

Carbon sequestration potential of poplar-based agroforestry using the CO2FIX model in the Indo-Gangetic Region of India

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Abstract: Poplar (*Populus deltoides*) is one of the dominant and most preferred agroforestry species of the farming community of the Indo-Gangetic Region (IGR). The species is maintained at different rotation lengths depending upon farmers' management needs. The objective of the study was to compare carbon sequestration potential of poplar-based agroforestry systems in different parts of IGR using the CO2FIX model. Growth of trees, and yield of associated crops along with their area coverage, soil carbon, and litter fall were measured at Ludhiana (upper-IGR), Pantnagar (middle-IGR) and Pusa (lower-IGR). These data were used as inputs for CO2FIX. Two rotation ages (6 and 9 years) were simulated for 54 years. The simulation results showed that biomass decreased by 62.50% in the upper IGR when rotation was reduced by three years from 9 to 6 years. Similarly the decrease was 56.57% and 43.18% in middle and lower IGR. The initial soil carbon pools were 7.7, 19.5 and 6.9 Mg ha⁻¹ for upper, middle and lower IGR, respectively, which increased to 15.9, 22.792 and 15.092 Mg ha⁻¹ by the end of 9th year; and 10.4, 18.8 and 12.3 Mg ha⁻¹ by the end of the sixth year in first rotation. The net carbon sequestered was 47.2%, 51.7% and 31.4% less in 6 year rotation in upper, middle and lower IGR, respectively, as compared to 9 year rotation when compared for 54 years. The result suggests that in lower IGR shorter duration rotation of 6 years should be preferred and in upper IGR 9 year rotation is beneficial for carbon sequestration.