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CARBON SEQUESTRATION THROUGH ORGANIC FARMING

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Carbon sequestration in the agriculture sector refers to the capacity of agriculture lands process by which carbon is fixed from the atmosphere via plants or organic residues and stored in the soil. Soil has capacity to store around 20 Pg carbon in 25 years, which is more than 10% of anthropogenic emissions (FAO). Carbon are continuously move in carbon cycle, but over main aim is more carbon sequestration and store in stable form in soil.Forests and stable grasslands are referred to as carbon sinks because they can store large amounts of carbon in their vegetation and root systems for long periods of time. In soil, there are basic three forms of carbon that may be present: 1) Element C, 2) Inorganic C,3) Organic C.There are three ways that carbon can be sequestered: 1) Terrestrial sequestration: in plants and soil, 2) Geological sequestration: underground, 3) Ocean sequestration: deep in ocean.

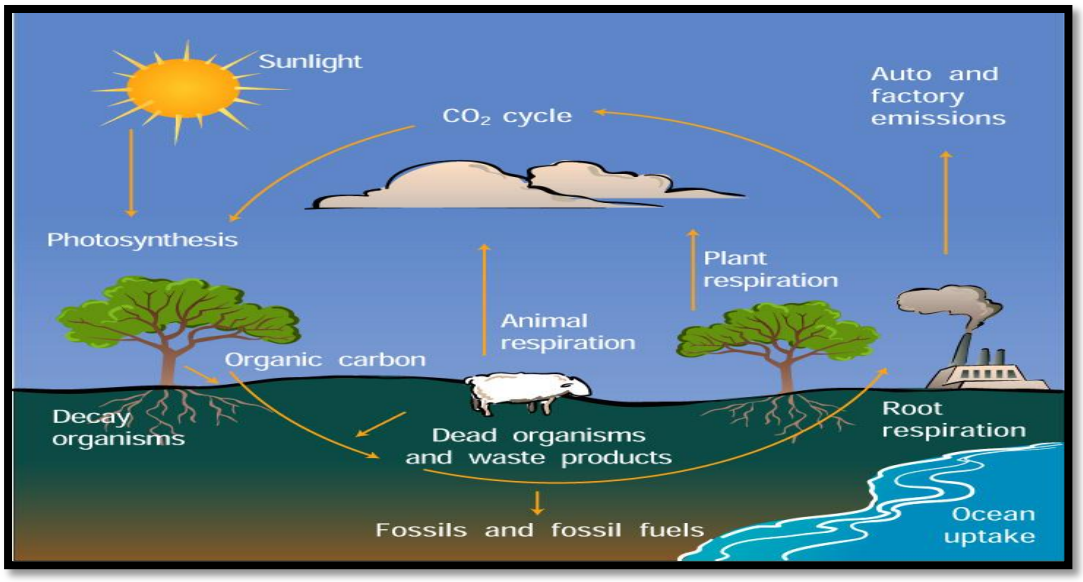

Fig.1 Carbon cycle (Source: https://eo.ucar.edu/kids/green/images/carboncycle.jpg)

The main causes of soil organic carbon depletion are soil erosion, residue burning, land use change, intensive cultivation, nutrient imbalance, low productivity and overgrazing. Organic farming is the way that we can minimize organic carbon depletion in soil through

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carbon sequestration. Organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives *etc*) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection. Total areas under organic agriculture land in india is 1.18 mha. The major states in india are MP, MH, UP, GJ and Odisha combined share of 90% organic food market in india (WOA, 2017).

Why carbon sequestration needed?

- **Soil:**
  - Increase soil fertility
  - Improve physical, chemical and biological properties
  - Rehabilitation of degraded land
- **Crop:**
  - Enhancing crop productivity
  - Increased income of farmers
  - Food security
  - Increase in use efficiency of inputs
- **Environment:**
  - Reduced GHGs emission
  - Enhanced soil C sink
  - Decrease in pollution

How organic farming helps in carbon sequestration?

- Organic farming is complimented the carbon sequestration because it focus on sustainability without using synthetic fertilizers, pesticides etc.
- Organic mulching refers to covering the soil with any organic matter such as applying compost or farm yard manure over the soil surface followed by adding a layer of dry organic matter over it.
- This compost contains aligned beneficial microbes, where the dry matter is rich in carbon and the green matter is rich in nitrogenous substances. When decomposition of these components takes place the carbon nitrogen ratio in the soil becomes 10:1, ideal for the proliferation of microbes. This type of farming practices not only improve the soil fertility but also increase farmers' income.

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- Hence, we can say organic farming is one of the best ways of improving soil fertility which co-benefited the sequestration of carbon from atmospheric CO_2.

Organic Farming management practices to increase soil organic carbon

- Tillage and residue management:Conservation tillage practices recorded significantly higher soil organic carbon content and soil carbon sequestration at 0-15 cm and 0-30cm depth as compared to conventional tillage with and without crop residue (Kumar and Babalad, 2018). Zero tillage with residue retention increase soil organic carbon and microbial biomass carbon. The compost, paddy and wheat straw and maize stover used as mulch for improving soil organic carbon content.
- Nutrient management: The nutrient management practices include manure and compost, green manure, legume integration and microbial fertilizers.Mishra (2015) reported that application of FYM + vermicompost 2t/ha (split) recorded higher soil organic carbon, soil carbon sequestration rate.Salahin *et al.* (2013) suggested that green manure crop (*Sesbania aculeate*) increase organic carbon, porosity, rice and wheat yield as compare to rest of treatment.

Fig.2 Farms planting into a no-till system

(Source: https://fyi.extension.wisc.edu/foxdemofarms/conservation agriculture/minimal-soil-disturbance-conservation-tillage/)

Conclusion

Organic farming practices are capable of enhancing soil properties and serving as a potential sink of atmospheric carbon dioxide sequestrated in soil through zero tillage, minimum tillage with crop residue management and application of organic amendments helps

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in sequestering carbon in surface soil, may have also positive effect on soil fertility and increased crop yield.

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