



Growth, biomass, carbon stocks, and sequestration in an age series of *Populus deltoides* plantations in Tarai region of central Himalaya

Gureveen ARORA¹, Sumit CHATURVEDI¹, Rajesh KAUSHAL^{2,*}, Ajeet NAIN¹, Salil TEWARI¹,
Nurnabi Meherul ALAM², Om Prakash CHATURVEDI²

¹G.B. Pant University of Agriculture & Technology, Pantnagar, India

²Central Soil and Water Conservation Research & Training Institute, Dehradun, India

Received: 23.07.2013 • Accepted: 07.12.2013 • Published Online: 27.05.2014 • Printed: 26.06.2014

Abstract: Growth, biomass, carbon storage, and carbon sequestration potential along an age series in *Populus deltoides* plantations were assessed. The growth rate of diameter at breast height and height was higher in trees of 4 to 7 years and 2 to 5 years, respectively. The total aboveground biomass (AGB) increased with age and reached its maximum (180.2 Mg ha⁻¹) at 11 years of age. Mean carbon concentration in aboveground components varied from 39.7% to 51.7%. Allometric equations were developed to estimate biomass and biomass carbon in different tree components, which had adjusted R squares greater than 94%. Aboveground carbon stocks in *P. deltoides* increased from 0.5 Mg ha⁻¹ at 1 year to 90.1 Mg ha⁻¹ at 11 years. The carbon sequestration rate (i.e. carbon sequestered in wood products and by the substitution of biomass for coal) in mature plantations (7–11 years) varied from 5.8 to 6.5 Mg C ha⁻¹ per year. Soil carbon stocks increased with age (1–11 years) from 61.2 to 66.8 Mg ha⁻¹ and decreased with soil depth. Soil carbon stock in different ages of plantations varied from 63.9 to 83.8 Mg ha⁻¹ at 0–30 cm depth, 57.5 to 60.1 Mg ha⁻¹ at 30–60 cm depth, and 55.5 to 59.7 Mg ha⁻¹ at 60–90 cm depth. The amount of total carbon stock (AGB and soil) increased from 64.4 Mg ha⁻¹ at 1 year to 173.9 Mg ha⁻¹ at 11 years. This study recommends *P. deltoides* planting as a viable option for sustainable production and carbon mitigation.