

Biodiversity Development and Soil Carbon Sequestration Efficiency of Certain Indigenous and Exotic Woody Species Planted on Coal Mine Habitats in a Dry Tropical Environment, India: A Case Study¹

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Abstract: Accumulation of significant C stock in redeveloping soils of mine spoil depends upon the quality and rapidity of biodiversity reconstruction in a short span of time. Developing young forests on any degraded ecosystems can play a significant role in mitigating the effect of global climate change. Present study was conducted on a degraded ecosystem in a dry tropical region of India where mining is one of the serious problems. We selected sixteen plantation sites as a total in different ecological models (mono- and mixed culture) for assessing plant diversity and efficiency of soil carbon sequestration on coal mine spoil for this study. Twelve plantation stands selected as mono-cultured and four (1: *Albizia lebbbeck* + *Acacia catechu*, 2: *Azadirachta indica* + *Phyllanthus emblica*, 3: *Dalbergia sissoo* + *Tectona grandis*, and 4: *Dendrocalamus strictus* + *Tectona grandis*) were selected as mixed cultured. Of which, eight woody species were indigenous, and in which, four of them (*Albizia lebbbeck*, *Pongamia pinnata*, *Dalbergia sissoo*, and *Albizia procera*) were leguminous tree and short stature in size; and four (*Azadirachta indica*, *Tectona grandis*, *Dendrocalamus strictus*, and *Shorea robusta*) were non-leguminous. While remaining four woody species (*Acacia auriculiformis*, *Casuarina equisetifolia*, *Eucalyptus hybrid* and *Gravillea pteridifolia*) were exotic in nature. Results indicated that influence of planted species under both models were significantly varied for accumulation of soil organic C and their sequestration in belowground component with increasing plantation age. However, recruitment of biodiversity development among plantation stands was not so effective due to plantation age, origin and combination; because, canopy cover of planted woody species and one invasive species (*Hyptis suaveolens*) invaded under planted stands significantly affected recruitment rates of plant reconstruction and C sequestration. However, in comparison to mono-culture plantation stands, mixed culture either legume or non-legume combination showed a strong tendency in soil carbon sequestration and plant diversity development beneath plantations with age confirming accretion and cycling of carbon in soil which may in turn more strong enhancement of biological fertility that will make a fertile ecosystem in a short range of time.

Additional Key Words: Ecological restoration; Species recruitment; Native; Carbon, Soil development

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3. Work reported here was conducted at site located at the North-eastern part of Singrauli coalfield in the district of Sidhi (Madhya Pradesh, India) between latitudes 24° 6' 45"-24°11'15"N and longitudes 82° 36' 40"-82°41'15"E and 40° 06' 07" N; 88° 14' 59" W.