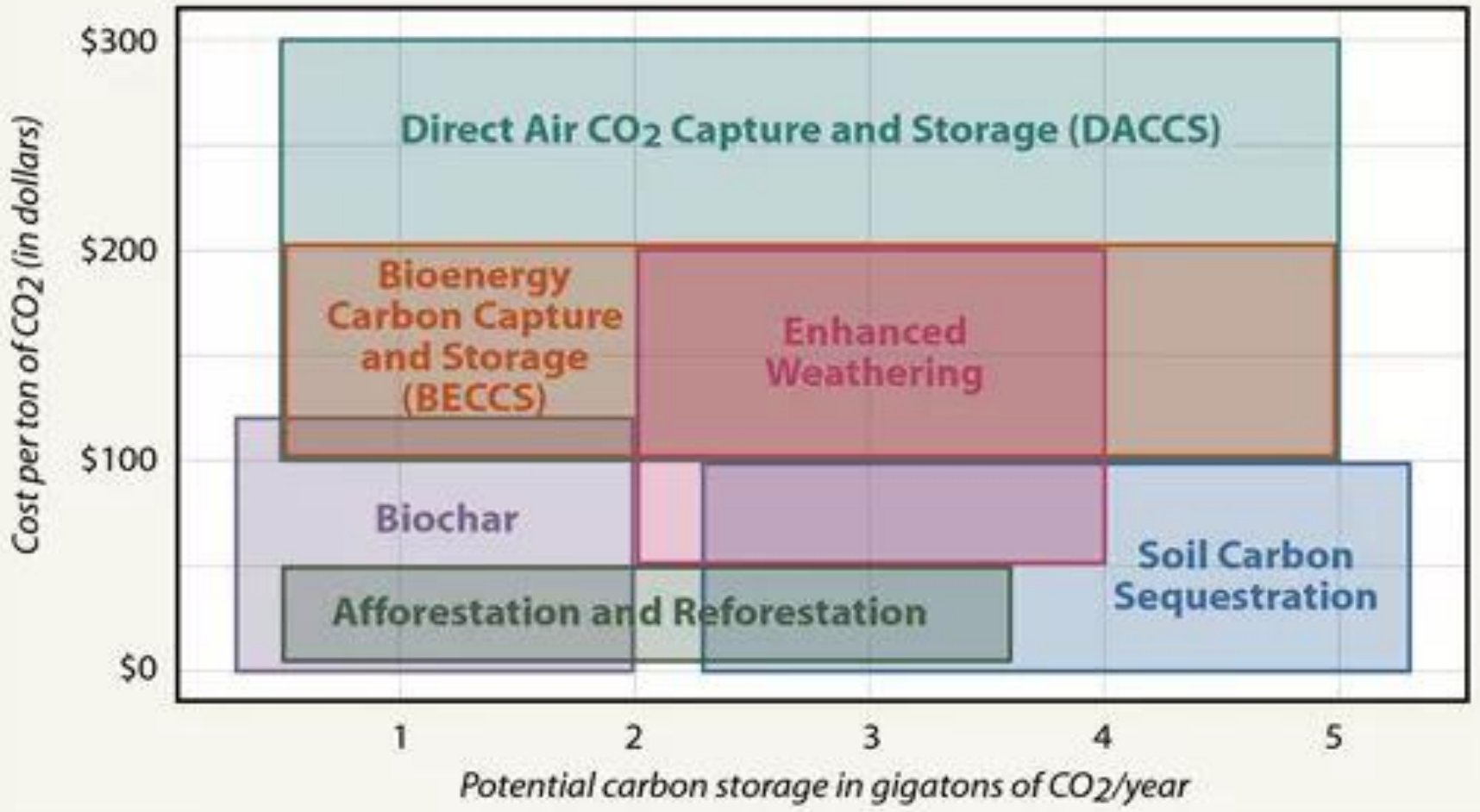
Intergovernmental Panel on Climate Change (IPCC)

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.

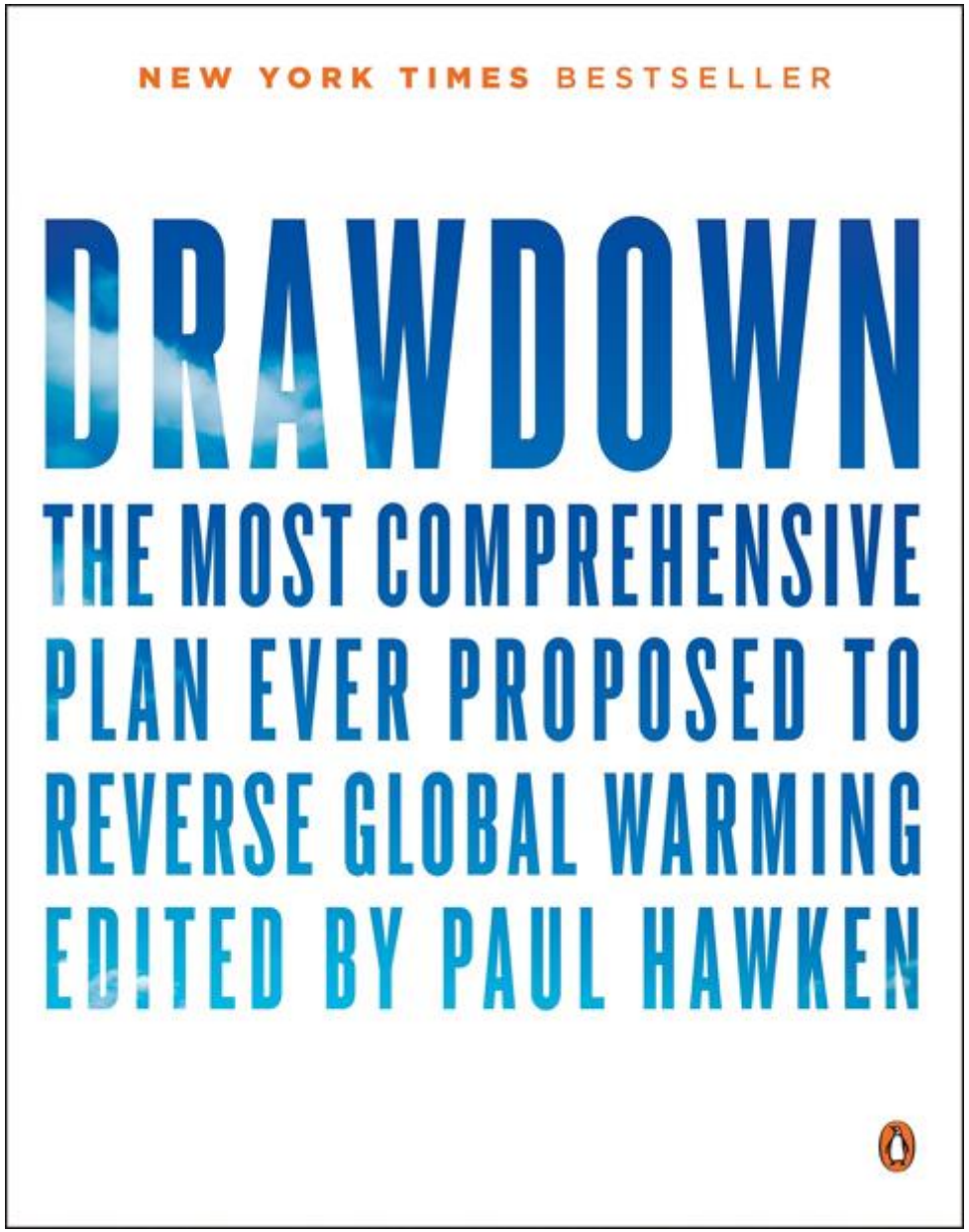


SOURCE: IPCC

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

Regenerative Agriculture

Conservation Agriculture

Silvopasture

Tree intercropping

Multistrata Agroforestry

Farmland restoration

System of Rice Intensification

Nutrient Management

Farmland Irrigation

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

Mother nature has solutions to all these problems

Safeguarding our collective *future*

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.

ZBNF incorporates all the recommended best Practices for Climate Change Adaptation - Four Wheels of ZBNF

ZBNF has a critical role in soil carbon Sequestration

Beejamrutham

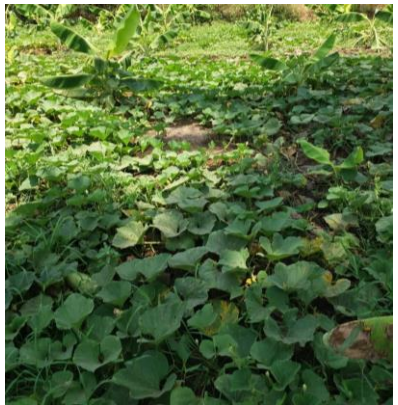
Microbial seed coating through cow urine and dung -based formulations

Jeevamrutham

Enhance soil microbiome through an 'inoculum' of cow dung, cow urine, soil, etc

Achhadana

Ground to be kept **covered with live crops** and crop residues as **mulching**



Waaphasa

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

Other Principles and Practices in ZBNF

Use of 'indigenous' cow – for cow-dung and urine. One cow is enough for cultivation of 30 acres

Botanical extracts – for pest management

Minimal tillage – ground becomes soft and porous with ZBNF practices

All inputs to be made within the village – nothing should be purchased from outside

The cost of production of the main crop is recovered from the income from the short duration, inter crops (3rd wheel) – hence the name 'Zero budget' Natural farming

AP ZBNF 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	23%
No. of Women SHGs	1,41,361	1,61,296	22%
No. of Farmers enrolled	5,23,000	5,80,000	9%
No. of landless, SC, STs and other		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. cr**

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	63.00	90.32	153.32
Total	181.33	132.89	314.22

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

ZBNF IMPACTS

Centre for economics and social studies – Crop Cutting Experiments evaluation

Yields - Kharif 2018

Yield Comparison between ZBNF and Non ZBNF (CESS CCE Kharif 2018)				
Crop	Condition	ZBNF Yield in Kg/Ha.	Non ZBNF yield in Kg/ha.	Percentage Change in Yield over ZBNF (%)
Bengalgram	Rainfed	1769	1720	3%
Cotton	Irrigated	2183	1652	32%
Groundnut	Irrigated	1713	1622	6%
Maize	Irrigated	5204	3987	31%
Paddy	Irrigated	4724	4948	-5%

ZBNF IMPACTS

Centre for economics and social studies – Crop Cutting Experiments evaluation

Cost of cultivation (Rs/Ha) - Kharif 2018

Cost of cultivation ZBNF Vs Non ZBNF (CESS CCE KHARIF 2018)				
Crop	Condition	Cost of Cultivation ZBNF (Rs/Ha.)	Cost of cultivation Non ZBNF (Rs/Ha.)	Percentage Change
Bengalgram	Rainfed	28611	33326	14%
Cotton	Irrigated	37197	40715	9%
Groundnut	Irrigated	33020	33746	2%
Maize	Irrigated	32590	32837	1%
Paddy	Irrigated	37742	43380	13%

ZBNF IMPACTS

Centre for economics and social studies – Crop Cutting Experiments evaluation

Net income (Rs/Ha) - Kharif 2018

Net Income ZBNF Vs Non ZBNF (CESS CCE KHARIF 2018)				
Crop	Condition	Net Income ZBNF (Rs/Ha.)	Net Income Non ZBNF (Rs/Ha.)	Percentage increase in Net income over ZBNF
Bengalgram	Rainfed	55197	47042	17%
Cotton	Irrigated	72046	41119	75%
Groundnut	Irrigated	49463	43649	13%
Maize	Irrigated	45906	21709	111%
Paddy	Irrigated	47859	43327	10%

Best Cases in 2018

Crop	ZBNF Yield (Kgs/acre)	Non-ZBNF Yield (Kgs/acre)	Percentage Change	Notes
Guli Ragi	1250	450	178 %	Farmer: Trimurthulu, Ananthagiri Mandal, Vishakapatanam
SRI Ragi	1320	450	193 %	Farmer: K Pandanna, Paderu, Vishakapatanam
Sama	717	350	104 %	Farmer: P Sonnu, Araku, Vishakapatanam
SRI Paddy	2350	1550	52 %	Farmer: Paradani Jogi Raju (farmer), Emaduguala mandal, Vishakapatanam
Coffee	103	67	54 %	Farmer in D Gonduru, Kadagaputu, Vishakapatanam
Cotton	557	360	54 %	Farmer: K Ganapathi, Duddukhallu, Vizianagaram
Cashew	900	600	50 %	Farmer: K Santa Kumari, Rampachodavaram, East Godavari

2 acres of land | Farming since 15 years | Chemical farming | Unviable | Adverse health | Left farming leased land

ZBNF changing lives

Mandal Maheswari
Sobhandhripuram village
Krishna District
Farmer &
Community Resource Person

- Community Resource Person encourage to take up ZBNF
- Took ZBNF paddy on 0.25 acres as experiment
- Phenomenal result achieved
- Encouraged by this, took back leased land to do ZBNF in all 2 acres

- Bought cow for input preparation
- Discuss ZBNF with her SHG member
- Grounded ZBNF kitchen garden
- Provides free ghanajeevamrutham and vegetable to villagers
- Phenomenal community presence, selected as community resource person

Non ZBNF Paddy	
Cost of cultivation per acre(Rs.)	20,500
Gross income per acre (Rs.)	47,250
Net income per acre (Rs.)	**26,750**

Disability is not inability

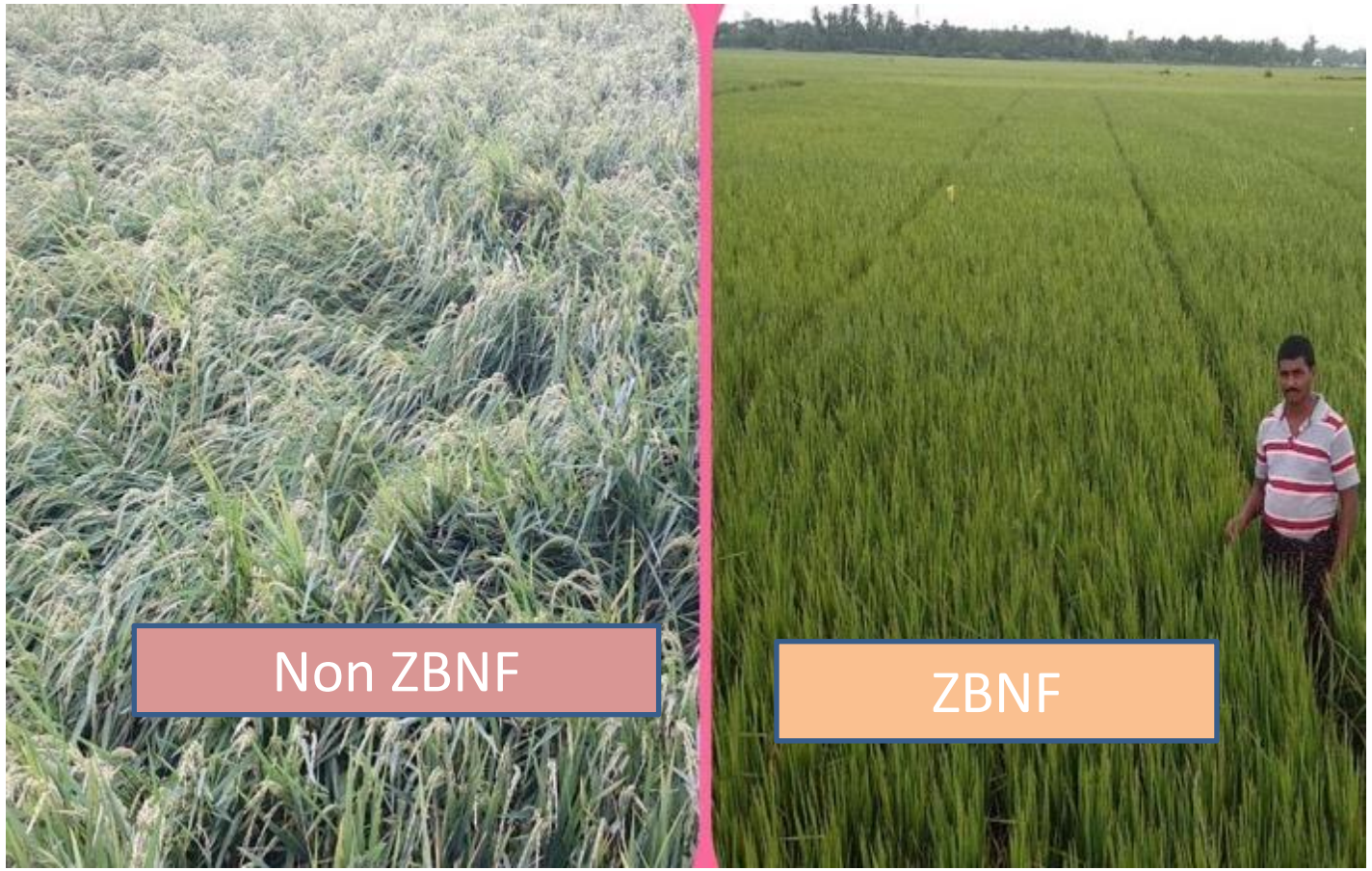
ZBNF Paddy	
Cost of cultivation per acre (Rs.)	13,200
Gross income per acre (Rs.)	61,425
Net income per acre (Rs.)	**48,225**

Impact on Health

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

Pillars of APZBNF Model

Commitment
State Government

Knowledge
Subhash Palekar

Extension
Champion Farmers

Ownership
Women SHGs

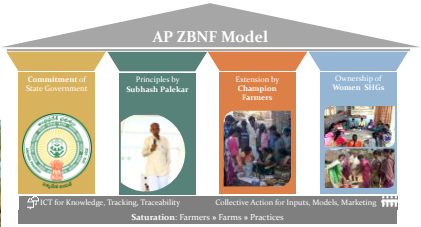
ICT for Knowledge, Tracking, Traceability

Collective Action for Inputs, Models, Marketing

Saturation: Farmers » Farms » Practices

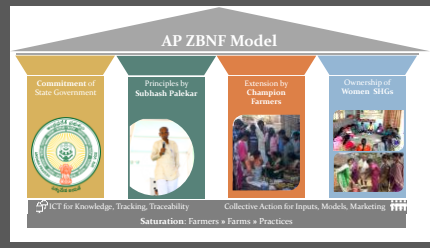
Women in Natural Farming: Our biggest Strength

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

Champion Farmers



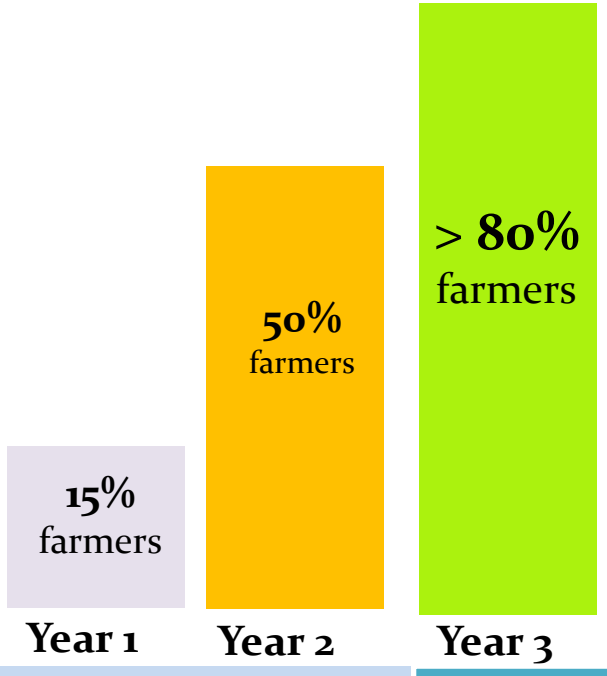
5,600 **Community Resource Persons**
@ 1 per 100 famers

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

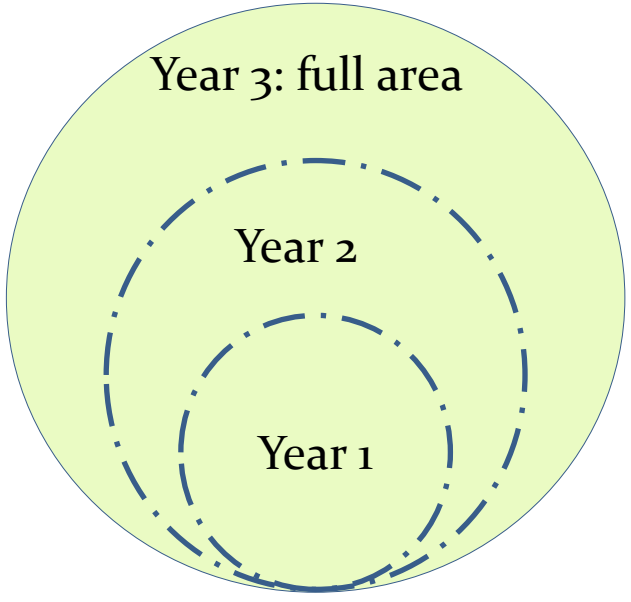
Inspiration | Knowledge Transfer | Handholding | Video Dissemination | Farmer Field Schools

Saturation Approach

Each Village takes 3 years to reach all farmers.



Each farmer takes 3-6 years to adopt all practices and cover entire holding.



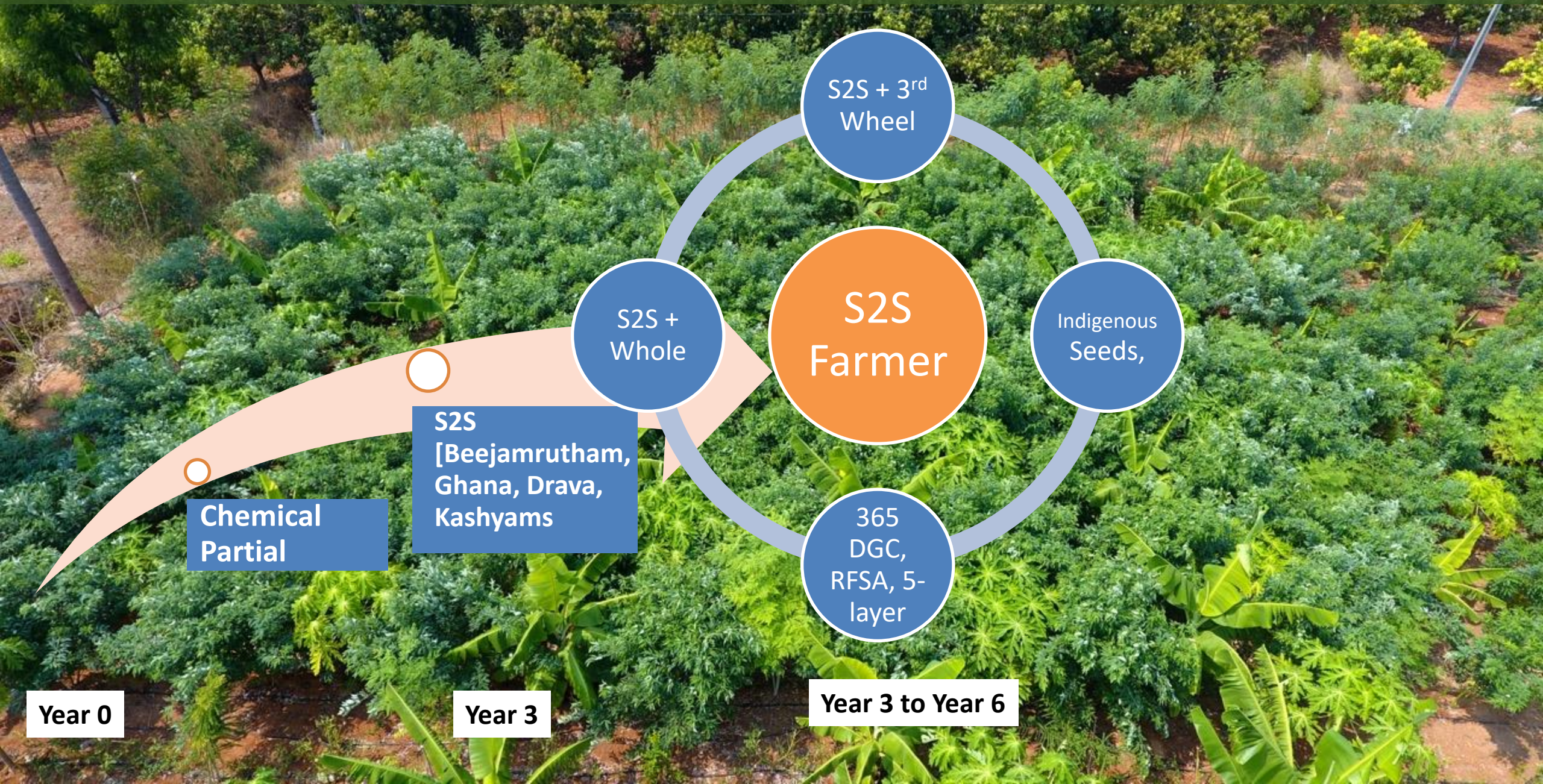
1st Bio-village in 3 years - Kondabaridi

In 5-6 years, a village becomes a 'BIO-VILLAGE

Year 5/6

All Villages | All Farmers | All Farms | All Practices

A Farmer's Graduation



Innovations under the APZBNF 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

Community Marketing

Farmers field school

Engaging school children in farming

Collaborations for Establishing the Science behind ZBNF

Food and Agriculture Organization of the United Nations

UN environment

World Agroforestry

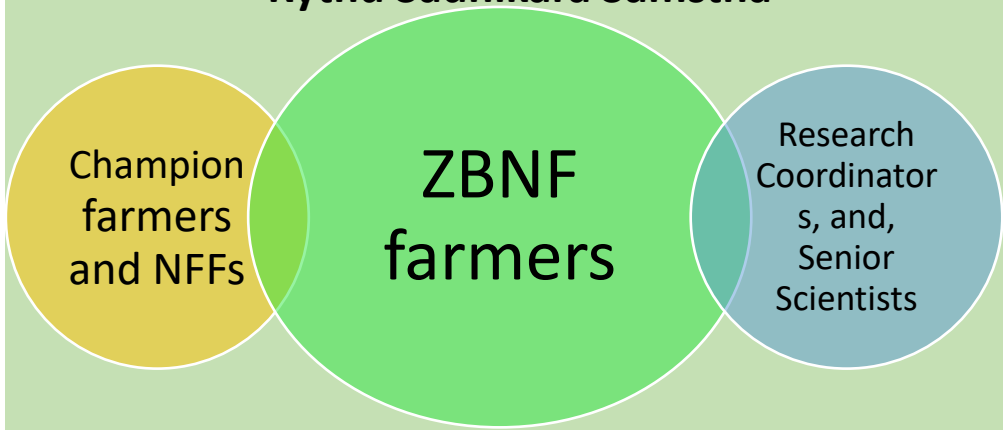
cirad

Bioversity International

WWF

University of Reading

Rythu Sadhikara Samstha



National Institutions
IIS, IISS, IITB, TERI

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

Drought Resilience

Kharif 2016 Season – Drought Year

696 kg/ha ZBNF; **342 kg/ha Non-ZBNF**	**100% increase in yield; Rs.17500/ha.**	**Costs reduced by Rs.2500/ha.**	**Net increase in income in a drought year, Rs.20,000/ha**

Kharif 2017 Anantapuramu –
Groundnut crop condition after 29-day dry spell

ZBNF

Non ZBNF

Kharif 2017 - Kondapuram, Gudur Mandal, Kurnool
Non Z.B.N.F Plant Struggling to revive from 30-day dry spell

ZBNF

Non ZBNF

ZBNF plot withstands dry spell, has 3 to 4 inflorescence with double the number of berries per ear head

Drought Resilience – Kharif 2018

Rayalseema received cumulative rainfall of 91.6 mm as against the normal rainfall of 168.1 mm from June 1 to July 31 2018

296 Mandal declared as Drought hit in early kharif season of 2018-19

Anantpur, Chittoor and Kurnool worst hit. Kadapa received scanty rainfall

ZBNF emerged as a silver lining withstanding dry spells.

Pre-monsoon sowing as a strategy initiated for drought proofing through ZBNF

Tadkanpalli cluster, Kurnool – Jowar crop after 20-day dry spell

ZBNF

Non ZBNF

ZBNF

Non ZBNF

ZBNF

Non ZBNF

Tammaraju cluster, Kurnool

Non Z.B.N.F Redgram Plant with no root nodules as compared to ZBNF Red Gram with abundant root nodules

Chillies

ZBNF

Variety of ZBNF paddy seedlings Balapanuru cluster thriving in spite of low rainfall

Non ZBNF

ZBNF

Non ZBNF

Nutrient Cycling in Natural Farming

Nature's Sophisticated Carbon Capture Mechanism

PLANT CONVERTS

SUNLIGHT, WATER and CO2 into SUGARS

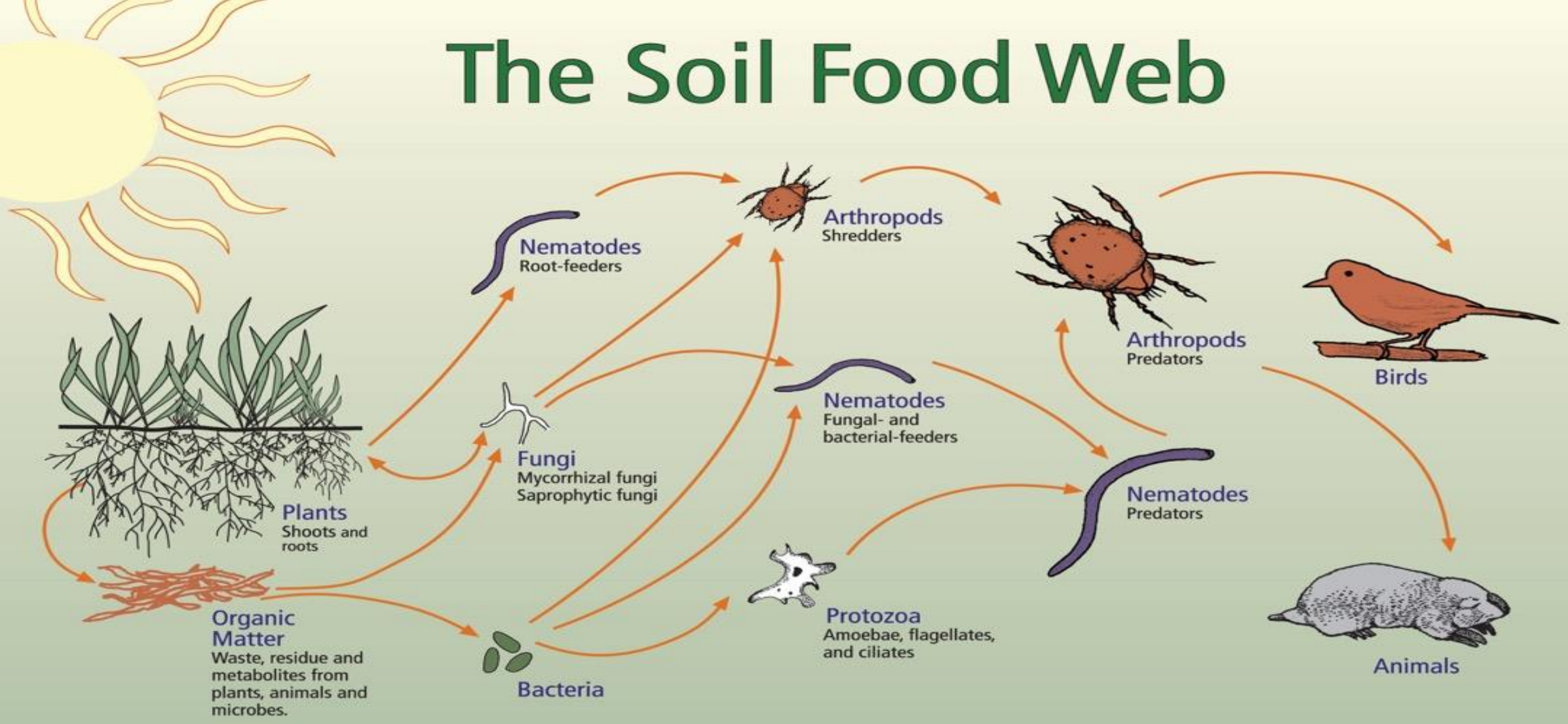
40% of Plant Sugars stored in Above Ground Biomass

30% of Sugars stored in Roots

30% of Sugars moves into the Soil as Exudates, feeding vast microbial population that makes plant healthy

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

The Soil Food Web



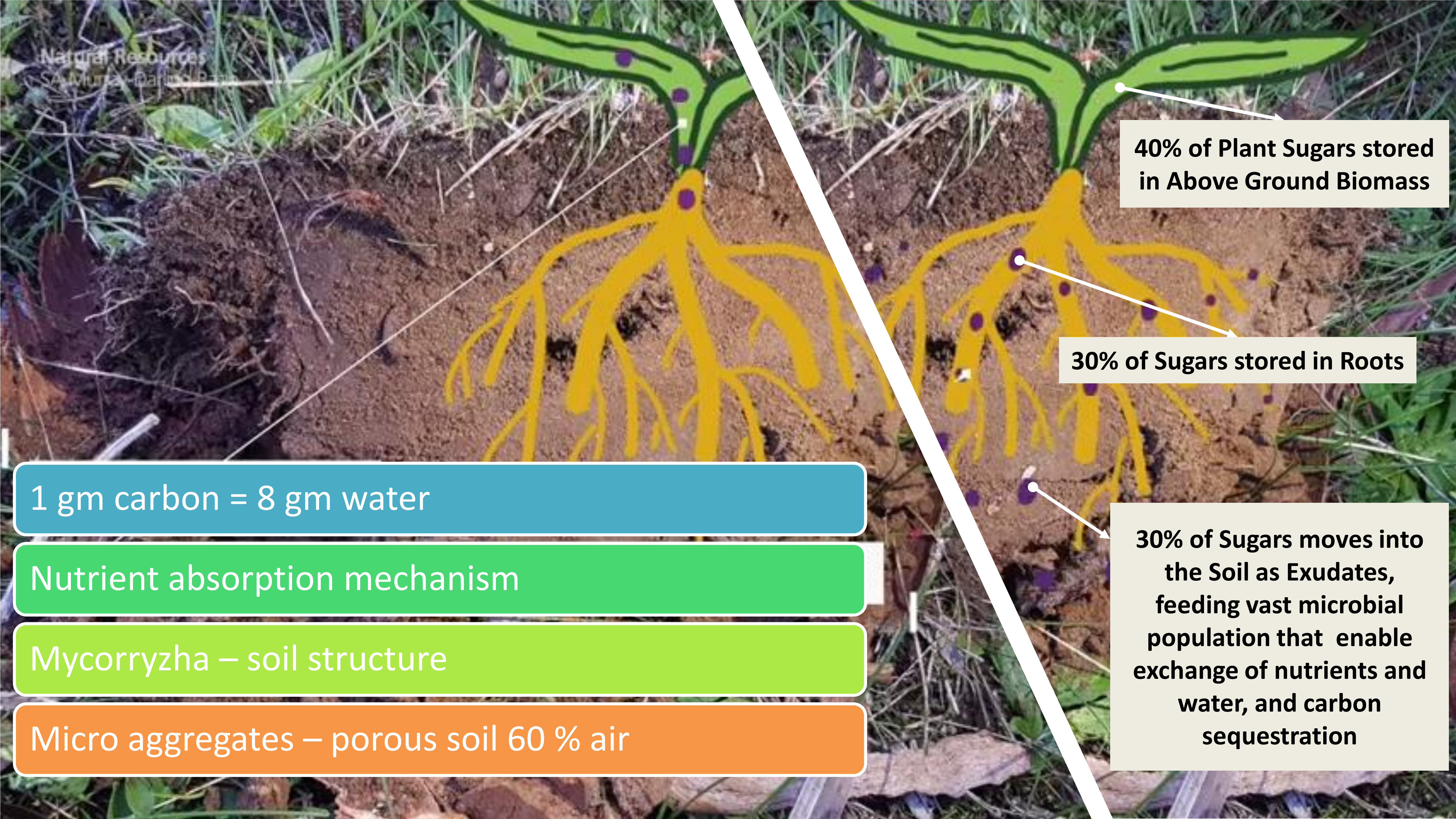
First trophic level:
Photosynthesizers

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

Third trophic level:
Shredders
Predators
Grazers

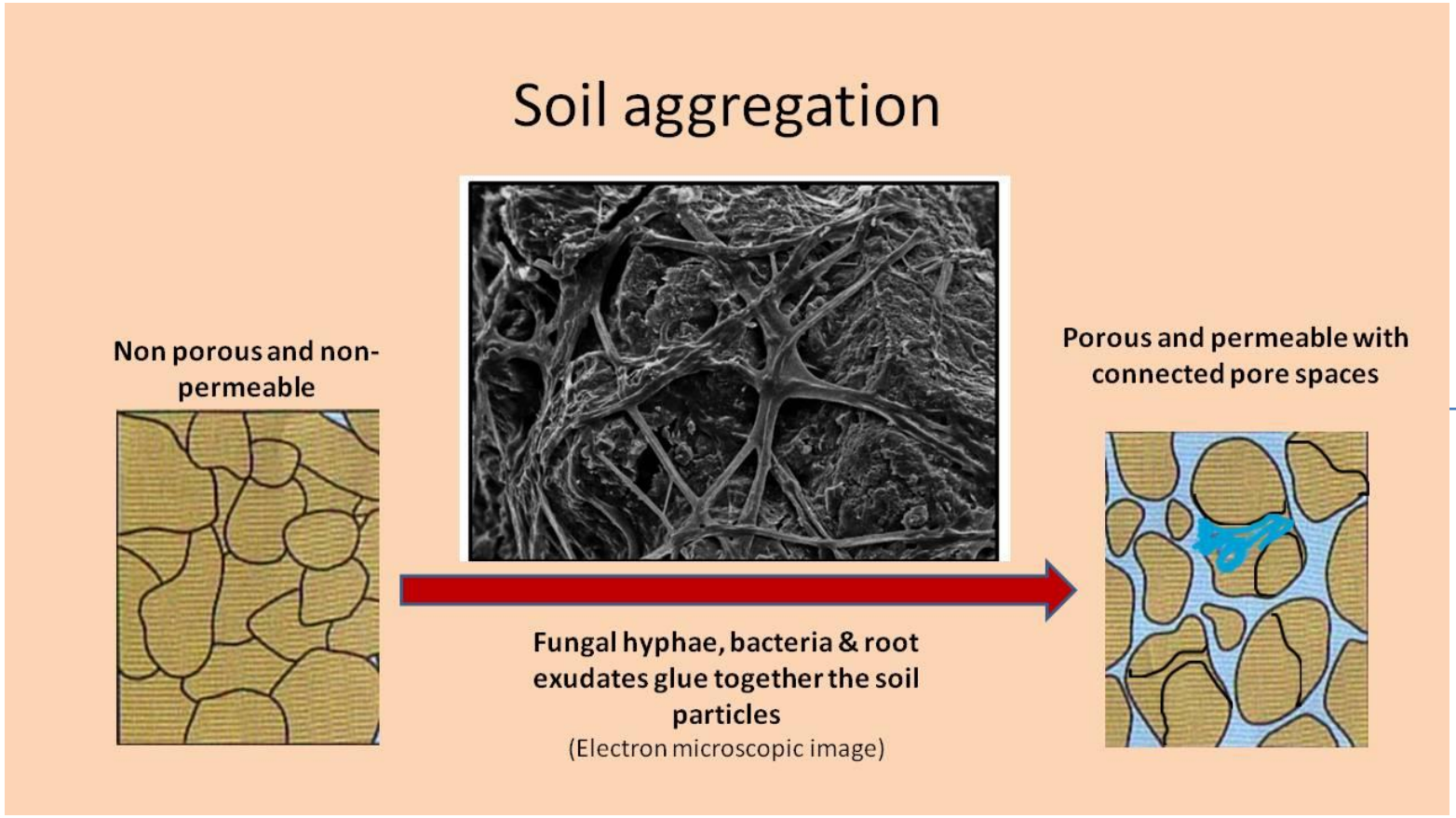
Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators



- 1 gm carbon = 8 gm water
- Nutrient absorption mechanism
- Mycorryzha – soil structure
- Micro aggregates – porous soil 60 % air

ZBNF enables these processes efficiently



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

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
- Dry situations regardless of regular monsoon
- Helps to maintain year-round ground cover in all districts

Drought proofing through Z.B.N.F – 2019 - 20

	Number of Farmers as on 15th June'19			
DISTRICT	April'19	May'19	June'19	**Total**
Srikakulam	131	444	8	**583**
Vizianagaram	82	512	421	**1015**
Visakhapatnam	6	145	181	**332**
East Godavari	90	927	9	**1026**
West Godavari	272	442	15	**729**
Krishna	135	352	5	**492**
Guntur	36	437	414	**887**
Prakasam	10	332	434	**776**
Nellore	21	328	70	**419**
Chittor	10	600	70	**680**
Y.S.R	25	691	1265	**1981**
Kurnool	18	219	526	**763**
Anantapur	69	684	22	**775**
Grand Total	**905**	**6113**	**3440**	**10458**

- 10458 Farmers undertook pre monsoon sowing in 2043.8 acres during 2019-20 across the state with average land coverage of 0.19 acres

Sarweswar Reddy
Mandaloor Village
Mandaloor Cluster
Kurnool

Pre-Monsoon Dry sowing

PMDS sowing on 20th June 2019

Land extent 0.30 acres

16th June’ 19

Preparation of Ghana Jeevamrutham

20th June’ 19

Land Preparation

20th June’ 19

Seed treatment with Beejamrutham

7th July’ 19

Preparation of Dhrava Jeevamrutham

20th June’ 19

Sowing seeds- Broadcasting

28th June’ 19

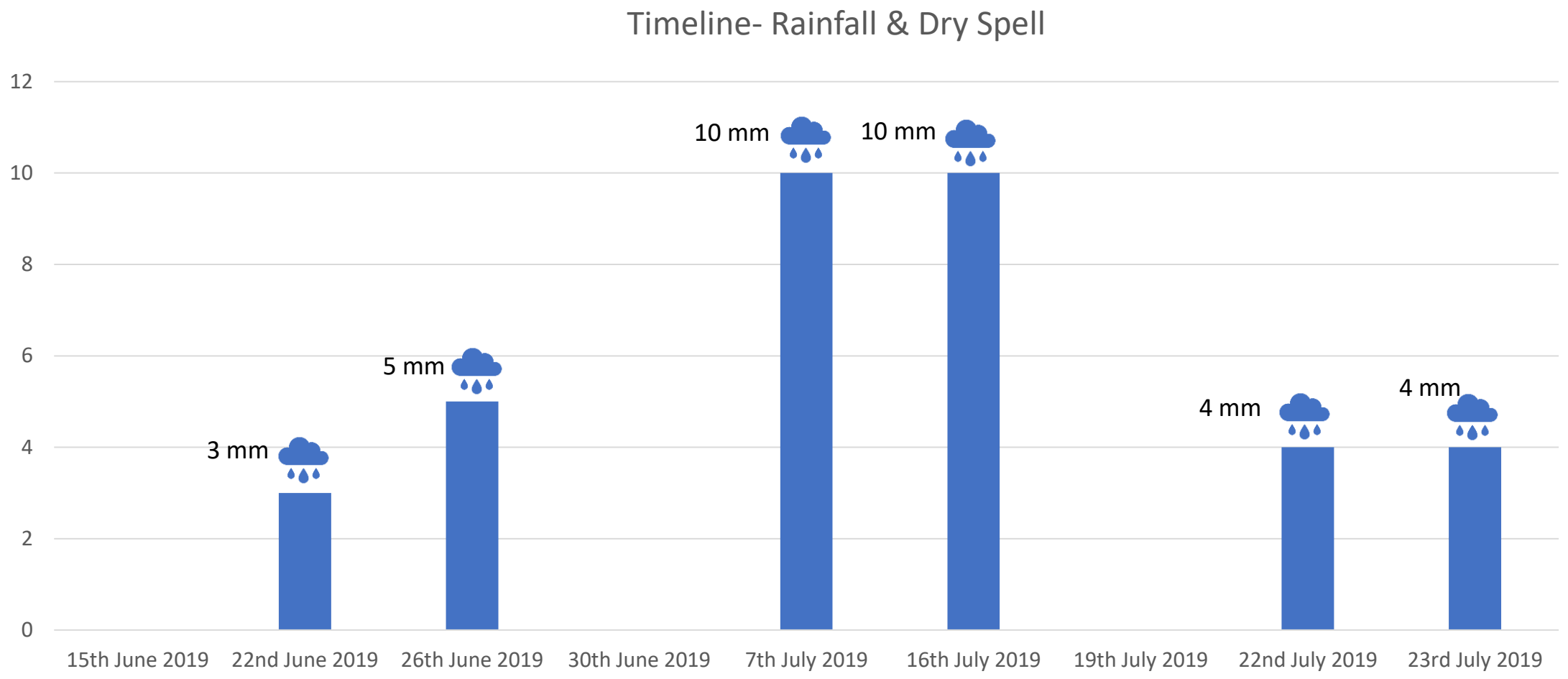
Paddy Straw as a mulch material

28th June’ 19

Greengram as a mulch material

30th June’ 19

Germination


Timeline- Rainfall & Dry Spell
12
10
8
6
4
2
0
3 mm
5 mm
10 mm
10 mm
4 mm
4 mm
15th June 2019
22nd June 2019
26th June 2019
30th June 2019
7th July 2019
16th July 2019
19th July 2019
22nd July 2019
23rd July 2019

30th June, 2019

21st July, 2019

Application of Neemastram- 23rd July, 2019

| Brown top millet | Foxtail millet| Finger millet | Kodomillet | Barnyard millet | Redgram | Jowar | Cowpea | Sesamum | Greengram | Blackgram | Cluster bean | Radish | Beet root | Carrot | Coriander | Castor |

25th July, 2019

Expenditure: Rs. 5050
Seeds : Rs.750
Land preparation with bullocks : Rs.400
Labours : Rs.1000
Mulch material : Rs.1000
Ghanajeevamrutham : Rs.800 (100kgs)
Jeevamrutham & Botanical extracts : Rs.600 (12 liters)
Others : Rs.500

Income:
Expected income: Rs.8000

Farmer Opinion (NFF):
In places like Rayalaseema where farmers leave their land without cultivation, this is a boon. Solves Global warming issue and especially "it gives a hope to farmers to continue farming rather than qutting"

Anantapur

Ghanajeevamrutham application

Seeds and seed treatment

Name of the Farmer : Gopal

Land preparation: July11

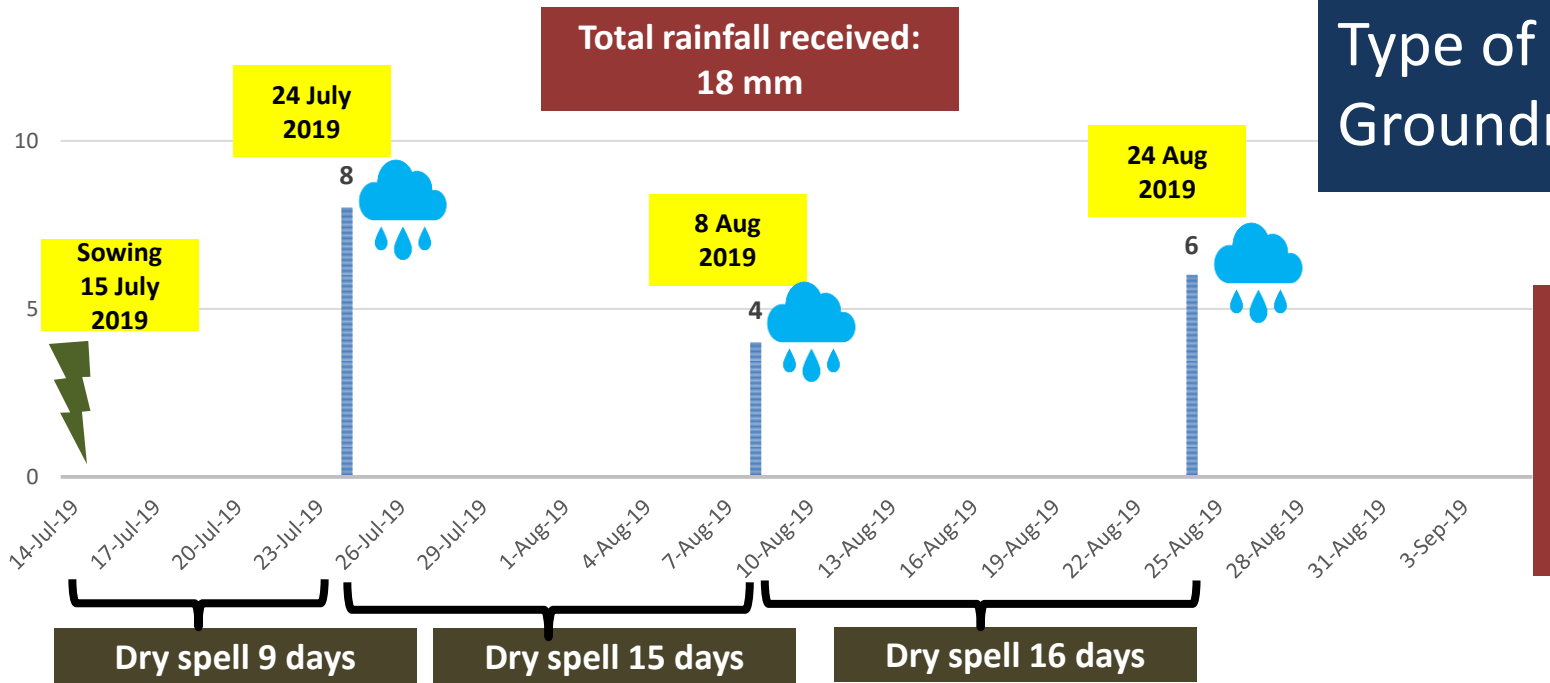
Extent: 0.80 acres

Ghanajeevamrutham Used (in KGs): 320kgs

Date of Sowing: July 15

Date of Germination: July 28

Type of Mulch Materials Used : Groundnut shells



Date of *Dravajeevamrutham* Sprayings:

30 July 2019

18 August 2019

Ghanajeevamrutam: 200
Mulching: 8000
Land preparation: 2000
Seeds: 1500
Labour: 1000

Total: Rs 12,700

Expected harvesting in the coming month

Present status of the crop on 28 August 2019

Farmer is delighted to see the growth inspite of rain deficiency

Yanamadala Veeraju

Shubhanapuram village
Nuzividu division
Krishna district

ZBNF farmer since two years

Dry sowing in 0.10 acres

Harvested maize in the land before PMDS

Line sowing of the seed post seed treatment

Light ploughing post sowing to cover the soil

Application of 50 kgs of ghanajeevamrutham

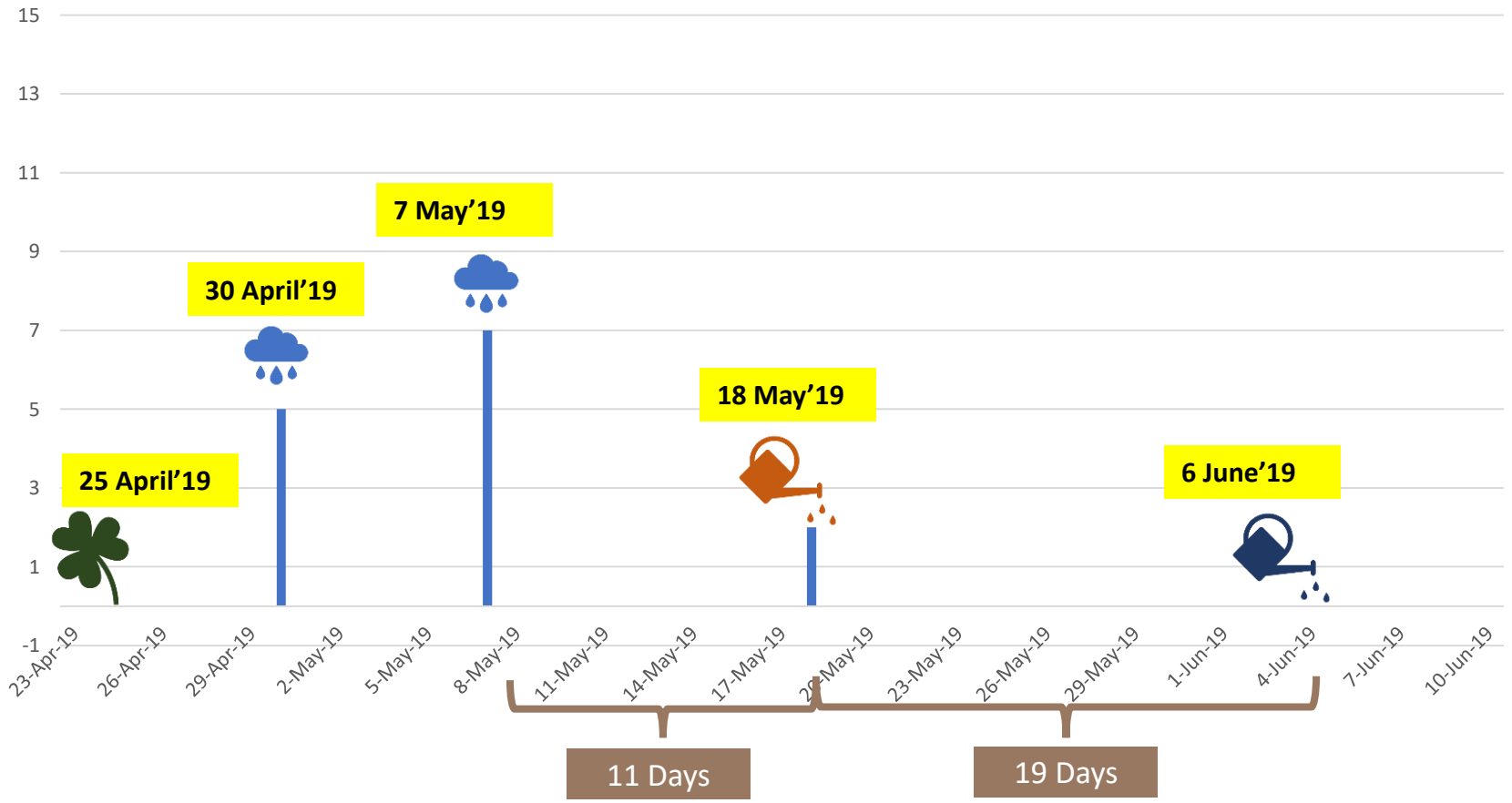
Date of sowing 25 April 2019

Sorgam |Cowpea | Bajra | Cucumber | Ridge gourd | Leafy vegetables

Timeline- Rainfall & Dry Spell in this Pre-monsoon Field

Total Irrigation/ dravajeevamrutham	
Light Irrigation 2 days Dravajeevamrutham	10 mm

Total Rainfall	
2 days	12 mm



Dry spells


Date of seed germination 6 May 2019

Vegetative state observed on 28th May 2019

Expenditure (Rs.)

Ploughing : 300
Seeds : 250
Ghanajeevamrutham : 100
Total investment : 650

Income (Rs.)

10 kgs Ridge guard: Rs 300/-
15 kgs Cucumber: Rs 225/-
150 bundles of leafy vegetables: Rs 750/-
Total income:. 1275/-

Net income = 1275 - 650 = Rs. 625

PMDS plot as observed on 24 July 2019

Collaborations for Establishing the Science behind ZBNF

Food and Agriculture Organization of the United Nations

UN environment

World Agroforestry

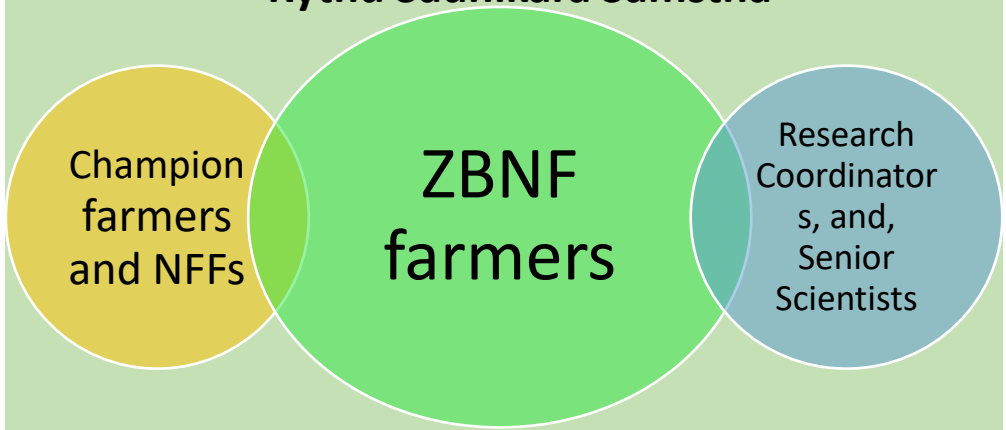
cirad

Bioversity International

WWF

University of Reading

Rythu Sadhikara Samstha



National Institutions
IIS, IISS, IITB, TERI

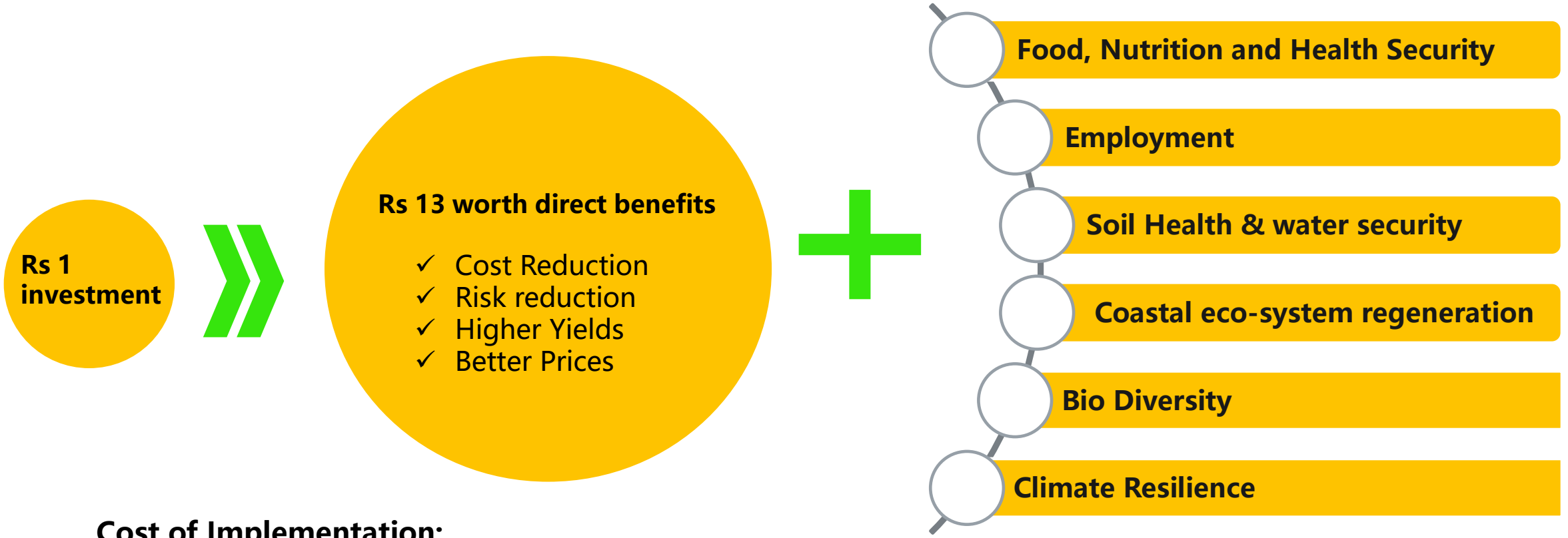
- Soil organic matter increase
- Water saving & Harnessing water vapor
- Savings in Energy
- Resilience to Droughts & Cyclones
- Nutrient and Carbon Dynamics
- Microbial diversity in inoculants

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

#	Categories	COSTS (in Rs.)	%
1	**Capacity building** [ZBNF Knowledge dissemination, Extension, Capacity Building and Human Resource Development]	15,511	56%
2	Women and Men Farmers' **Institution building** and funds to farmers' institutions, Support in establishing markets (inter-village, inter-cluster, inter-district) using farmers own institutions	7,600	27%
4	ICT, PGS Certification, Quality Assurance, **Tracking** and Monitoring	3,750	13%
5	**Technical Support** and Overall Programme Management at the District and State levels	1,050	4%
	TOTAL	27,911	

Cost to convert one farmer: 27,911 over 5-6 years

Benefits of Scaling up ZBNF in India



Cost of Implementation:
It takes Rs.27,911 per capita over 5-6 years for a farmer to adopt ZBNF

Ecosystem & Health Benefits to citizens

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

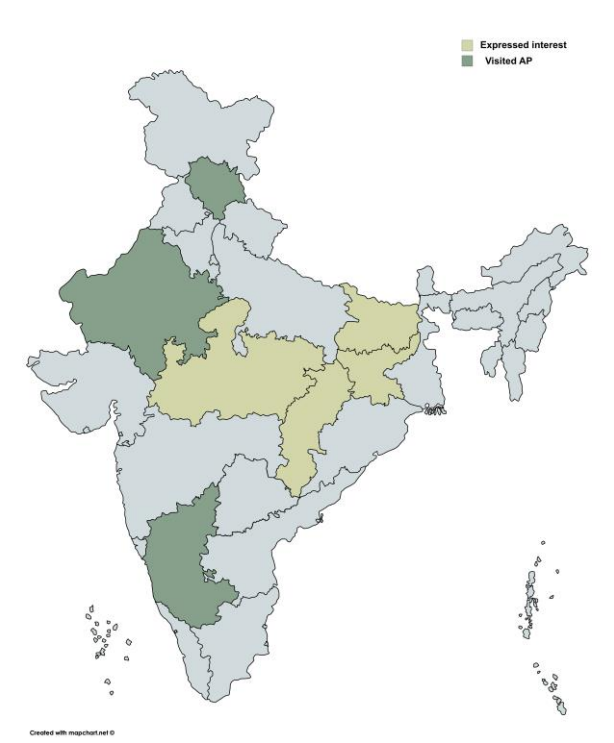
2027
- All bio villages
- ***Transforming all 60 lakh farmers to ZBNF***

All Villages | All Farmers | All Farms | All Practices

2019 – 20 : APZBNF at National level

Union Govt has announced a National Mission for Z.B.N.F. Andhra Pradesh is providing technical support to the Ministry of Agriculture

Indian Council of Agriculture Research invited AP to be part of National Committee to assess the impact of ZBNF



AP's support to Other States in India

- States interested
  - Gujarat
  - Himachal Pradesh
  - Meghalaya
  - Rajasthan

Global Recognitions for APZBNF

UN General Assembly Event, ZBNF as case study was discussed as part of south-south collaboration, 24 Sep 2018

Paris Peace Forum: AP ZBNF is selected as top 10 projects that will receive scaling up support

Global Alliance for the Future of Food has selected AP ZBNF as one of the 21 'Beacons of Hope'

Indonesian Ministerial delegation visited AP to learn about ZBNF

World Future Council selected AP ZBNF as one of the top 30 most promising policies in agroecology

2019 – 20: APZBNF in International fora

United Nations
Climate Change Summit September 2019

Andhra Pradesh ZBNF Model is being showcased

UN Agencies (WFP, UNEP, CBD, WHO, IFAD, FAO, UNDEP) jointly approved the Scaling up Agroecology Initiative work plan for 2019-2020. Mexico, Senegal and India (specifically the region of **Andhra Pradesh**) selected for the first phase of implementation – Launch in October, 2019.

Global Environment Facility has approved the proposal submitted by UN Environment India to provide technical support to AP Govt – in 2020 -21

United Nations Convention to Combat Desertification invited Hon'ble Chief Minister of Andhra Pradesh (2 September 2019)

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