AGRIBLOSSOM
ISSN-2582-8258
A monthly peer reviewed e-magazine for Agriculture & allied Sciences

Carbon sequestration: scenario in indian agriculture

B. Jayasree*[1] G.R.Charan Kumar[2]

[1]B. Jayasree, PhD Scholar, Department of Soil Science and Agricultural chemistry, S.V.Agricultural College, Tirupati, ANGRAU-517502

[2] G.R.Charan kumar Department of Soil Science and Agricultural Chemistry, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, U.P-250110

Introduction

- Soil, land and water are essential resources for the sustained quality of human life and foundation of agricultural development.
- As nation has progressed, we have been emitting carbon or gases which results in warming globe. This climate change has emerged as the leading environmental threat facing the world today.
- Emission of greenhouse gases is concern of global warming and relative effect on biological life (IPCC 2001).
- Most soils in agriculture ecosystem have lost 50 to 75% of their antecedent soil C pool and most of the soil contain soil C pool below their ecological potential.
- Under such situation carbon sequestration plays a key role to conserve natural resources and achieve sustainability in agricultural production.

Challenges faced by Indian agriculture

- Depleting soil organic matter
- Imbalance use of fertilizer
- Emerging multi-nutrient deficiencies particularly of secondary and micronutrients
- Negative soil nutrient balance
- Land degradation
- Slow growth in food grain productivity

Carbon sequestration

The processes of restoration of SOC pool through conversion of atmospheric carbon dioxide in to humus via process of photosynthesis is called soil C sequestration.

- It is a process where CO_2 is pulled from the atmosphere and stored for a long period of time may be one way to slow or reverse the accumulation of CO_2 in the earth's atmosphere. Terrestrial sequestration utilizes natural processes in ecosystems to absorb CO_2 from the atmosphere and store it in plants, animals, and soil.

Why carbon sequestration.....?

- The important mitigation strategy to cope with the negative impact of climate change
- To restore degraded soils and ecosystem and increase agronomic productivity to achieve food security
- The potential of soil carbon sequestration in India is estimated at 10-14 Tg C/y for restoration of degradable soils and ecosystem (Lal *et al*. 2004)
- Soil carbon sequestration is a natural, cost effective and environment friendly process
- To mitigate the effect of atmospheric CO_2, carbon capture and storage (CCS) has been found to be an important tool.
- Soils capture and store both organic and inorganic forms of carbon and thus act both as source and sink for atmospheric CO_2.
- **Large C pool (world C pool)**
- **Oceanic pool 38000 G.t**

2. **Geologic pool 4500 G.t**
3. **Soil C pool/ Pedologic C pool**
   I. **Soil organic C (SOC) 1550 G.t**
   II. **Soil inorganic C (SIC) 950 G.t**
4. **Atmospheric pool 760 G.t**
5. **Biotic pool 560 G.t**

G.T = giga tonnes = 10^9 Kg

Agroforestry in carbon sequestration

- Gera *et al* (2006) reported that carbon sequestration potential of poplar 1564 tons C /ha and eucalyptus 56 tons C /ha for boundary plantation under irrigated agroecosystem on farmer's field.
- In one study in Uttar Pradesh, approximately 20 million tons of carbon has been estimated to be sequestered by the farm forestry plantation (Singh et al 2000).

- In India fast growing species such as Poplar, Eucalyptus, Leucaena, Acacia, Dalbergia, Bamboo can be incorporated in agroforestry system to sequester the carbon.

Biochar as soil amendment to sequester carbon

- Biochar refers to the carbon-rich materials (charcoal) produced from the slow pyrolysis (heating in the absence of oxygen) of biomass.
- Biochar improves soil fertility by improving cation exchange capacity, stimulating plant growth, reduced leaching of nutrients, reduced soil acidity, increased water retention, and reduced irrigation and fertilizer requirements.

Advantages of carbon sequestration in agriculture soil

- Increasing crop productivity
- Diversified crop rotation
- Higher returns of crop residue
- Increasing use organic manures
- Green manuring
- Intensive cropping
- Agroforestry
- Improved irrigation
- Increasing root biomass
- Depth placement of carbon
- Reduce soil erosion
- Tillage
- Mulch farming
- Reduce bare fallow
- Low quality input

Conclusions

- Soil C sequestration is essential for improving the soil quality to increase agronomic productivity and achieve global food security and mitigate climate change by reducing atmospheric CO_2.
- The practice of conservation tillage, integrated nutrient management, residue management and afforestation, found promising options for carbon sequestration.

References

Benbi, D. K., & Brar, J. S. (2009). *A 25-year record of carbon sequestration and soil properties in intensive agriculture. Agronomy for Sustainable Development, 29(2), 257–265*

Das, S.K. and Itnal, C.J. (1994). Capability based land use systems: Role in diversifying dryland agriculture. In:

Lal, R. (2004). *Soil Carbon Sequestration Impacts on Global Climate Change and Food Security. Science, 304(5677), 1623–1627*