Karnataka Soil Crisis

Why in News?

Recent data from the Karnataka's Agriculture Department revealed that more than half of Karnataka's agricultural land suffers from low levels of soil organic carbon (SOC).

What is the status of soil health in Karnataka?

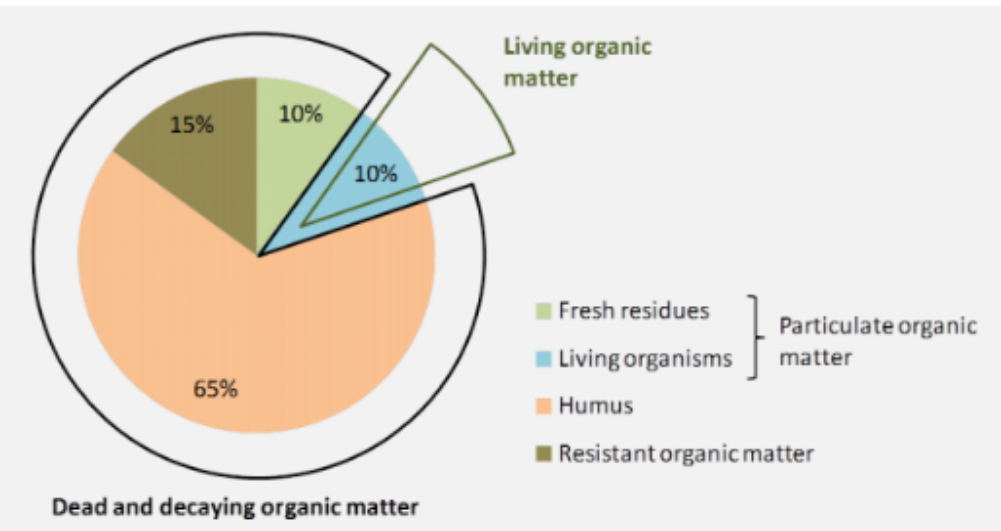
- **Fertilizer high usage districts** – Districts like Kolar shows that over 94% of its farmland recording *low organic carbon levels*.
- **Soil crisis** – Recent analysis shows that, between 2017 and 2024, more than 50% of Karnataka's farmland falls ***below the necessary SOC threshold of 0.5%.***
- It signals towards *widespread soil degradation*.
- **Organic manure usage districts** - Districts such as Dakshina Kannada, Uttara Kannada and Udupi, which boast more tree cover and traditional farming practices, exhibit healthier soil conditions with satisfactory SOC levels.
- This belt is formed along the coast due to the deposition of alluvium and sediments carried by the rivers and sea waves.
- The soil here consists of sand and clay which is very rich in organic nutrients.
- Here, cropping pattern, practices and yield have remained constant.
- Even though few thousand acres are being diverted for plantation crops, the cultivators ensure not to use chemical fertilisers but practice mulching and other bio-friendly methods.

What is Soil Organic Carbon (SOC)?

- **SOC** - It is a measureable component of soil organic matter.
- SOC refers only to the carbon component of organic compounds.
- **Measurement** – It is difficult to measure directly, so laboratories tend to measure and report SOC.
- **Backbone of soil quality** - It plays a vital role in water retention, nutrient availability, pH buffering and preventing soil erosion.
- **Foundation for sustainable agriculture** – Optimal SOC levels ensures in maintaining healthy and productive soils.
- **Significance** - Sequestering carbon in SOC has been suggested as one way to mitigate climate change by reducing atmospheric carbon dioxide.

Organic Matter

• It makes up just 2–10% of most soil's mass.
• **Composition** – It is composed mainly of carbon, hydrogen and oxygen.
• It has small amounts of other elements, such as nitrogen, phosphorous, sulfur, potassium, calcium and magnesium contained in organic residues.
• **Components** – It is divided into *'living' and 'dead' components* and can range from very recent inputs, such as stubble, to largely decayed materials that might be many hundreds of years old.
• About 10% of below-ground SOM, such as roots, fauna and microorganisms, is 'living'.



• **Importance** – It contributes to nutrient retention and turnover, soil structure, moisture retention and availability, degradation of pollutants, and carbon sequestration.
• It has a greater role in the physical, chemical and biological function of agricultural soils.

What are reasons for SOC depletion in Karnataka?

- **Heavy us of fertilizers** - Karnataka ranks *amongst the top five states* in fertiliser consumption.
- Their usage per hectare *surpassing the national average*.
    - In the 2020-21 and 2021-22, fertiliser use skyrocketed to over 45 lakh metric tonnes.
- **Reduction in livestock population** – It fell from 1.48 crore in 2007 to 1.14 crore in 2019.
- **Rising costs cattle manure** – It costs *approximately Rs 14,000 per acre compared to Rs 3,000 for chemical fertilisers*, which have pushed farmers to rely heavily on the synthetic alternatives.
- **Logistical challenges** – There is a *shortage in supply of mulching agents* every season from the sources as it is not economical to transport the mulching material over 100 kilometres.
    - Apart from cattle manure, they mulch coconut, areca leaves and forest wastes onto the fields.
- All these interconnected factors led to *decline in the application of organic manure* and increase of synthetic fertilizers.

What are its impacts?

- The impact of declining SOC is *not uniform* across Karnataka.
- **Reduce soil fertility** – Low SOC levels are directly linked to reduced soil fertility.

The districts that have black alluvial soil are the worst affected, namely in the northern parts of the state, which are locally called 'Eremannu'. These are derived from the weathering of basalt rocks.

- **Increase vulnerability** – Such soils are *prone to erosion and water runoff*, compounding the impact of climate change on local agriculture.
- **Lowers crop yields** – Decreased soil nutrients and soil quality reduce the crop yields and also affects the crop health.
- North and central Karnataka are experiencing a marginal lowering of yields and the quality of the yield in various crops such as oil seeds, cotton, groundnut, jowar, maize and millets.
- **Creates a vicious cycle of environmental degradation** – SOC depletion along with monocropping and deforestation which are common practices in the state, further strip the soil of its natural nutrients.

What are the measures taken by Karnataka government?

- **Soil testing** – They had launched one of the biggest-ever plans to collect and analyse soil conditions in over 500,000 soil samples on over 30,000 hectares in different parts of the state.
- **Distributing manures** – Efforts are underway to increase the distribution of green manure seeds and enhance soil testing capabilities.
- Both of the above projects will begin and end in the year 2024.
- **Tracking soil health** - A dedicated mobile phone app to offer farmers real-time access to soil test results and recommendations.
- It will allows farmers to adopt appropriate soil conservation measures easily and encourage in taking up mulching in an extensive way.

What lies ahead?

- Use green manure, vermicompost and practices such as mulching post-harvest crop residue on the field can play a significant role in rejuvenating the soil.
- Integrate organic and inorganic fertilisers to strike a balance between productivity and soil health.
- Farmers can install their own shredding machines for converting the biomaterial into mulching agents.

Reference

Down To Earth| Depletion of Soil Organic Carbon in Karnataka



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