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Carbon Sequestration and Soil Carbon Dynamics: An Introduction to the Special Issue

SATISH C. GARKOTI
School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110067, India
Email: sgarkoti@yahoo.com

Since the first assessment report (Climate Change) of the Intergovernmental Panel on Climate Change (IPCC) in 1990 (Houghton et al. 1990) concluded that the rapidly increasing atmospheric concentration of green house gases, particularly CO2, which results from various anthropogenic activities, would lead to climate changes with consequent important impacts on natural and human systems, enormous global effort has gone into understanding the causes and impacts of global warming and climate change, as well as on strategies for mitigation and adaptation. Among these, an area of considerable interest is concerned with the global carbon cycle. Terrestrial ecosystems provide a major sink as CO2 is sequestered in forest biomass and soils. But large scale deforestation and degradation of forests together with various other land use changes contribute to the atmospheric CO2 pool. Extensive studies on carbon stocks, rates o sequestration and losses (emissions) have been conducted worldwide (e.g., see Quéré et al. 2016).

The tropical ecosystems which contain largest proportions of biodiversity and contribute to the livelihoods of over one and half billion poor people are under the greatest pressure. Being inherently fragile, these ecosystems are facing the anthropogenic pressure on one hand and the threat from changing climate looming large on the whole life support systems on the other. The tropics occupy about 40 % of earth's surface, are endowed with the largest reservoir of terrestrial Carbon, much higher CO2 and water than any other biome of the world and play critical role in determining earth's energy balance. Therefore, tropical ecosystems in general and forests in particular have received much attention for their carbon dynamics, especially their role in carbon sequestration (Silver et al. 2000, Gibbs et al. 2007, Talbot 2010). These studies have emphasized the complex patterns of carbon dynamics and biodiversity in tropical forests, multiplicity of environmental factors responsible for these patterns, causal relationships between carbon dynamics and biodiversity, temporal variability of ecosystem processes, and the need for accurate assessments of carbon stocks and fluxes, including those in the soils and belowground biomass.

In India also, many studies were made on biomass in different kinds of forests, their carbon sequestration potential, and effect of land use systems on carbon dynamics. The Forest Survey of India conducted a national level assessment of Forest Carbon Stock and its changes between 1994 and 2004 that formed a part of the India's Second National Communication to UNFCC. In 2007, a National Carbon Project (NCP) was launched under the Geosphere Biosphere Program of the Space Research Organisation (ISRO), as a collaborative effort with many institutions, with the goal of assessing C Pools, Fluxes & Net C balance for terrestrial biosphere in India. The project involved the assessment of vegetation and soil C pools throughout the country under different conditions. During the past decade, numerous studies have been undertaken throughout India and synthesised in several publications (Chhabra etal. 2002, 2003, Dadhwal et al. 2009, 2011, Neupane and Sharma 2014, Velmurugan et al. 2014)

It was but natural that the subject drew special attention at the international Conference on Tropical Ecosystems in a Changing World (TEC-14) organized by the International Society for Tropical Ecology (ISTE) in collaboration with the Jawaharlal Nehru University (JNU), New Delhi during 10-12 December 2014. It was decided to publish all contributions to the subject at the Conference as a special issue of an international journal. However, the submission of the manuscripts was unexpectedly slow and it took some time to process the manuscripts. Eventually, the delay prompted some authors to publish their contributions elsewhere.

This special issue of the International Journal of Ecology and Environmental Sciences brings together 13 contributions from India and Nepal to the theme of carbon sequestration and soil carbon dynamics. These papers cover diverse types of tropical/subtropical forests

– both natural and plantations, agroforestry systems and sacred groves. Their geographical coverage spans from Central Himalaya (Nepal) and Eastern Himalaya to western semi-arid regions of Haryana and Rajasthan, central India (Madhya Pradesh and Chhattisgarh) and North-Eastern India. I sincerely hope that these papers will make an important contribution to our understanding and knowledge of carbon sequestration in biomass and soils in different kinds of ecosystems and the influences of a multitude of biotic and abiotic factors of the carbon dynamics.

I sincerely thank all the authors for their contributions and for patiently cooperating through the editorial process to meet the requirements of the Journal. I also take this opportunity to thank the office bearers at ISTE for holding the 2014 Congress at the JNU, New Delhi. Grateful thanks are due to National Biodiversity Authority, Mountain Division of Ministry of Environment Forests and Climate Change, Department of Science and Technology, Indian Council of Agricultural Research, Indian National Science Academy, Council of Scientific & Industrial Research, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, G.B. Pant Institute of Himalayan Environment and Development, Almora, and the Jawaharlal Nehru University for their vital support in various ways, including finances, in organizing the congress. Thanks are due to International Centre for Integrated Mountain Development, Tribhuwan University, Kathmandu, Forest Research Institute, Dehradun and the G.B. Pant Institute of Himalayan Environment and Development, Almora, also for organising a session during the Congress. I thank my colleagues, friends and students who helped in various ways in making the TEC-2014 successful. The editorial board of this journal, IJEES, is thanked for getting the paper reviewed and for publishing this special issue. The views expressed and findings presented in this volume are those of the respective authors and do not reflect in any manner those of the organizations they are affiliated to.

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