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BIOMASS AND CARBON ESTIMATION IN TREES PLANTED ON OVERBURDEN DUMPS AND NATIVE SOIL IN WARDHA COALFIELDS, MAHARASHTRA

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ABSTRACT: Mining operations lead to large scale land degradation. Restoration of mining lands by tree plantations helps in amelioration of physical, chemical and biological characteristics of overburden dumps. Tree biomass is a primary renewable energy source that can reduce CO_2 concentration from the atmosphere. Carbon sequestration in tree plantations in mined out areas is important for the restoration of the damaged ecosystem as well as mitigating the negative impacts of climate change. Quantification of carbon stock in trees gives us an understanding of better management of plantations to offset maximum carbon from the atmosphere. The present investigation was conducted on estimation of biomass and carbon in trees planted over coal mine overburden (OB) dumps and surrounding native soil in Western Coalfields Limited (WCL), Maharashtra (India). Sixty-four quadrats of 10m x 10m size were laid in the tree plantations at Chandrapur, Wani and Wani North area of Wardha Coalfields. Growth characteristics including height and girth of trees found within the laid quadrats, were measured after rainy season. Carbon in trees of different age groups planted on OB dumps and soil was quantified by non-destructive method using allometric equations and compared with each other. Carbon stock in trees planted on native soil was found 27.30% higher than OB dumps. Among the selected sites, maximum carbon was recorded in the trees of Chandrapur (50.96 t ha-1), followed by Wani (44.23 t ha-1) and Wani North (40.79 t ha-1). The highest rate of carbon sequestration was observed during the initial 15 years of the plantation, which then invariably decreased with the age of the trees.

Key words: Tree plantation, coal mine overburden dump, biomass, carbon, Western Coalfields Limited.

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Opencast mining operations involve generation of immense quantity of overburden dump, dumping and backfilling of excavated space, which gives rise to the danger of dump failures, and numerous associated environmental issues like soil erosion, dust, noise, water pollution and impacts on native diverseness (Campbell, 1992). Mining operations degrade significant areas of land and replace existing ecosystems with undesirable waste materials within the sort of mine spoil dumps (Singh et al., 2004).

Global climate change caused by elevated carbon dioxide (CO_2) and other greenhouse gases has become one in all the imperative worldwide environmental topics of the twenty-first century and mitigating climate change has become a core analysis interest for all scientific communities. Forests covers 30% of total global surface and their role in mitigating negative effects of climate change has been highlighted as a result of forests act as a never ending carbon sink of 1.9-2.6 Pg C (1 Pg = 1015 g) per year (Tang, 2015). National forest carbon balance in Indian forests showed that forests are a major sink for atmospheric carbon (Haripriya, 2000; Gupta, 2009). Carbon stock in Indian forests has increased from 6663 to 6941 m tones from 2004 to 2011, thereby registering an annual increment of approximately 39.71 m tonnes of carbon. The carbon pool for the Indian forests is estimated to be 7,044 million tonnes (SFR 2016).

Eco-restoration is the process of assisting the recovery of structural and functional components of the ecosystem, which has been destroyed or degraded by mining activities. Restoration of mine sites usually entails amelioration of physical and chemical characteristics of the substrate and ensuring the return of vegetation cover (Schaller, 1993). Plantations play a vital role in providing timber, energy resources, soil and water conservation, restoration of degraded land, and