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Distribution of soil carbon stock in a forested wetland in the semiarid region of India: implications for climate change mitigation

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Climate change mitigation strategies require long time removal and storage of carbon; thus, enhancing soil carbon stock is an appealing way to increase carbon sink potential and control emissions owing to associated ecosystem benefits. Understanding soil organic carbon (SOC) stock in the semiarid landscape is vital for natural based climate solutions and mechanisms. The carbon stock in soil represents 25% of the potential of natural climate solutions and wetlands have around 72% mitigation potential for soil carbon. Wetlands have a very complex natural system and provide a potential sink of atmospheric carbon. Particularly the role of wetlands in arid and semiarid lands has become vital as they not only provide a water source and livelihood options to the local community but also play an important role in maintaining ecosystem services. However, only limited studies have been conducted to assess the roles and potentials of wetlands in carbon sequestration in a semiarid region. The geospatial technologies provide a cost-effective and more accurate estimation of SOC stock in these ecosystems. The SOC distribution in wetland ecosystems and their carbon sequestration potential studies are crucial to understanding the global carbon budget. The present study area Keoladeo National Park is an ecologically important forested wetland situated in semiarid India with a heterogeneous landscape. Current research work illustrated a hybrid interpolation method for estimating the distribution of soil carbon in different vegetation type/land cover (VT/LC) using point survey data (prepared after laboratory test) with remote sensing. The map prepared has given satisfactory results with more than 80 present accuracy. SOC distribution data were collected from 130 plots from both the surface (0-15 cm) and subsurface soil (15-30 cm) covering all the 15 VT/LC classes. SOC was found to be significantly related to VT/LC type and water availability. The spatial distribution of SOC shows a wide range with an average value of around 1.5%; the seasonal distribution shows an increased amount of carbon in pre monsoon season and a high amount of carbon in the surface soil. The concentration of SOC (around 2.5%) has been observed to be more in wetland and grassland soils in both the seasons that cover about 13% and 27% area of the park, respectively. SOC stock management in this region is vital in observing the local community needs, which is mainly dependent on the park for livestock food. Further geospatial analysis of soil carbon stock potential will add value to the study. Synergising climate change mitigation strategies and community requirements are needed to enhance vulnerable communities' benefits.

Keywords: Soil carbon, semiarid region, remote sensing, climate change mitigation.