Global Soil Conference 2024 and Soil in India

For Prelims: Soil Health Card Scheme, Pradhan Mantri Krishi Sinchayee Yojana, Zero Budget Natural Farming, Sustainable Development Goal 15, Soil Types in India

For Mains: Soil Health and Sustainability, Sustainable Agricultural Practices, India's Soil Conservation Efforts

Source: PIB

Why in News?

Recently, the **Global Soil Conference (GSC) 2024** was held in New Delhi, highlighting the importance of **soil health** for **food security, climate change mitigation**, and ecosystem services.

What is the Global Soil Conference 2024?

- **About:** The GSC 2024, organised by the **Indian Society of Soil Science (ISSS)** in collaboration with the **International Union of Soil Sciences (IUSS),** aims to address challenges in sustainable soil/resource management.
    - The event aimed to foster a global dialogue on how caring for soils can drive sustainability across various sectors.
- **Theme:** *Caring Soils Beyond Food Security: Climate change mitigation & Ecosystem Services.*
- **Key Highlights of GSC 2024:** Soil health was recognized as a pressing issue, with soil degradation affecting productivity and posing a **threat to global food security.**
    - Around **30% of India's soil is reportedly compromised** due to erosion, salinity, pollution, and loss of organic carbon.
    - The conference underscored the importance of international cooperation in tackling soil erosion, which aligns with **Sustainable Development Goal 15 (SDG 15) of the United Nations.**
        - SDG 15 aims to protect, restore, and promote the sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt land degradation, and halt biodiversity loss.

Note:

- The ISSS was established in 1934, in Calcutta under the **Societies Registration Act xxi of 1860.** The Society organises seminars, and conferences to promote soil science knowledge.
- IUSS is a non-profit, non-governmental scientific society. It is part of the **International Science Council (ISC).**
    - The IUSS promotes soil science research and its applications, fostering global collaboration among scientists.

What are the Concerns Regarding Soil Health in India?

- **Soil Degradation**: **Over one-third** of India's land is at risk of **degradation** due to unsustainable farming practices and **wrong soil management practices.**
- **Soil Erosion and Loss of Fertility**: **India loses 15.35 tonnes of soil per hectare annually,** reducing crop productivity and causing a **loss of 13.4 million tonnes of rainfed crops.**
    - This leads to significant economic losses, along with increased **floods, droughts,** and a 1-2% annual reduction in reservoir capacity.
- **Soil salinity:** Salinity harms soil health by **reducing water infiltration, nutrient uptake, and soil aeration,** leading to decreased crop productivity.
    - It disrupts soil structure, promotes salt-tolerant organisms, and accelerates soil degradation, ultimately making the land infertile.
- **Low Organic Content and Nutrient Levels**: A major concern is the **organic content in the Indian soil is inordinately low (around 0.54%)**, indicating a deficiency in essential nutrients, which affects soil fertility and agricultural productivity.
    - Over 70% of Indian soils suffer from either **soil acidity or alkalinity**, which disrupts the natural nutrient cycle.
    - Additionally, essential nutrients like nitrogen, phosphorus, and potassium are often deficient in Indian soils, further exacerbating the **health crisis.**
- **Desertification:** It leads to soil **degradation by reducing organic matter**, nutrient content, and moisture retention. It results in the loss of soil fertility, causing lower agricultural productivity.
    - Desertification accelerates erosion, reduces biodiversity, and makes land unsuitable for farming, worsening food insecurity.
- **Diversion of Fertile Land**: A significant amount of fertile agricultural **land is being diverted for non-agricultural purposes,** contributing to the loss of valuable soil resources.

India's Initiatives for Soil Conservation:

- **Soil Health Card (SHC) Scheme**
- **Pradhan Mantri Krishi Sinchai Yojana.**
- **Zero Budget Natural Farming**
- **Natural Farming Mission.**

What are the Key Facts About Soil in India?

- **Classification of Soils:** India's varied relief features, landforms, climatic realms, and vegetation types have contributed to the development of various types of soils.
    - Historically, Indian soils were classified into two main groups: **Urvara (fertile) and Usara (sterile).**
    - The **Soil Survey of India,** established in 1956, and the **National Bureau of Soil Survey and Land Use Planning** have classified Indian soils based on the **United States Department of Agriculture (USDA) Soil Taxonomy,** considering genesis, colour, composition, and location.
- **Major Soil Types in India:**

Soil Type	Distribution	Characteristics	Main Crops Grown
Alluvial Soils	Northern plains, river valleys, deltas of the east coast, and plains of Gujarat	Vary from sandy loam to clay; rich in potash, poor in phosphorus; Khadar (new alluvium) and Bhangar(older alluvium); colour ranges from light	Rice, wheat, sugarcane, cotton

		grey to ash grey	
Black Soil	Deccan Plateau (Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh, Tamil Nadu)	Clayey, deep, impermeable; swells and becomes sticky when wet, shrinks and develops cracks when dry; retains moisture for long periods; rich in lime, iron, magnesia, alumina, and potash; poor in phosphorus, nitrogen, and humus	Cotton, sorghum, pulses, millets
Red and Yellow Soil	Eastern and southern Deccan Plateau, parts of Odisha, Chhattisgarh, southern Ganga plain	Develops on crystalline igneous rocks; red due to iron diffusion, yellow when hydrated; fine-grained soils are fertile, coarse-grained soils in uplands are less fertile; poor in nitrogen, phosphorus, and humus	Wheat, rice, millets, pulses, groundnut
Laterite Soil	High temperature and rainfall areas (Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, Odisha, Assam)	Result of intense leaching; rich in iron oxide and potash, poor in organic matter, nitrogen, phosphate, and calcium	Cashew, tea, coffee, rubber, coconut
Arid Soil	Western Rajasthan, Punjab and Haryana	Sandy and saline; poor in moisture and humus; high evaporation and calcium content create 'kankar' layers; poor nitrogen, normal phosphate; colour ranges from red to brown	Barley, cotton, millet, pulses
Saline Soil	Western Gujarat, eastern coastal deltas, Sunderbans (West Bengal), areas with excessive irrigation (Punjab, Haryana)	High in sodium, potassium, and magnesium; infertile; saline due to dry climate and poor drainage; poor nitrogen and calcium; salt crust formation due to capillary action in irrigated areas	Rice, wheat, barley (with gypsum treatment)
Peaty Soil	Areas with heavy rainfall and high humidity (Northern Bihar, southern Uttarakhand, coastal	High organic matter and humus content; heavy and black; can be alkaline; organic matter up to 40-50%;	Rice, jute

	West Bengal, Odisha, Tamil Nadu)	found in waterlogged and swampy areas	
Forest Soil	Forested areas with sufficient rainfall, Himalayas, Western and Eastern Ghats	Varies in structure and texture; loamy and silty in valleys, coarse-grained in upper slopes; acidic and low in humus in snow-bound areas; fertile in lower valleys	Tea, coffee, spices, tropical fruits

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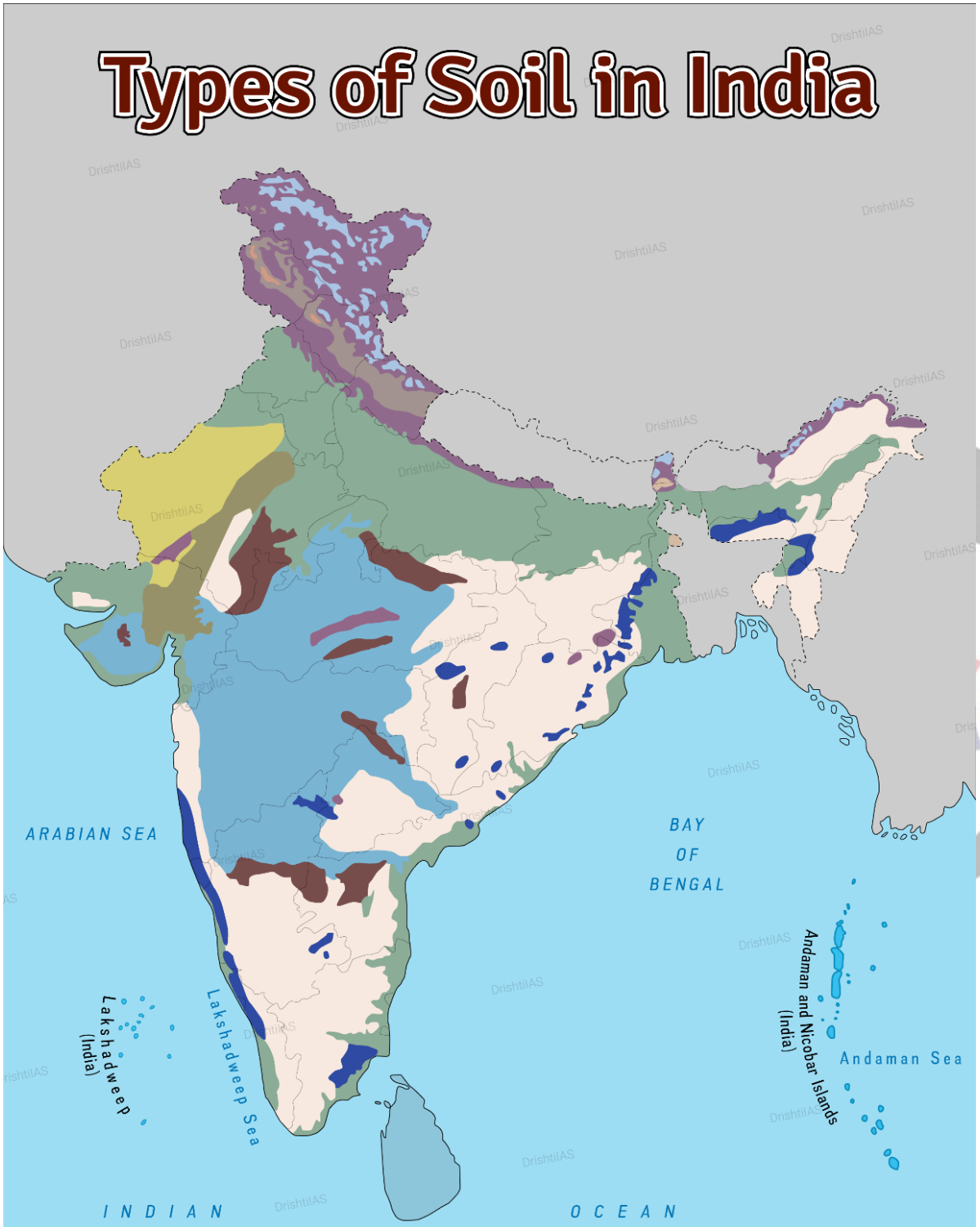
Types of Soil in India

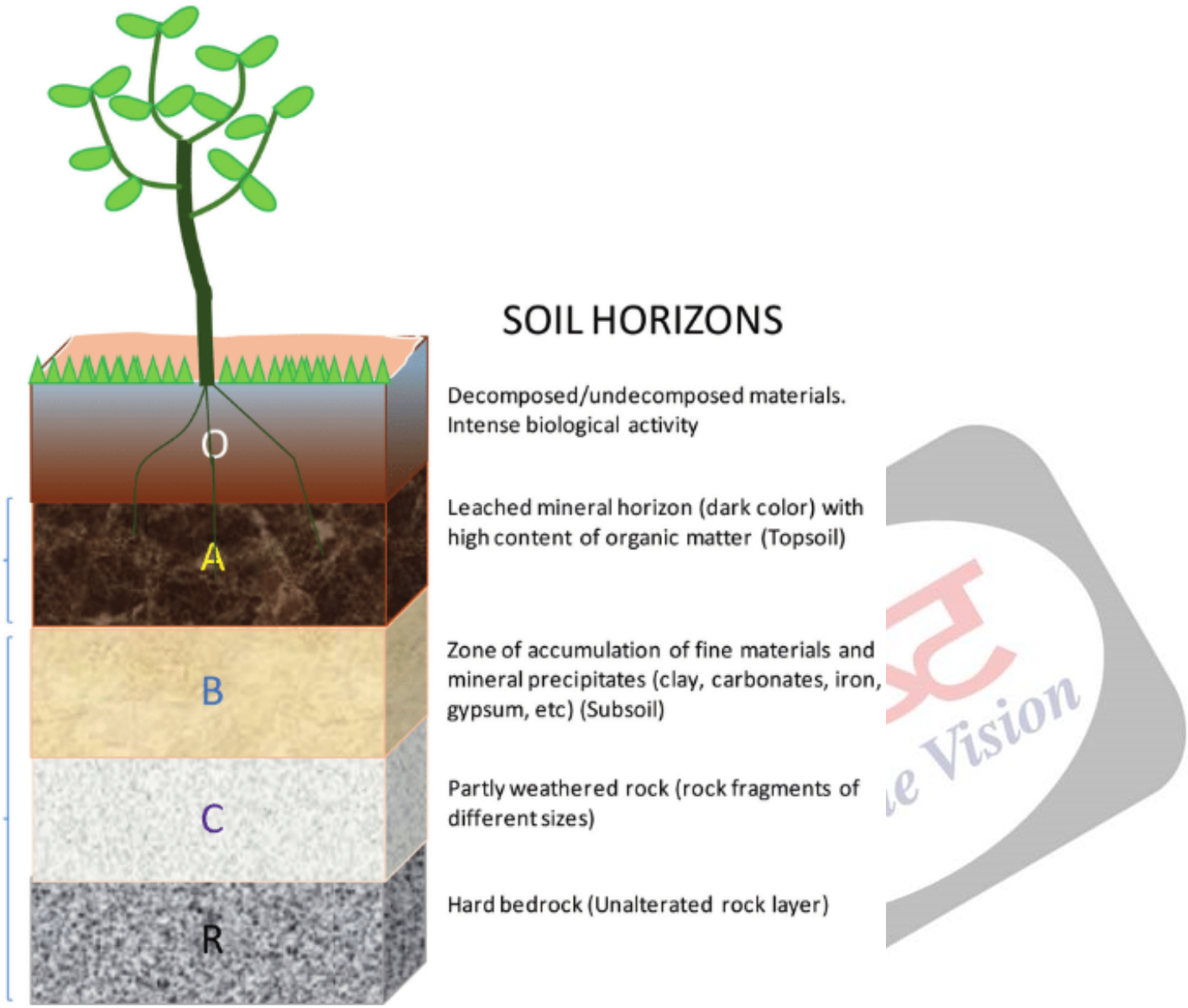


	Alluvial Soil (29.55%)	In the Upper and Middle Ganga plain, two different types of alluvial soils have developed, viz. Khadar and Bhangar.
	Black Soil (19.62%)	It is also known as 'Regur Soil' or the 'Black Cotton Soil'.
	Red Soil (19.62%)	The soil develops a reddish colour due to a wide diffusion of iron in crystalline and metamorphic rocks. It looks yellow when it occurs in a hydrated form.
	Desert Soil (14.02%)	They are generally sandy in structure and saline in nature.
	Laterite Soil (4.77%)	Laterites are not suitable for cultivation. Thus, are widely cut as bricks for use in house construction.
	Mountain Soil	It is also known as 'Forest Soil'. They are loamy and silty on valley sides and coarse-grained in the upper slopes.
	Snowfields	This soil is found under the snow and glaciers at the highest peak of the greater Himalayas, Karakoram, Ladakh, and Zaskar.
	Grey and Brown Soil	Submontane Soil / Red and Black Soil

Drishti IAS

Soil Profile

- **About:** A soil profile is a vertical cross-section of soil, showing different layers (horizons) that vary in texture, colour, and chemical composition.
    - Soil Horizons developed through interactions of climate, organisms, and land surface can be **organic (O) or mineral (A, E, B, C).**
- **Key Layers of Soil:**
    - **O Horizon (Organic Layer):** Contains undecomposed organic matter like leaves, twigs, and moss.
    - **A Horizon (Topsoil):** Rich in organic matter and minerals, supports plant growth, soft and porous.
    - **E Horizon (Eluviated Layer):** A lighter, nutrient-depleted layer due to leaching (removal of minerals by water).
    - **B Horizon (Subsoil):** Accumulates leached minerals from upper layers; contains iron, clay, and organic compounds.
    - **C Horizon (Parent Rock):** Made up of broken bedrock or saprolite, with little organic matter.
    - **R Horizon (Bedrock):** Unweathered bedrock at the base of the soil profile.



What Can Be Done to Enhance Soil Health?

- **Policy:** Develop more comprehensive schemes like the **SHC**, which provides farmers with **detailed information about the nutrient status of their soil.** This helps in making informed decisions about fertiliser use and soil management.
- **Carbon Sequestration: Soil carbon sequestration** boosts soil health by storing **atmospheric carbon dioxide (CO_2)** as organic carbon, improving fertility and water retention. Practices like cover cropping and reduced tillage enhance carbon levels and sustainability.
- **Sustainable Farming Practices:** India can adopt **large-scale no-till farming**, as successfully **implemented in Brazil,** to improve **soil health, reduce erosion,** and boost crop yields.
    - This sustainable practice ensures better productivity and environmental conservation.
    - Sustainable Farming practices like crop rotation, **agroforestry** and organic farming are vital for soil health and environmental conservation.

Conclusion

The Global Soil Conference 2024 highlighted the need for sustainable soil management to ensure food

security and climate resilience. India must adopt better farming practices and policies to address soil degradation. Strengthening soil health is crucial for long-term agricultural and economic sustainability.

Drishti Mains Question:

Soil health is integral to ensuring food security." Discuss the challenges faced by India regarding soil degradation and propose sustainable solutions.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. The black cotton soil of India has been formed due to the weathering of

(a) brown forest soil
(b) fissure volcanic rock
(c) granite and schist
(d) shale and limestone

Ans: (b)

Exp:

- Black soil, also known as regur soil or black cotton soil, is ideal for growing cotton. The climatic conditions along with the parent rock material are the important factors for the formation of black soil. Black soil is typical of the Deccan trap (Basalt) region spread over northwest Deccan plateau and is made up of lava flows (fissure volcanic rock).
- The Deccan Plateau includes parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu. Black soil also covers upper reaches of the Godavari and the Krishna, and the north Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu.
- Chemically, the black soils are rich in lime, iron, magnesia and alumina. They also contain potash. But they lack phosphorus, nitrogen and organic matter. The colour of the soil ranges from deep black to grey.
- Therefore, option (b) is the correct answer.

Q. Which of the following statements regarding laterite soils of India are correct? (2013)

1. They are generally red in colour.
2. They are rich in nitrogen and potash.
3. They are well-developed in Rajasthan and UP.
4. Tapioca and cashew nuts grow well on these soils.

Select the correct answer using the codes given below:

(a) 1, 2 and 3
(b) 2, 3 and 4
(c) 1 and 4
(d) 2 and 3 only

Ans: (c)