Soils in Relation to Sustainable Development Goals

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World Soil Day 2022

Theme - "Soils: Where food begins“

To raise awareness of the importance of maintaining healthy ecosystems and human well-being by addressing the growing challenges in soil management, increasing soil awareness and encouraging societies to improve soil health.

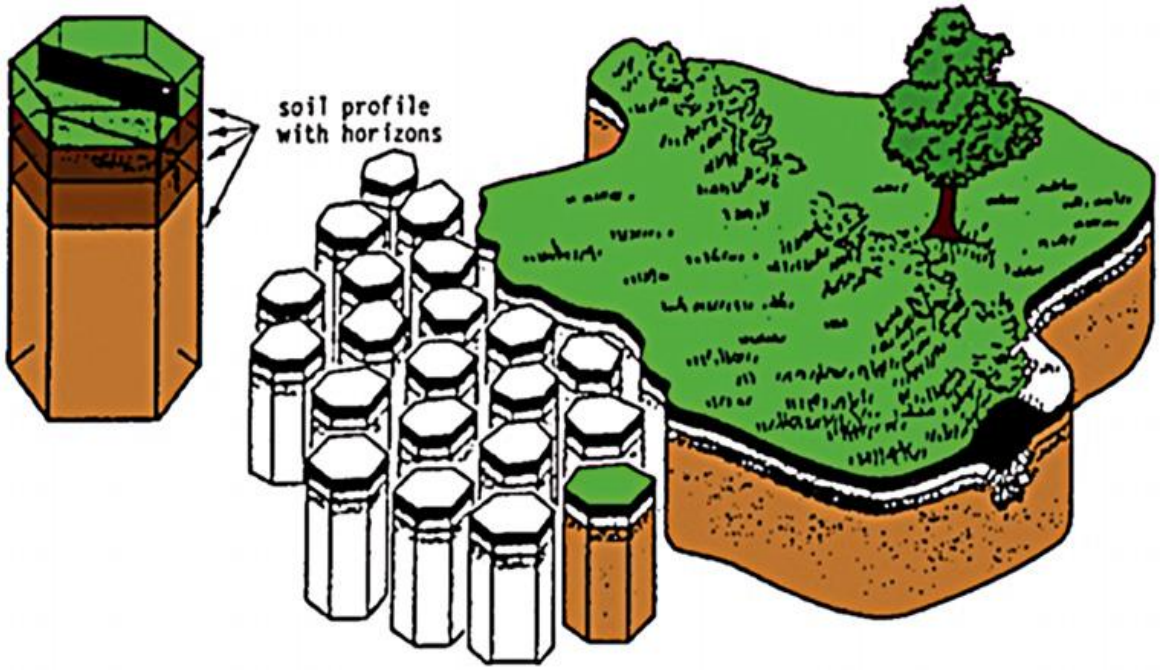
Definition of soil

As a three phase system consisting of the solid phase, liquid phase and gaseous phase intimately mixed together

Joffe's definition .

Soil is a natural body differentiated into horizons of mineral and organic constituents, usually unconsolidated, of variable depth, which differs from the parent material below in morphology, physical properties and constitution, chemical properties and composition and biological characteristics

Land surface (right) with soils the important land component (left)



Concept of soil as an ecosystem

Consists of a dynamic complex of plant, animal, microbial communities and the non-living environmen.It is a functional unit with close interaction between the components. A change in this balanced system or equilibrium impairs the soil functions as a medium for plant growth.

What are ecosystem services

- The multiple benefits provided to human society by the biotic and abiotic components are collectively termed as ecosystem services. Life and biodiversity on earth depend on these services.
- Millennium Ecosystem Assessment has identified four classes
- Provisioning Services
- Regulating Services
- Supporting Services
- Cultural Services

Disturbance of the ecosystem leads to loss or degradation of service

Provisioning Services

- Includes products/raw materials or energy outputs like food, water, medicines, biofuels and other resources from ecosystems.

Regulating Services

- Ecosystems act as regulators of several services, includes the services which regulate the ecological balance.
- Example, terrestrial environs like forest purify and regulates air, water quality, prevent soil erosion, and control greenhouse gases.
- Biotic components such as birds, rats, frogs, act as natural controllers and thus help in pest and disease control..
- Carbon sequestration and soil biodiversity control
- Waste decomposition and detoxification

Supporting services

- ❖They provide habitat for different life forms, retain biodiversity, nutrient cycling, provide support and infrastructure for human and animals

Cultural services

- ❖Includes tourism provides recreational, aesthetic, cultural and spiritual services, etc
- ❖Most natural elements such as landscapes, mountains, caves, are used as a place for cultural and artistic purposes.
- Even a few of them are considered sacred.
- Derive enormous economic benefits in the name of tourism

Monetary value of ecosystem services

- To meet rapidly growing demand for food, fresh water, timber, fiber and fuel. humans have changed ecosystems more rapidly and extensively resulting in a substantial and irreversible loss in the diversity of life on Earth.
- Changes to ecosystems have resulted in substantial net gains in human well-being and economic development, at the risk of degradation of many ecosystem services
- Unless addressed, this will substantially diminish the benefits of future generations of these ecosystem services.
- Economists have developed methodologies to quantify the value of goods and services applied to ecosystem
- Millennium Ecosystems Assessment (MEA, 2005) has identified four values that reveal the benefit we derive from nature

- **Direct use values**

  Includes the benefits derived from our consumption of various types of food, use of timber, out door recreation etc

- **Indirect use Values**

  Include the processes that contribute to the production of goods and services like soil formation, water purification ,pollination etc

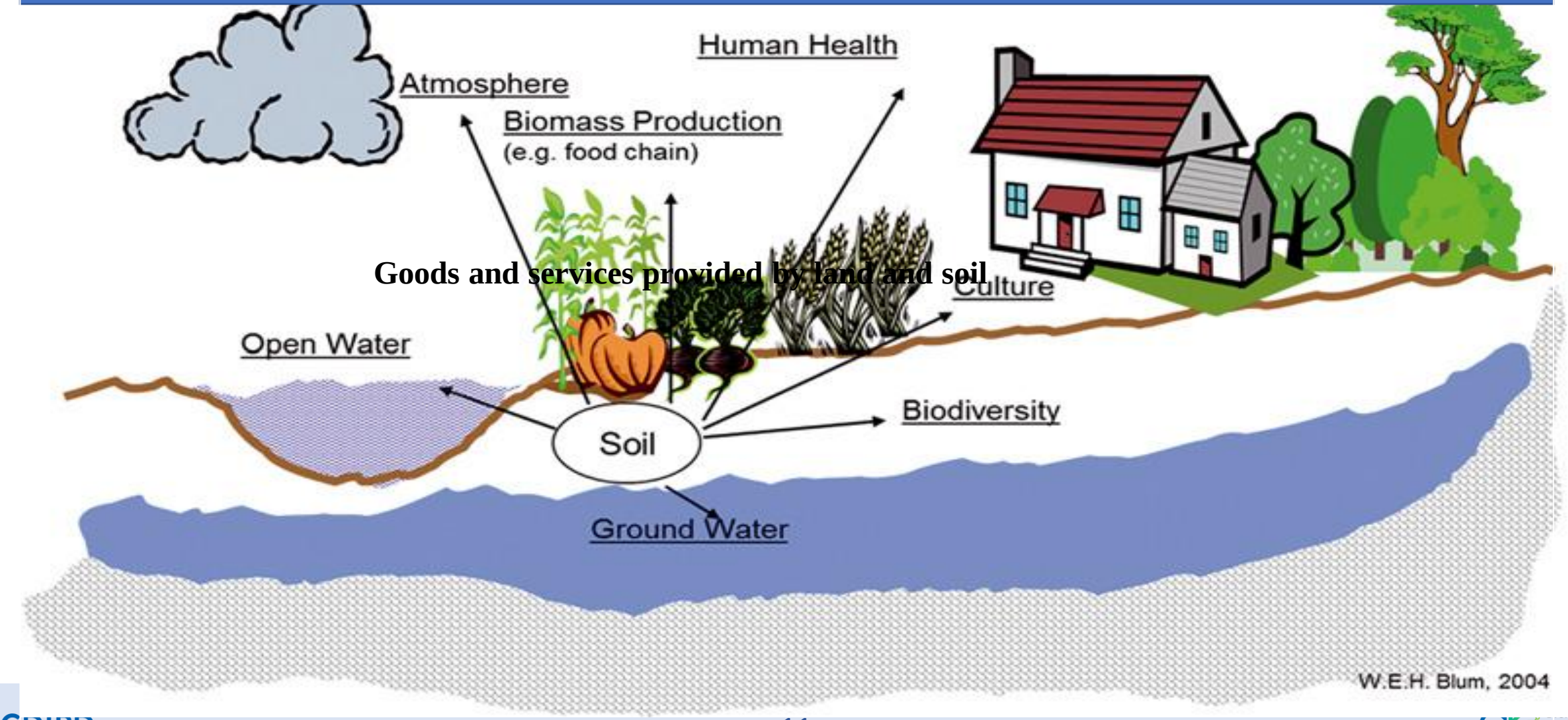
- **Non-use Values**

  Include goods that may not have an immediate use to the present generation but has a bequeath value to future generations.eg built infrastructure, natural resources

  Option Values

- **Despite the fact that people may not currently be gaining any benefits from them, many ecosystem services could provide the option for services in the future eg elements of biodiversity**

Goods and services provided by land and soil



What is Sustainability ?

- Consists of fulfilling the needs of current generations without compromising the needs of future generations. while ensuring a balance between economic growth environmental care and social well-being.
- What are Sustainable development Goals ?
- Collection of 17 interlinked global goals designed as blueprint to achieve a better and more sustainable future for all.

Contd.

- **SDGs were set in 2015 by the United Nations General Assembly and is a call for action to end poverty and inequality, protect the planet, and ensure that all people enjoy health, justice and prosperity. The Goals are to be achieved by 2030**
- **Included in UN Resolution called the Agenda 2030**
- **Specific Targets for each goal and indicators to measure progress of each target are identified**
- **For some of the targets, no end date is given.**
- **Agriculture and soils form the heart of the SDGs**

Contd.

Soils have fundamental role in achieving multiple SDGs and make valuable contributions to existing challenges in the food front

Soils need to be recognized and valued not only for their productive capacities but also for their contribution to the maintenance of key ecosystem services

Seventeen Goals have been identified covering every aspect of life of people and protection of the planet

United Nations Sustainable Development Goals (SDG'S)

- Goal 1. No Poverty
- Goal 2. Zero Hunger
- Goal 3. Good Health and Well being
- Goal 4. Quality Education
- Goal 5. Gender Equality,
- Goal 6. Clean water and Sanitation
- Goal 7. Affordable clean energy
- Goal 8. Decent work and economic growth
- Goal 9. Industry , Innovation and Infrastructure,
- Goal 10. Reducing Inequality

SDG’s Contd.

Goal 11. Sustainable cities and communities,

Goal 12 Responsible consumptions and production,

Goal 13. Climate action

Goal 14. Life below water

Goal 15. Life on Land

Goal 16.Peace ,Justice and strong Institution,

Goal 17 Partnership for the goals

Link Between Soils and SDG's

- Goal 6. Clean water and sanitation
- Goal 13 Climate action
- Goal 15. Life on land
- Goal 2. Zero Hunger,
- Goal 3 Good Health and Well Being

Grouping of SDG’s

5 P’S Classification	**Three Categories**
People	Economic
Planet	Social
Prosperity	Environmental
Peace	
Partnership	

Sphere of influence of soil ecosystem services and overall role in achieving SDGs

Role of soils in maintaining ecological sustainability

- Soil is a core component of land resources and the foundation of agricultural development and ecological sustainability.
- Plant and animal life depend on primary nutrient cycling through soil processes
- It is the basis for food, feed, fuel and fibre production and many critical ecological services
- In addition to food crops, has competing uses for forestry, pasture/rangeland, energy and raw material production etc
- Area of productive soil is limited and the thrust has to be on maximizing productivity
- Soil is a reservoir for at least a quarter of global biodiversity and therefore requires the same attention as above ground biodiversity
- Efficient management of soils provide the largest store of terrestrial carbon, reduction of greenhouse gas emissions, desertification processes, and climate change mitigation

Key challenges ahead for Soil Scientists in achieving SDGs

- Environmental impact of high input agriculture calls for caution in food production systems
- Much soil knowledge has been gained by research over a period of 100 years.
- Modern developments of precision agriculture represent a major breakthrough
- Application of the right quantity of water and agrochemicals at the right time and place during the growing season, is the hall mark
- Avoids losses to the environment, minimizes pollution increases use efficiency of the applied nutrient and the improves overall production process
- The need to better interact with scientists in agronomy. food and energy security, hydrology, climatology, and ecology has been emphasized
- Interacting with the various stakeholders and policy makers are very crucial

Contd

- Lot of expertise, knowledge and skills, have been gained over the centuries by land users
- This knowledge has also to be mobilized by the scientists for the betterment of the community
- Research on cutting edge technologies has to continue to solve present day problems facing the farming sector.
- The transdisciplinary effort is particularly relevant in the coming years when SDG's are to be formulated and, implemented and solutions to location specific problems are to be solved

Summing up

Soil Science, as a land-related discipline, has links to several of the UN Sustainable Development Goals which are demonstrated through the functions of soils and related ecosystem services.

The specific value of soil science research using modern information have to be demonstrated through inter- and trans disciplinary studies on SDGs in areas related to food security, water scarcity, climate change, biodiversity loss and health threats. It is only through intensive and genuine collaboration with stake holders the goals envisaged for sustainable development can be realized.

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Thank You