

BLACK GOLD BENEATH OUR FEET: THE ROLE OF SOIL ORGANIC CARBON IN PRODUCTIVE SOILS

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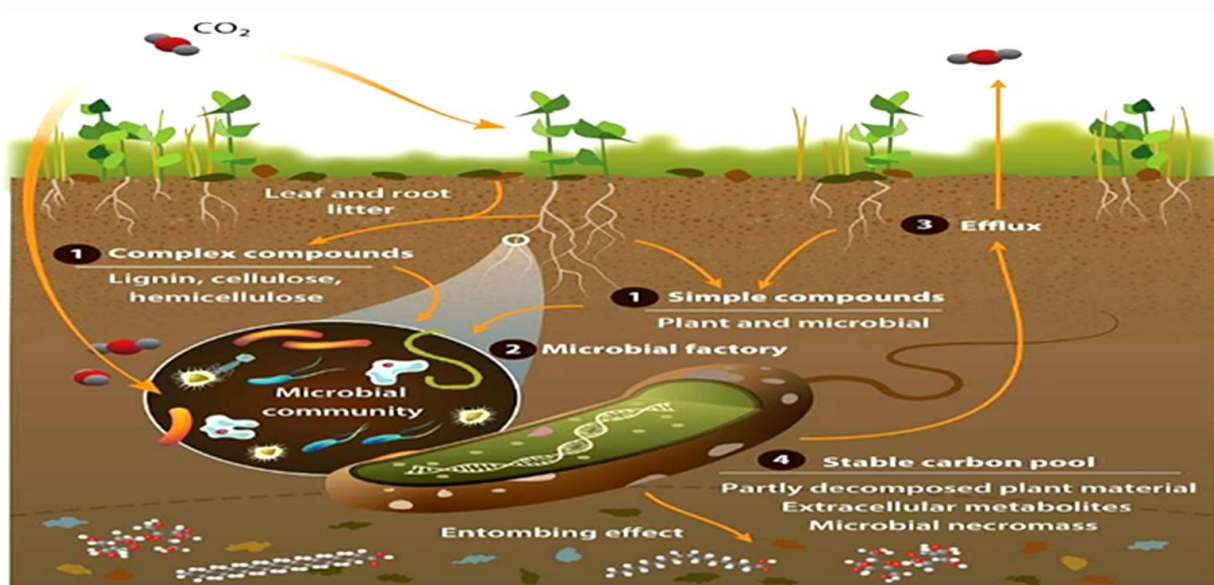
Unlocking Nature's Potential Beneath Our Feet

What is Soil organic carbon?

Soil organic carbon (SOC) is the carbon-rich component of soil organic matter derived from decomposed plant, animal and microbial residues. It is essential for maintaining soil health by improving soil structure, nutrient availability and biological activity. SOC enhances water infiltration and retention, helping crops withstand drought stress.

It also supports beneficial microorganisms that drive nutrient cycling and soil fertility. By storing carbon in the soil, SOC contributes to climate change mitigation and reduces greenhouse gas emissions. Ultimately, higher SOC levels increase the productivity and resilience of agricultural systems.

Why Organic Carbon is called the Foundation of Productive Soils



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Organic carbon is often called the "**storehouse of nutrients**" of soil because it supports healthy and productive crop growth. It improves soil structure, making the soil loose, well-aerated and better able to hold water. It acts as a storehouse of essential nutrients and releases them gradually for plant use. Organic carbon also feeds beneficial soil microorganisms that help recycle nutrients and suppress harmful pests and diseases. By improving soil health, water availability and nutrient efficiency, organic carbon plays a key role in sustaining crop productivity and building resilient farming systems.

Role of Soil Organic Carbon in Enhancing Vegetable Crop Productivity and Quality

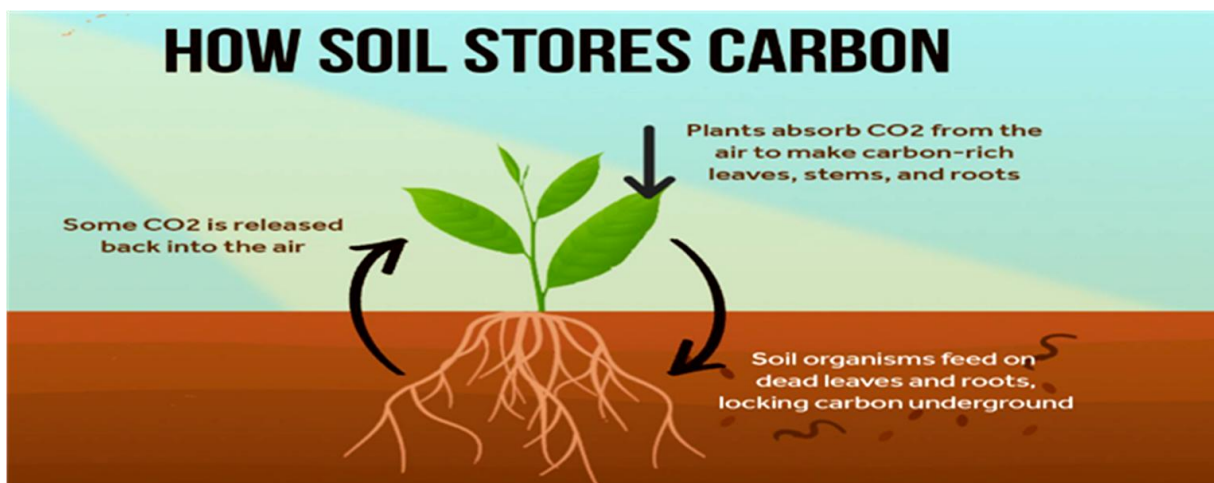
Soil organic carbon is a key determinant of soil health and plays a vital role in the growth, productivity and quality of vegetable crops. It improves soil structure, enhances water-holding capacity and promotes better root development, creating favourable conditions for crop establishment and growth.

Soil organic carbon also supports beneficial microbial activity, which facilitates nutrient cycling and improves nutrient availability to plants.

By enhancing nutrient and water-use efficiency, soil organic carbon contributes to higher yields and improved produce quality. In vegetable crops such as tomato, chilli, brinjal, okra, cabbage and cauliflower, adequate levels of soil organic carbon support vigorous plant growth, better fruit and head development and improved post-harvest quality. Furthermore, it helps reduce nutrient losses and improves the efficiency of applied fertilizers, contributing to more sustainable and resilient vegetable production systems.

Benefits of Soil Organic Carbon in Sustainable Agriculture

- Improves soil health and fertility
- Enhances water infiltration and water-holding capacity
- Reduces soil erosion and land degradation



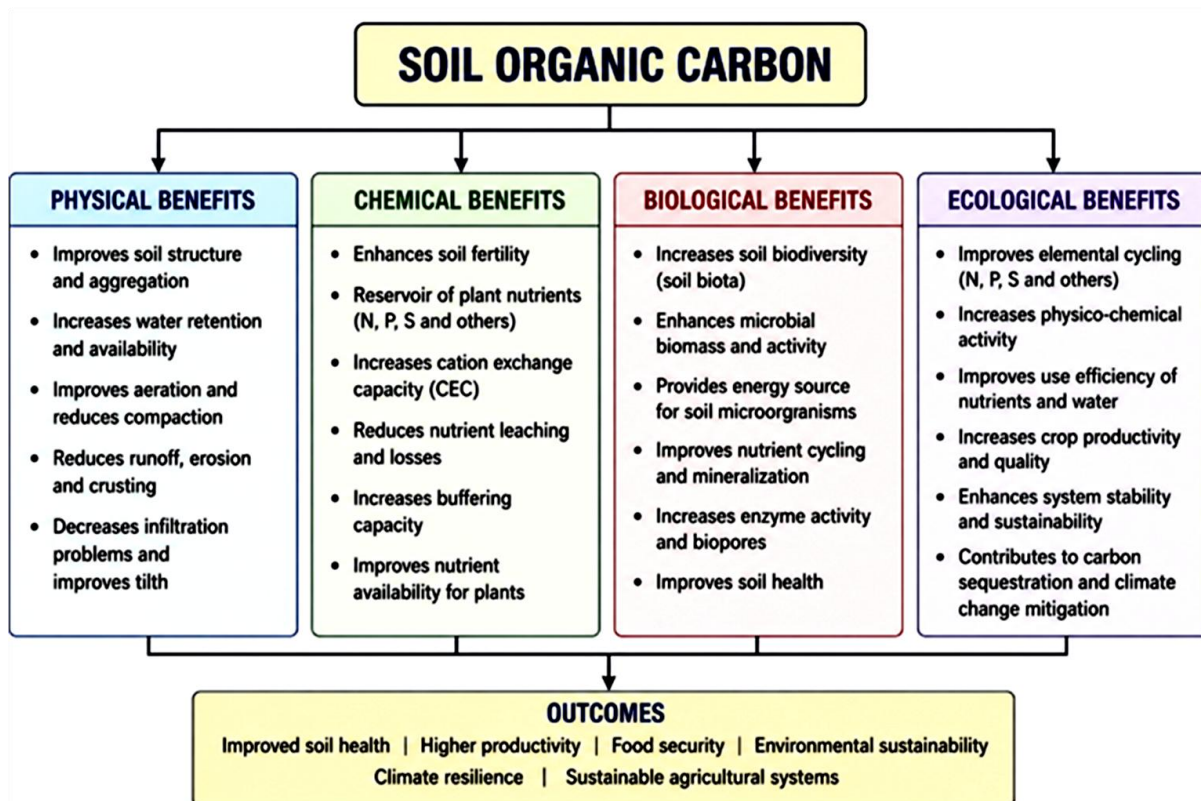
- ☞ Increases nutrient availability and nutrient-use efficiency
- ☞ Promotes beneficial soil microorganisms
- ☞ Reduces dependence on chemical fertilizers
- ☞ Improves crop productivity and quality
- ☞ Enhances resilience to drought and climate variability
- ☞ Sequesters carbon and mitigates climate change
- ☞ Supports long-term agricultural sustainability and food security

Soil Organic Carbon: Nature's Climate Solution

Soil organic **carbon sequestration** is the process of capturing and storing carbon in

the soil through sustainable management practices. Techniques such as residue incorporation, compost application, crop diversification and reduced tillage increase soil carbon stocks while improving soil health. This helps mitigate climate change, enhances agricultural productivity and strengthens the resilience of farming systems.

Soils rich in organic carbon function as effective **carbon sinks**, capturing and storing carbon for long periods while simultaneously improving soil fertility and productivity. Increased soil carbon also enhances water retention, nutrient availability and soil biodiversity, enabling crops to better withstand droughts and other climate-related stresses.



By reducing carbon losses and promoting sustainable land management, soil organic carbon contributes to lower **greenhouse gas emissions** and supports more resilient agricultural systems. Its role extends beyond the farm, contributing to global efforts toward climate action, food security, ecosystem conservation and sustainable development.

Causes of Declining Soil Organic Carbon

- ☞ Excessive tillage
- ☞ Residue burning
- ☞ Monocropping
- ☞ Imbalanced fertilizer use
- ☞ Soil erosion
- ☞ Low organic matter addition

Practical Ways to Increase Soil Organic Carbon

- ⇒ Apply **farmyard manure (FYM), compost, and vermicompost** regularly to enrich the soil with organic matter.
- ⇒ Incorporate **green manure crops** to add fresh biomass and improve soil fertility.
- ⇒ Grow **cover crops** to protect the soil and increase carbon inputs.
- ⇒ Retain and incorporate **crop residues** instead of burning them.
- ⇒ Adopt **conservation tillage or minimum tillage** to reduce soil carbon losses.
- ⇒ Practice **crop rotation** and



Integrated Nutrient Management

(INM) to sustain soil fertility and organic carbon levels.

Conclusion:

Healthy soils begin with healthy levels of organic carbon. As a key driver of soil fertility, crop productivity, and environmental sustainability, soil organic carbon is central to the future of agriculture. Enhancing and conserving soil carbon will be critical for meeting the growing demand for food while protecting natural resources and adapting to a changing climate.

"Soil organic carbon is the hidden wealth beneath our feet - the foundation of productive soils and sustainable agriculture."

