

IAJESM SPONSORED NATIONAL SEMINAR
ON
ESSENTIAL OF LITERATURE REVIEW AND RESEARCH METHODOLOGY
20 JUNE 2021

Carbon Sequestration in Agroforestry Systems

Manju Kodope, Research Scholar, Department of Botany, SunRise University, Alwar, Rajasthan (India)

Abstract

Agroforestry systems, which integrate trees with crops and/or livestock on the same land, offer a promising nature-based approach for mitigating climate change while supporting agricultural productivity and ecosystem resilience. Carbon sequestration in agroforestry occurs through the accumulation of carbon in tree biomass, crop residues, soil organic matter, and, to a lesser extent, below-ground root systems. Compared with conventional agricultural systems, agroforestry can enhance carbon storage by increasing perennial biomass, improving soil structure, reducing erosion, and promoting continuous organic matter inputs. The magnitude of carbon sequestration varies considerably with tree species, planting density, climate, soil characteristics, management practices, system age, and land-use history. Silvopastoral, agro silvicultural, and Agri silvicultural systems can therefore contribute differently to both above-ground and below-ground carbon pools. In addition to carbon storage, agroforestry provides multiple ecological and socioeconomic benefits, including biodiversity conservation, microclimate regulation, nutrient cycling, improved soil fertility, diversified farm income, and enhanced resilience to climatic stresses. However, accurate assessment of carbon stocks requires standardized measurement, monitoring, and verification methods because carbon accumulation rates may change over time and differ among agroforestry systems. Integrating agroforestry into climate-smart agriculture and land-management strategies can contribute to greenhouse-gas mitigation while maintaining productive agricultural landscapes. Thus, promoting suitable agroforestry practices, supported by scientific management and long-term monitoring, can play an important role in achieving sustainable land use and strengthening climate-change adaptation and mitigation efforts.

Keywords: Agroforestry, Carbon sequestration, Climate change mitigation, Soil organic carbon, Biomass carbon, Carbon storage, Sustainable agriculture, Ecosystem services, Climate-smart agriculture, Greenhouse gases.