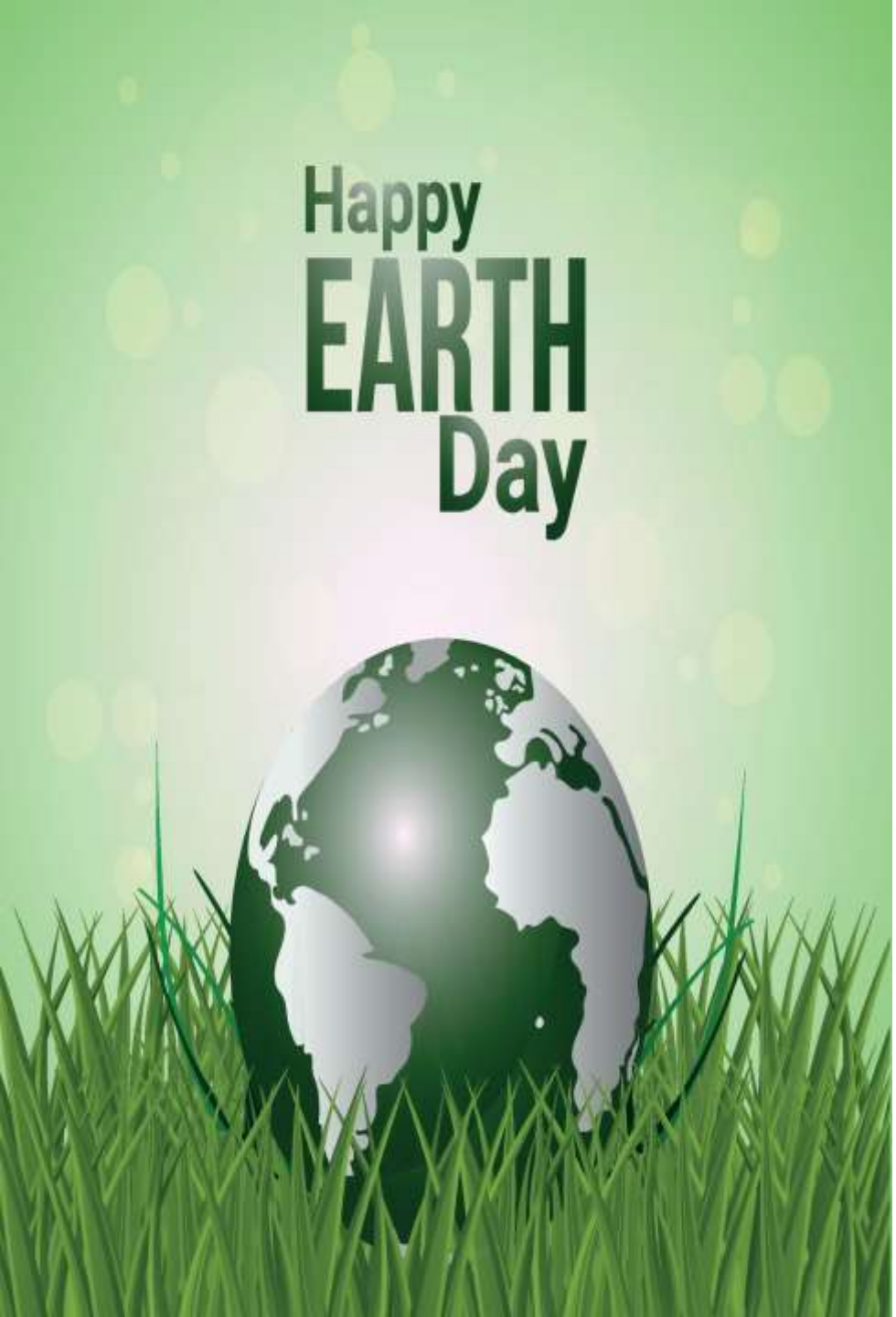


CIRDAP

World Earth Day
22nd April, 2023

Dr. Muhammad Israr
IRD Expert CIRDAP

Scheme of presentation

- History of Earth Day
- Theme of 2023
- Importance of Earth Day
- Investment in Earth planet
- Happy Earth planet
- Earth health & Agriculture
- Climate Smart Agriculture & Earth Planet
- Investment in food & agriculture innovations in the context of earth health, protection of marine life & Ecosystem
- Water & energy saving
- Reduction in plastic pollution & investment in peace
- Goals for achievements to ensure planet health

History

- Earth Day is an annual celebration, which gives us a reason, to celebrate and honor our beautiful planet.
- This day serves as a helpful reminder of a message to review the impact on our environment and also re-commitment to save our planet through global support.
- In the late 1960's and into 1970, most Americans paid little attention to the damage being done to our environment
- Not only were petroleum products being used excessively and automobile as well as industrial emissions were polluting the air
- Americans were against the oil spill in sea, industrial pollution as well the loss of wilderness, deforestation and the extinction of many wildlife species
- Dumping of toxins, such as pesticides and other toxic wastes, into streams and rivers…..

Continued……

- The true founders of earth day are JOHN MCCONNEL and GAYLORD NELSON, a US Senator from Wisconsin who proposed and organized the first Earth Day in 1970.
- As a result, on April 20, 1970, 20 million Americans took up the environmental cause and protested
- Thousands of schools, colleges and universities students participated in the first Earth Day.
- The participants led peaceful demonstrations in favor of environmental reform.

Theme

- Every year on Earth Day a theme is decided which gives a message to save our Earth.
- This year 2023, the theme for Earth Day is “ 'Invest in Our Planet”.

Earth (our homeland)

- Earth gives us food, water and shelter. It is very necessary to maintain the natural assets of the earth to continue life on the earth.

- We must invest to save the planet, so that the coming generations can have a secure future.

- We can start it on 22nd April on the day of World Earth Day because on this day World Earth Day is celebrated every year all over the world.

- The first Earth Day led to the creation of the United States Environmental Protection Agency and the passage of the Clean Air, Clean Water, and Endangered Species Acts.

- In 1990 Earth Day went global, mobilizing 200 million people in 141 countries.

- In 1995 President Bill Clinton awarded Senator Nelson the Presidential Medal of Freedom -- the highest honor given to civilians in the United States -- for his role as Earth Day founder.

Contd.

- In 2010, on the 40th anniversary of Earth Day, the Earth Day Network launched a “Billion Acts of Green.” Participants were asked to register their “acts of green” and state what they were doing to protect the environment.

- By April 22, 2012, one billion actions had been recorded by the people of the world.

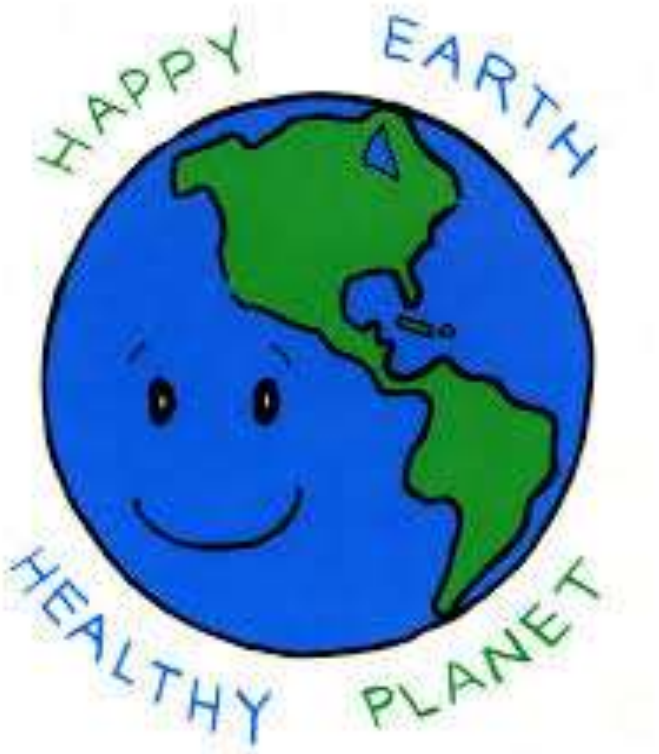
How we can invest in our planet:

- Investing in a planet does not mean investing only in gold, silver, business, real estate and diamonds. Rather now we have to invest to save our earth. It is not necessary to invest only by putting money, but in its place we can also invest our precious time, energy, effort and knowledge.

Happy earth healthy planet

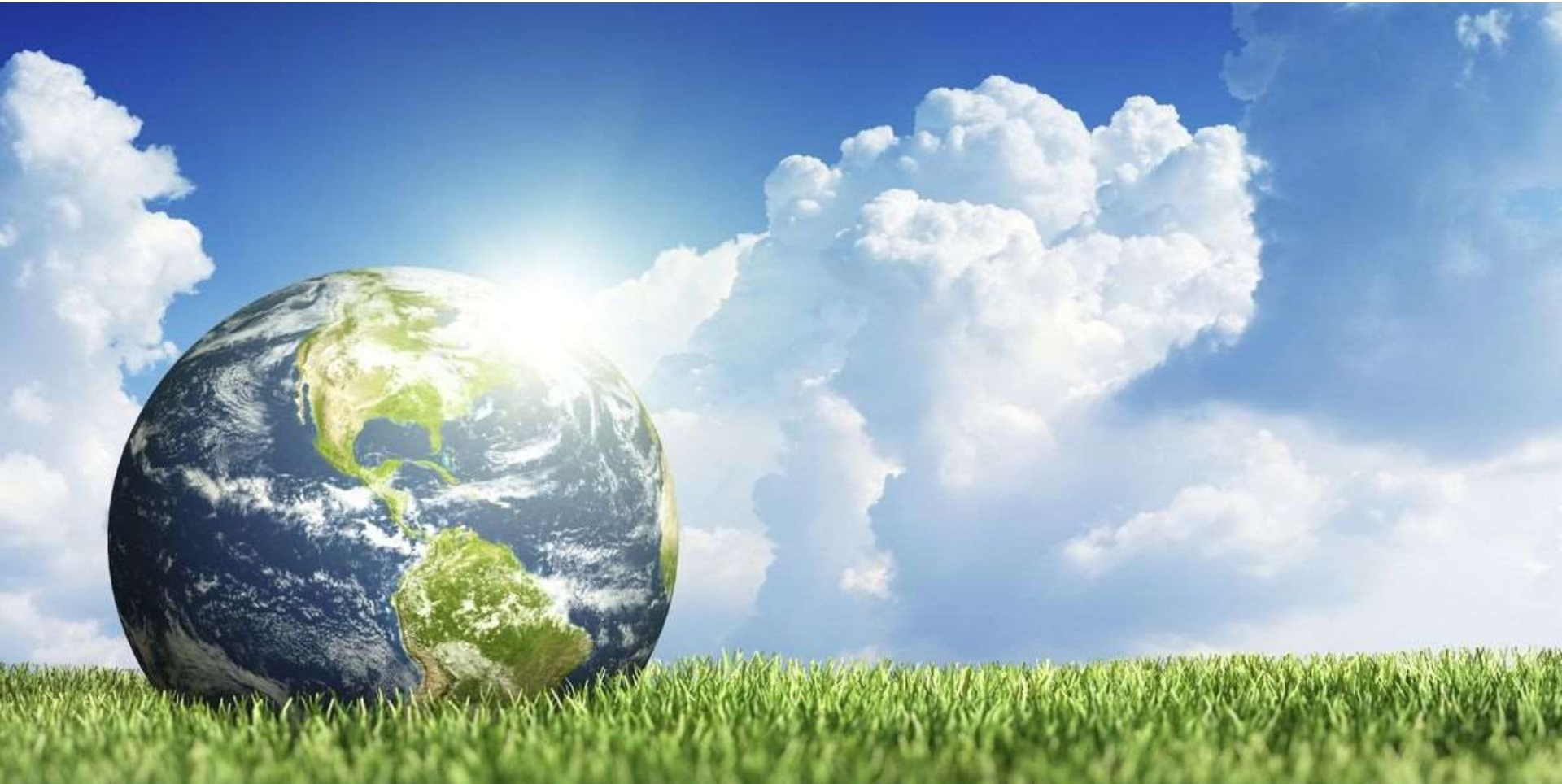
We make our earth happy by focusing on following;

- Invest in food and agriculture innovation
- Protect Marine Wildlife and Ecosystems
- Climate change
- Save Water—and Energy Along With It
- Reduce Plastic Pollution
- Invest in peace.



Earth health and Agriculture

- Agricultural practices can help sequester carbon in soils, decrease greenhouse gas emissions, and feed and fuel the planet.



Climate Smart Agriculture :

- Soil is a critical resource—the way it is managed can improve or degrade the quality of this resource.

- Despite the essential role that soil plays in human livelihoods, there is a worldwide increase in degradation of soil resources due to inappropriate management practices and population pressure.

- To this end, specific attention is needed to be given to the management of soil organic C that help sustaining crop productivity and mitigating climate change.

Soil is a critical resource

- 95% of our food comes from soil.
- 815 m people are food insecure, 2 billion people are nutritionally insecure, but we can mitigate this through soil.
- Soil holds 3 times as much C as the atmosphere and can help us meet the challenges of a changing climate.
- More than 33% of our soils are degraded but we need healthy soils to grow healthy crops.
- Healthy soil is the foundation for profitable, productive, and environmentally sound agricultural systems.

Soil Health Indicators

- The organic C content of soil is one of the key indicators of its health and is a master variable that controls many of the soil processes.

- It is the organic C content of soils that largely governs their capacity to absorb, retain and supply moisture within the soil and to sustain active plant growth.

- Every gram of C in the soil can retain up to eight grams of water.

Role of Organic C

- Soil organic carbon is the basis of soil fertility and plays a key role in soil health through biological, physical and chemical functions.

- Soil C helps support a healthy balance of nutrients, minerals and soil microbial ecologies, improving soil fertility.

- It promotes the sustained production of essential food and fiber as well as the capacity of plants and animals to resist disease, insect infestation and climate stresses.

Status of SOC

- Our soils are low in SOC as they mostly fall under the influence of arid, semiarid and sub-humid climates and this is a major factor contributing to their poor productivity.

- Indeed, an increase of SOC stock by 1 t C ha^{-1} in the root zone can raise the crop yield by 15-33 kg ha^{-1} for wheat (Benbi and Chand, 2007), 160 kg ha^{-1} for rice, 170 kg ha^{-1} for pearl millet, 13 kg ha^{-1} for groundnut and 145 kg ha^{-1} for soybean (Srinivasarao et al. 2013). Therefore, greater SOC content can result in higher food grain production.

Critical Range of Organic C Content in Agricultural Soils

- < 0.5 % Very low
- 0.5 – 1.0 % Low
- 1.0 – 1.5 % Medium
- > 1.5 % Optimum

Main inputs and losses of SOC

Inputs

The main inputs of SOC to soil are from plant materials, such as crop residues, plant roots, root exudates and animal manure.

Losses

Losses of SOC from soil are from decomposition by microorganisms, erosion of surface soil and off-take in plant and animal production.

Decomposition and SOC

- Occurs when microorganisms use SOC in soil to obtain the C, nutrients and energy they need to live.

- During decomposition, SOC is lost from soil because microorganisms convert about half of the SOC to CO2 gas. Without continual inputs of SOC, the amount stored in soil will decrease over time because SOC is always being decomposed by microorganisms.

Erosion of Surface Soil and SOC

- Losses of SOC from erosion of surface soil can have a large impact on the amount of SOC stored in soil.
- This is because OC is concentrated in the surface soil layer as small particles that are easily eroded.
- Erosion can cause the annual loss of 0.2 t/ha of soil from a pasture, 8 t/ha from a crop and up to 80 t/ha from bare fallow.

Off-take and SOC

- Off-take of OC in plant and animal production is also an important loss of OC from soil.

- Harvested materials such as grain, hay, feed and animal grazing all represent loss of OC (and nutrients) from soil.

Management Practices to Improve Soil C

The management practices that increase soil C sequestration and mitigate C loss include:

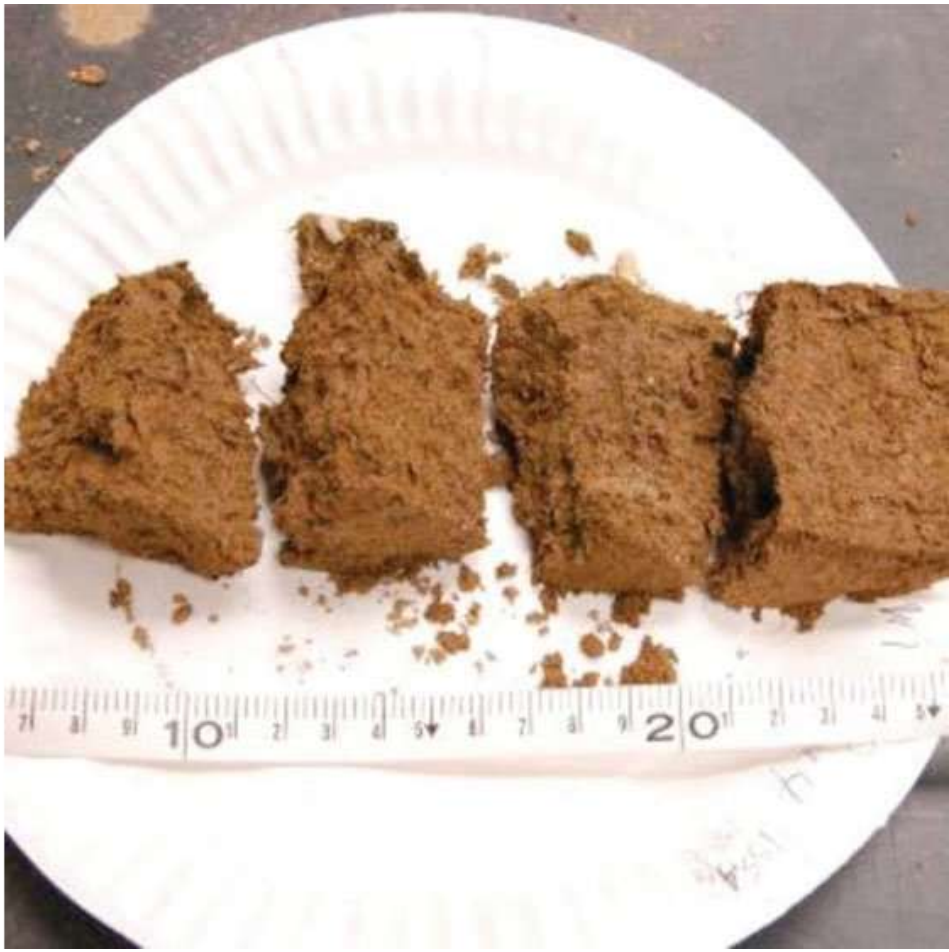
- Less soil disturbance
- More crop residues return to soils
- Adoption of diversified crop rotation
- More use of organic and biofertilizers
- Improved water and nutrient management practices.
- Soil Organic Carbon (Mg/ha) increases with minimum tillage **(Álvaro-Fuentes et al., 2014)**

Effect of Tillage on Soil Properties (Shah et al., 2010)

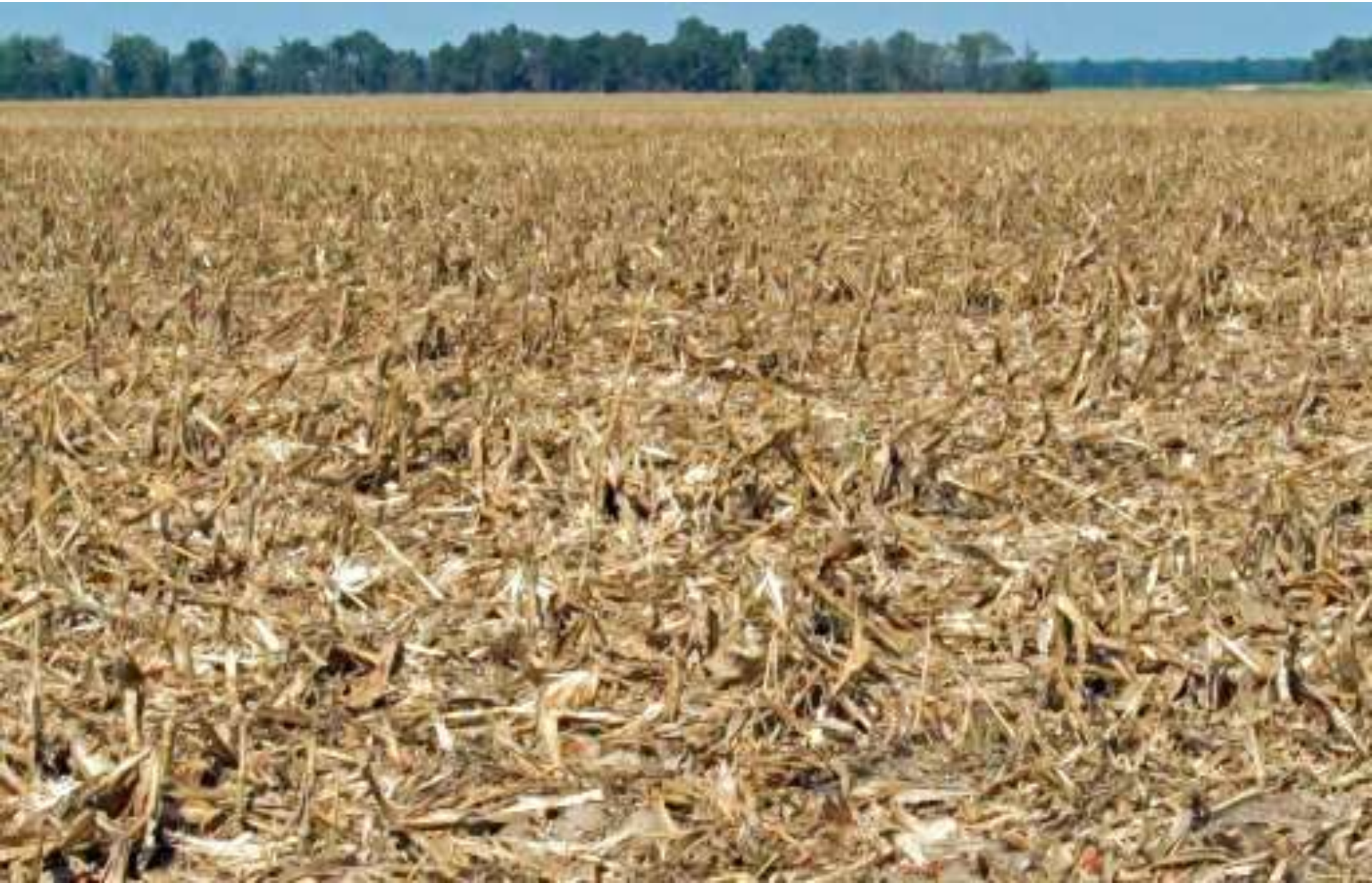
Soil property	+Tillage	-Tillage	%increase
SOC (g/kg soil)	5.50	6.39	16.2
TN (g/kg soil)	0.34	0.40	17.1
Mineralizable N (mg/kg in 10 d)	11.18	12.40	9.9
MB-C (ug/g soil)	420	464	10.5
MB-N (ug/g soil)	46.8	54.7	16.9

Particulate soil organic matter was extracted from five different soils with varying degrees of tillage history. Particulate organic matter such as this contains organic forms of nutrients that can be made available to plants through microbial decomposition processes. Vials to the left had increasing levels of tillage in the crop rotation, while vials to the right were from untilled soils under permanent grass sod and forest. The vial in the center is from a continuous no-till field with annual crop rotation.

Soil on the left easily crumbles upon handling, revealing well-formed macroaggregates and the macropores between the aggregates. Soil on the right is cloddy, with only a few macropores. Soil on the right is from an intensively tilled field, whereas soil on the left is from the grass sod adjacent to the same field



Crop residue management to sustain soil health



Effect of Residue Return (Shah et al., 2010)

Soil property	+Residue	-Residue	%increase
SOC (g/kg soil)	6.25	5.63	11.0
TN (g/kg soil)	0.41	0.34	20.3
Mineralizable N (mg/kg in 10 d)	13.6	10.2	35.0
MB-C (ug/g soil)	477	407	17.2
MB-N (ug/g soil)	56.1	45.4	23.7

Effect of residue retention on N2 fixation, grain yield and N balance for mungbean in rainfed area of Swat (average of 3 years data: Shah et al., 2003)

	-Residue	+Residue	% increase
$\delta^{15}N$ (‰) Ref	+1.23	+1.51	-
Mungbean	-1.43	-1.73	-
%Ndfa	70	79	12.9
Crop N fixed (kg/ha)	74	112	51.4
Grain yield (t/ha)	0.91	1.08	18.7
Grain removed (kg/ha)	40	48	20.0
N Balance (kg/ha)	+9	+64	610

Crop rotation

Effect of Legume in Crop Rotation (Shah et al., 2010)

Soil property	Wheat-fallow	Wheat-mung	%increase
SOC (g/kg soil)	5.24	6.25	19.2
TN (g/kg soil)	0.28	0.49	76
Mineralizable N (mg/kg in 10 d)	5.21	20.87	300
MB-C (ug/g soil)	375	533	42.2
MB-N (ug/g soil)	40.4	64.7	16.8

Effect of previous crop and fertilizer N on yield of wheat (Average of 3 years data; Shah et al., 2003)

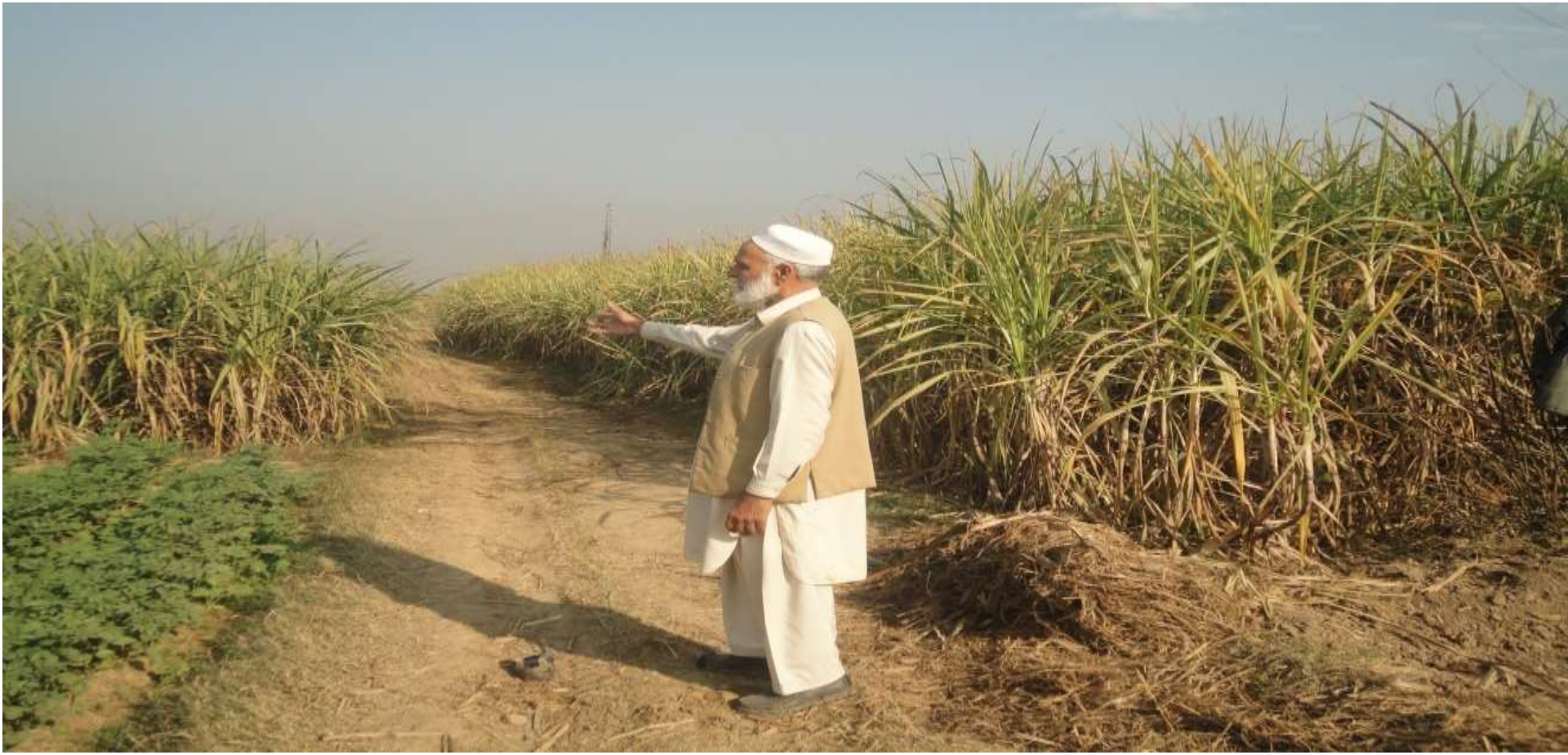
Treatment		Shoot biomass (t/ha)	Grain yield (t/ha)
Wheat 0N following:			
	Sorghum 0N	2.72	0.76
	Sorghum +N	7.32	1.90
	Mungbean	3.99	1.03
Wheat +N following:			
	Sorghum 0N	9.97	2.07
	Sorghum +N	9.61	2.33
	Mungbean	9.99	2.41
Significance		<0.001	<0.001
S.E.D		0.35	0.09

Effect of previous crop and fertilizer N on shoot biomass yields of sorghum/maize (average of 3 years data; Shah et al., 2003)

Treatment		Shoot biomass (t/ha)
Sorghum/maize 0N following:		
	Wheat 0N	3.83
	Wheat +N	5.05
	Lentil	5.70
Sorghum/maize +N following:		
	Wheat 0N	9.18
	Wheat +N	9.57
	Lentil	8.85
Significance		<0.001
S.E.D		0.23

Effect of Organic Fertilizers

Response was evident on sugarcane crop

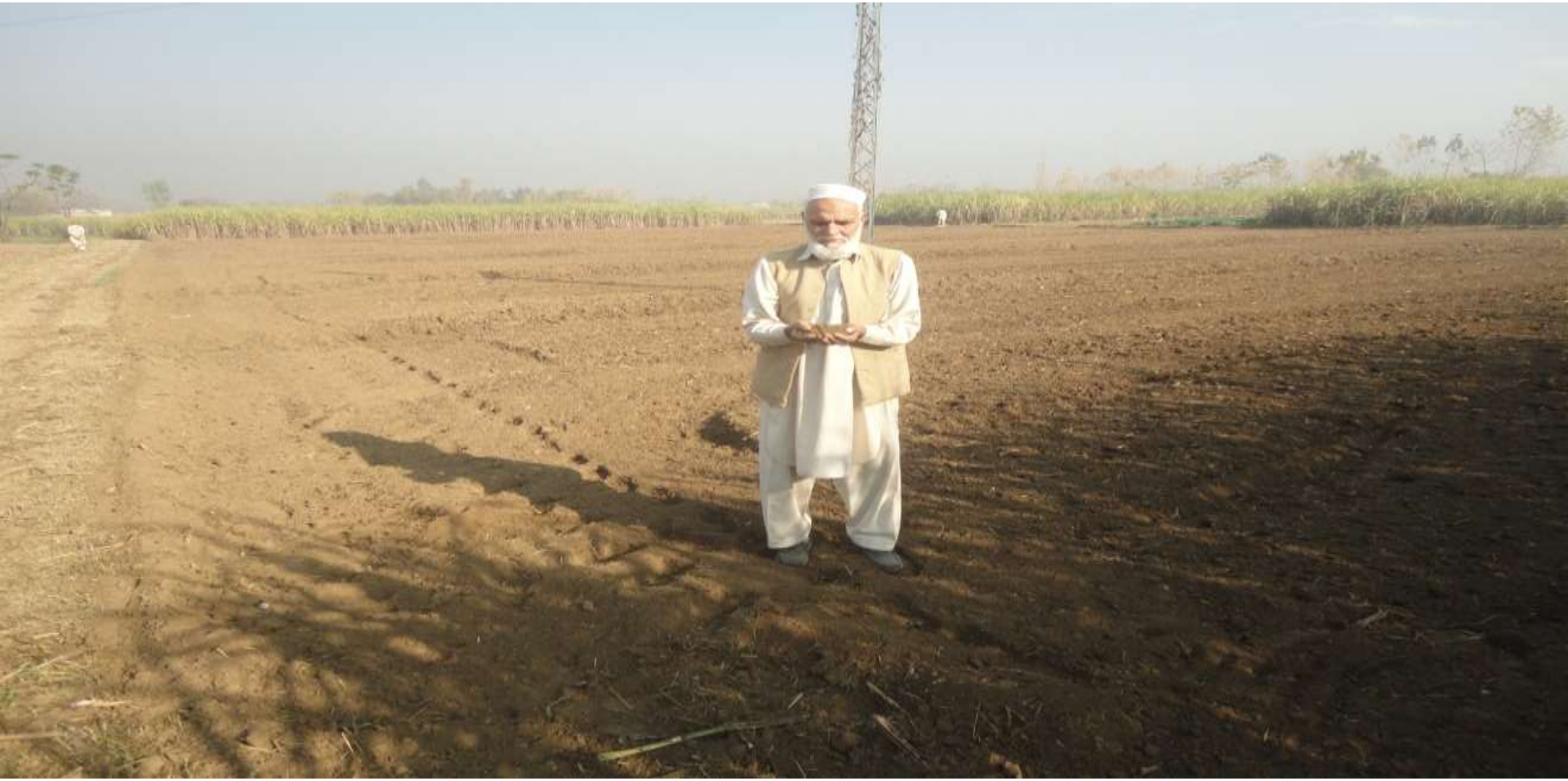


Response of sugarcane to organic fertilizer

Effect on gur quality

Colour of gur improved. Colour of original gur without any colouring agent

Soil was highly porous

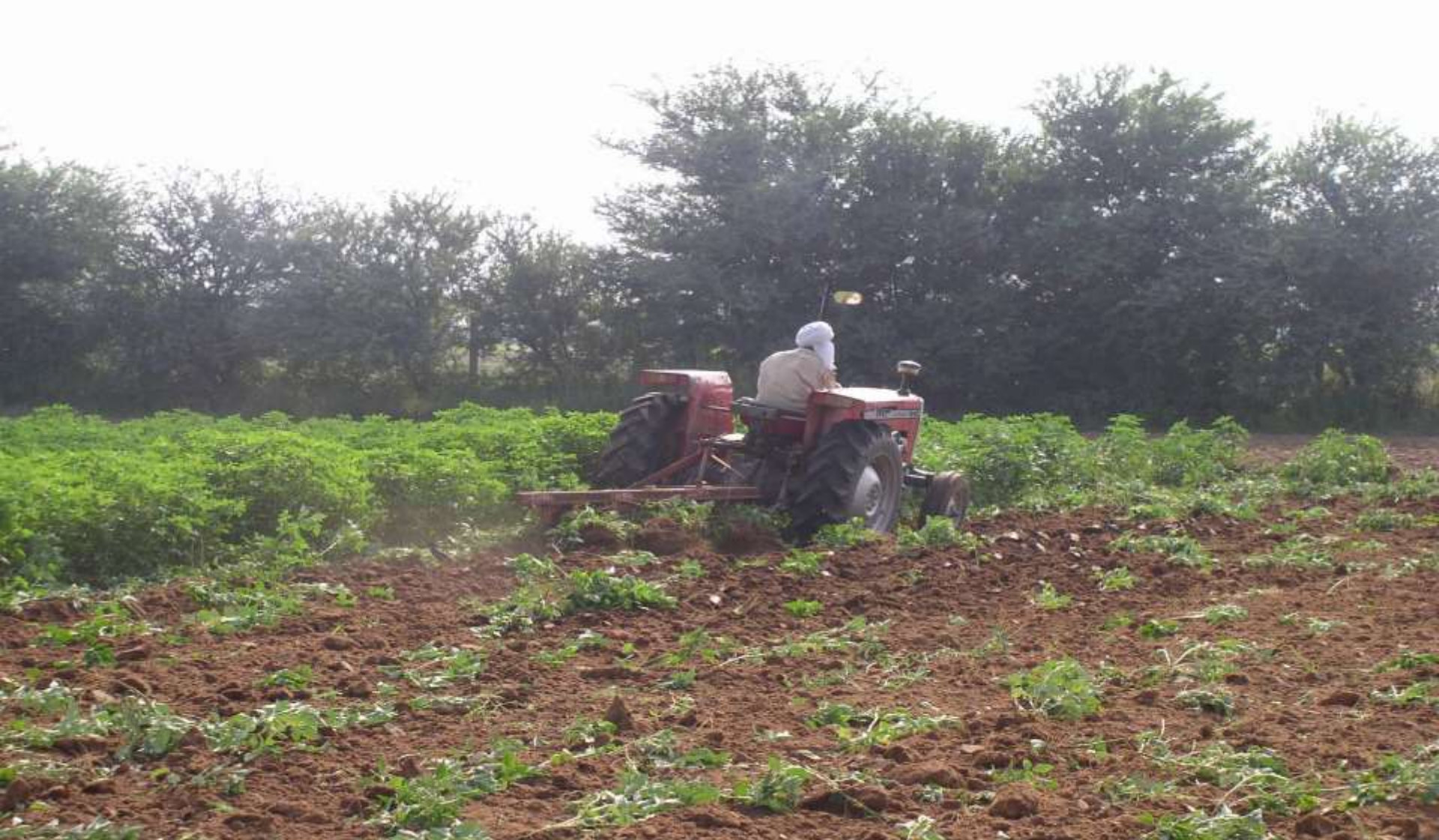


Effect on soil properties

Soil was rich in organic matter

Effect on soil properties

Green manuring to increase organic matter content in soil



Summary

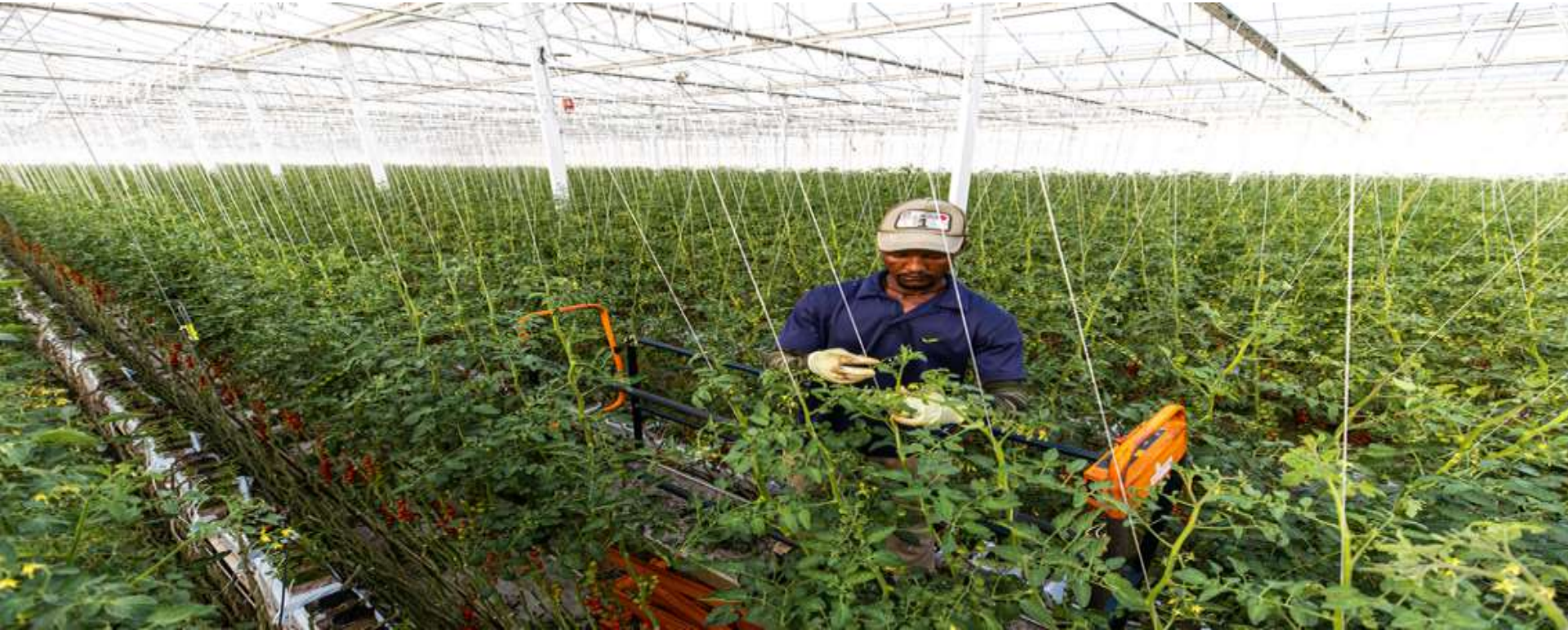
- Zero tillage (ZT) agriculture can enhance soil-C sequestration by reducing the degree of soil disturbance and C turnover. In wheat based cropping systems, conversion from CT to ZT resulted in net C sequestration rates ranges from 219-359 kg C ha^{-1} yr^{-1} (Grace et al., 2012).
- Balanced application of fertilizers can enhance SOC concentration by 6 to 100% and C sequestration by 20-600 kg ha^{-1} yr-1, while integrated nutrient management practices is estimated at 100-1200 kg C ha^{-1} yr^{-1} (Benbi, 2013).
- In India, agriculture contributes nearly 18% of total GHGs emission in the country. Crop residues burning is a potential source of Green House Gases (GHGs) causing global warming. In India, an estimated 141 Tg crop residues are surplus most of which are burnt in situ. The crop residues on an average contain 45% C and assuming a humification rate 10% the incorporation of surplus crop residues can result in C sequestration of 6.3 Tg C annually (NAAS, 2012).

- Adoption of improved water management such as alternate wetting and drying, direct-seeding of rice (DSR) in place of submerge rice reduce or totally eliminate methane emission. The DSR have potential to reduce the global warming potential (GWP) by about 25-50% compare to the conventional puddled transplanted rice (*Pathak et al., 2015*).

- Raising vegetation on degraded lands can increase C content in surface soil by 19 % resulting in about 2500 kg C ha^{-1} sequestered over a 4 year period (*Wani et al., 2012*).

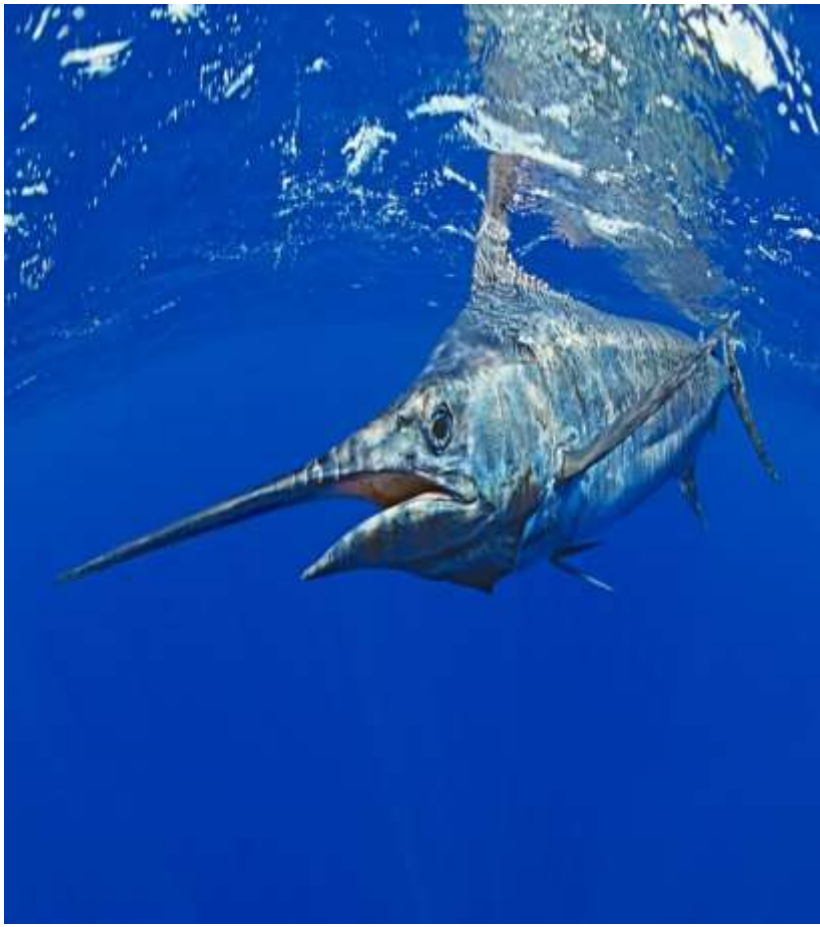
Invest in food and Agriculture innovation

- Using less chemical fertilizers Using fewer pesticides to reduce air and water pollution.
- when possible to make the farm less susceptible to drought and erosion.
- Making better use of underutilized land.



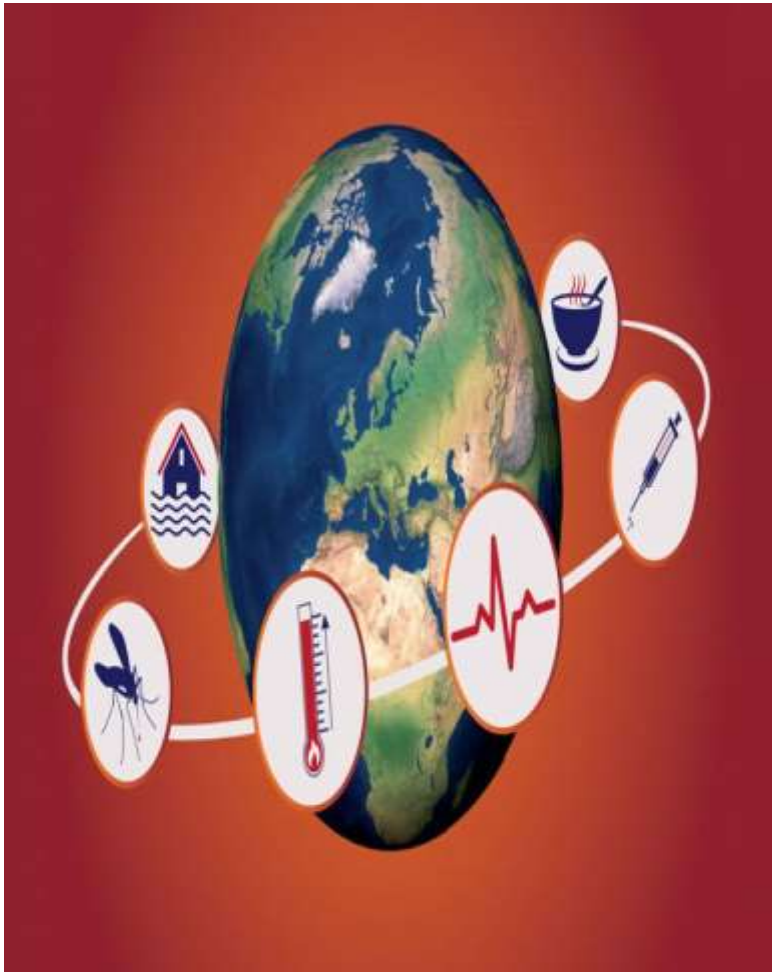
Protect Marine Wildlife and Ecosystems

- Conserve Water and use less water so excess runoff and waste water will not flow into the ocean.
- Reduce Pollutants. ...
- Reduce Waste. ...
- Shop Wisely. ...
- Reduce Vehicle Pollution. ...
- Use Less Energy. ...
- Fish Responsibly(catch & Release)
- Practice Safe Boating



Climate Change

- Ending Our Reliance on Fossil Fuels.
- Greater Energy Efficiency.
- Renewable Energy.
- Sustainable Transportation.
- Sustainable Buildings.
- Conservation-Based Solutions.
- Industrial Solutions.
- Better Forestry Management and Sustainable Agriculture.



Save Water and Energy Along With It

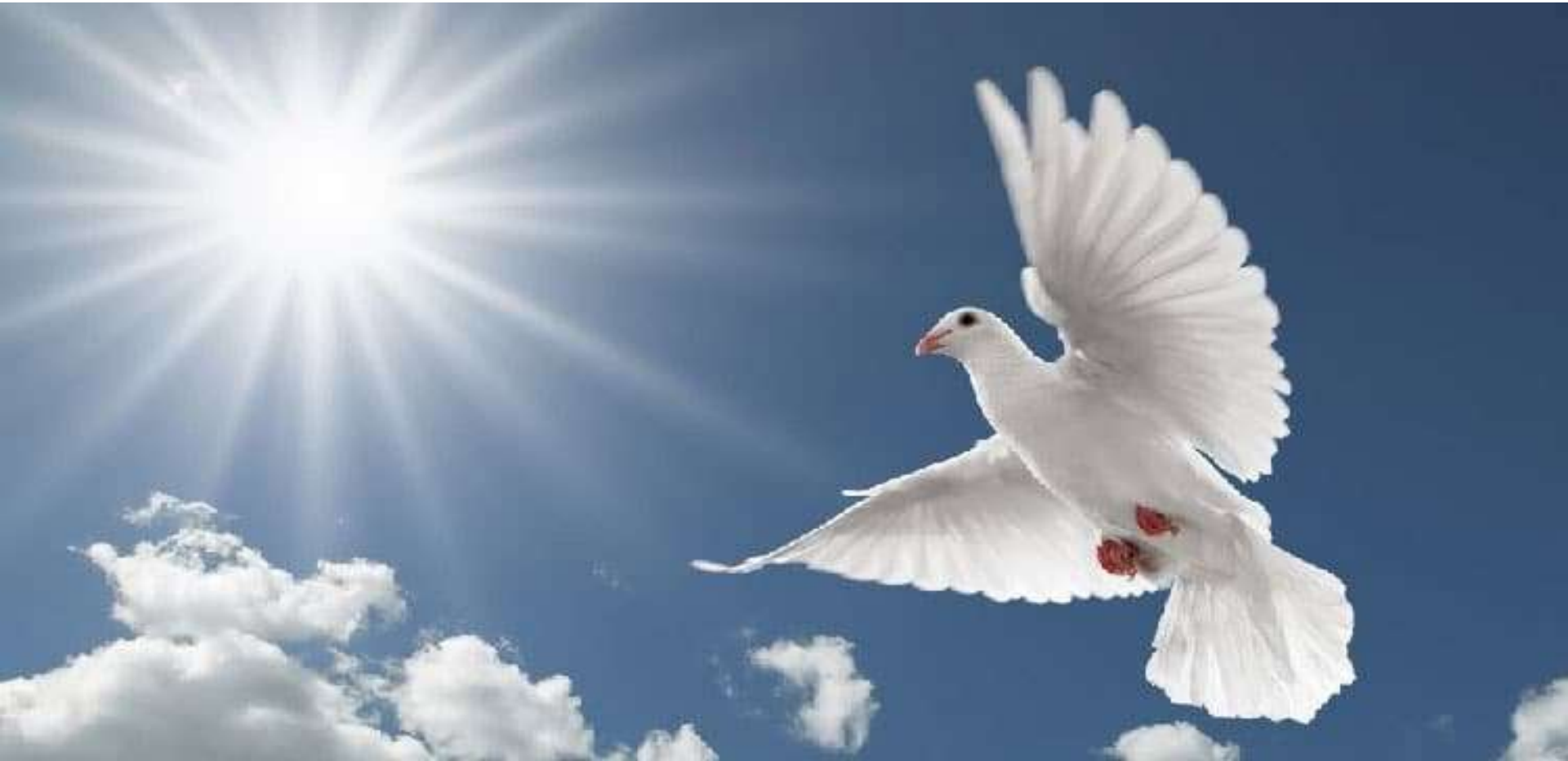
- Using water-saving techniques can save you money and diverts less water from our rivers, bays, and estuaries, which helps keep the environment healthy. It can also reduce water and wastewater treatment costs and the amount of energy used to treat, pump, and heat water.

Reduce Plastic Pollution

- Most plastics are made from oil and gas — fossil fuels that contribute to climate change. About 4% to 8% of the world's oil production is for plastics, and most plastics are thrown away after a single use. By reducing your plastic use, you can also reduce your carbon footprint.

Invest in peace

- War doesn’t only cost human lives and cause widespread hunger, poverty, and suffering. It also hurts the planet.



What is your goal for Earth Day?

- Get a recycled bottle
- Get composting
- Scientific Forest Management
- Build birds house or Honey Bee Farm
- Establishment of Energy Efficient houses
- Introduction of reusable Grocery bags leads to
- Nature Enjoyment through investment in Planet.

THANK YOU