THE OHIO STATE UNIVERSITY

Soil Organic Carbon for Climate ,Food and Peace

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SOIL AND WORLD PEACE

Depleting Soil Organic Matter and Declining soil fertility, Degrading Soils and Denuded Lands, Recurring Drought and Intensifying Heat Waves, Increasing Salinization and Reducing Use Efficiency of water, Low Crop Yields and Perpetual hunger, and marginal living and Desperateness are as Real Threats to Global Peace and Security as are ICBMs and Nuclear Weapon Proliferation Because the Health of Soil, Plants, Animals, People and Ecosystems is One and Indivisible.

Rattan Lal
16th November 2017
COP 23,Bonn,Germany

SECURITIZATION OF FOOD AND THE ENVIRONMENT THROUGH SOIL SUSTAINABILITY

Security → Political → Economic → Social → Environmental

Human (Gender)

Societal (Ethnic)

National

Regional

International

Global

Lal (2015)

Soil Degradation

The Regime Shift by Extractive Farming

- Extractive Farming/Subsistence
- Depletion of SOC and Nutrients
- Decline in Soil Structure
- Loss of Soil Resilience
- Decline in Ecosystem Functions and Services
- Loss of Soil biodiversity
- Disruption of Key Processes

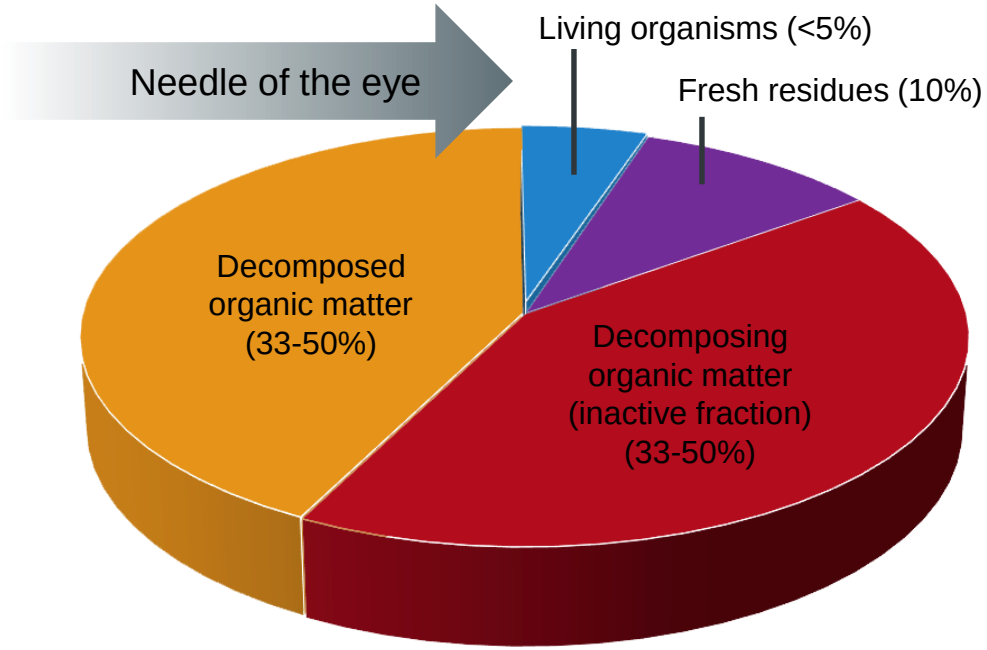
- Hunger
- Malnutrition
- Political Unrest
- Civil Strife
- War and insecurity
- 65 Million Refugees in 2016

Severe Degradation

SOIL ORGANIC MATTER

Soil organic matter is the organic component of the soil, and comprises of plant and animal residues at various stages of decomposition, cells and tissues of soil organisms and substances synthesized by soil biota. It consists of four primary components:

1. Living organisms : < 5%
2. Fresh plant residues: <10%
3. Decomposing organic matter (active/labile): 33-50%
4. Decomposed organic matter (stable): 33-50%



ESTIMATES OF GLOBAL SOIL ORGANIC DEBT

133 Pg C to 2m depth … *Sanderman et al. (2017)*

130 Pg C … *Lal (2018)*

Total Drawdown Potential of CO_2 ≅ 60-65 ppm

CARBON SEQUESTRATION IN THE TERRESTRIAL BIOSPHERE (LAL, 2010)

Strategy	Technical Potential (Pg C/yr)	
• Afforestation and agroforestry	1.2-1.4	
• Forest plantations	0.2-0.5	
• Grassland and grazed ecosystems	0.3-0.5	1.2-3.1
• Arable land	0.4-1.2	
• Salt-affected soils	0.3-0.7	
• Desertification control	0.2-0.7	
TOTAL	2.6-5.0 (3.8)	

1. 60 ppm of draw down of atmospheric CO_2 within one century

2. World soils are “a global public good” & farmers/land managers must be paid for ecosystem services

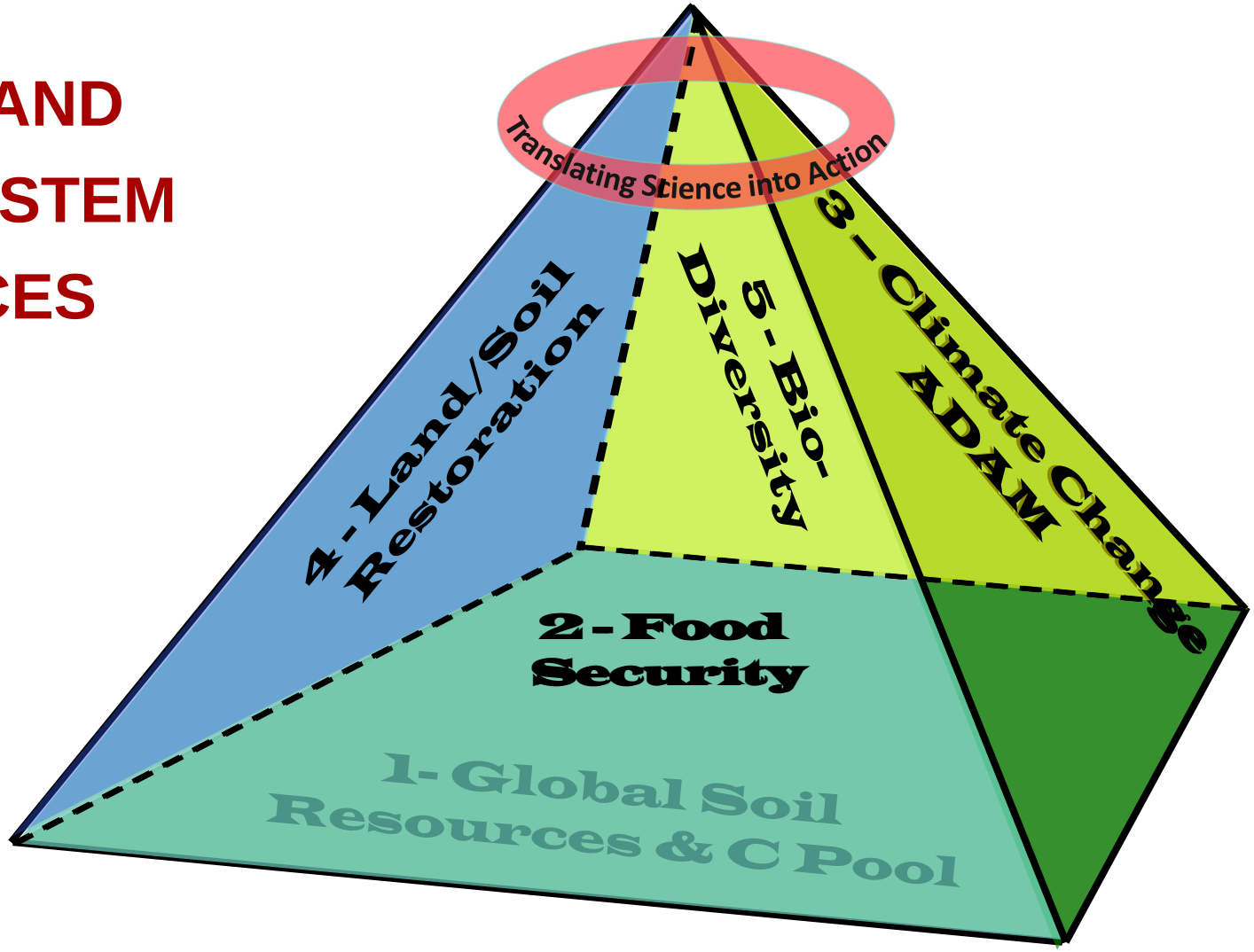

#2
End Hunger
#13
Climate Action
#15
Life on Land
Primary Impact
Soil Health & Land Use
Secondary Impact
#1
End Poverty
#3
Good Health
#6
Clean Water
#7
Renewable
Energy

CLIMATE CHANGE AND HUMAN RESPONSE


Illustration by Lincoln Agnew, NYT 4/21/2013

- Humans have not had to deal with such a drastic climate change since 10-12 millennia ago
- Now the humans, with population of 7.6 billion and projected to be 11.2 billion, have to deal with it and increasingly so in the future
- **COP-21 in Paris and COP22 in Marrakech were historic landmarks for soil health & C sequestration.**
- **COP-23 is the Time for Action**

SOILS AND ECOSYSTEM SERVICES



Lal (2012)

SOCIETAL VALUE OF SOC

- Cost of Residue + Nutrients: **$120/ MgC**
- Cost of Nutrients Only : **$102/ Mg**

Payments for Ecosystem Services at $40 / ha. yr

SOIL CARBON FOR CLIMATE AND FOOD

If I am asked what would I suggest to mitigate global warming and end hunger, the only rational response would be to change the ways we treat our soils to produce, transport, process, and consume our food. This would imply making soil, water and agriculture an integral part of the solution, and empowering farmers and land managers to produce more and more from less and less by reducing waste ,enhancing the eco-efficiency and restoring the degraded soils and afforesting denuded lands.

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