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## Biomass production, carbon sequestration and water transmission properties as influenced by densified plantations raised on old river bed lands in the north west Himalayas

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### ABSTRACT

Old river bed lands in the North West Himalayas have generally been utilized for the production of fodder and firewood but its quantitative biomass production and resource (carbon and water) conservation potential have not been worked out. Plantations of three tree species-*Grewia optiva* Drumm, *Bauhinia variegata* L. and *Dalbergia sissoo* Roxb. were raised during 1996, at 2x2m (close), 3x2m (medium) and 4x2 m (wide) spacings and were thinned mechanically at the age of 7, 12 and 15 years. The performance of *D. sissoo* was the best with trees attaining an average height of 9.87 m and 10.3 m in the 7<sup>th</sup> year and 12<sup>th</sup> year, respectively. *G. optiva* trees attained an average height of 5.67 m and 6.20 m at the same age. Foliage (as fodder) availability from annual prunings in *G. optiva* declined from the 11<sup>th</sup> year and woody biomass from the 8<sup>th</sup> year. More woody biomass was obtained at medium spacing and that of foliage at close spacing. First thinning in the 7<sup>th</sup> year yielded 54.70, 20.45 and 13.65 t ha<sup>-1</sup> of woody biomass at close spacing in *D. sissoo*, *G. optiva* and *B. variegata*, respectively, followed by production from medium and wide spacing. During the 2<sup>nd</sup> thinning at the 12<sup>th</sup> year, maximum woody biomass (100.50 t ha<sup>-1</sup>) was obtained from *D. sissoo* at medium spacing followed by 53.43 t ha<sup>-1</sup> from *G. optiva* at wide spacing and 34.94 t ha<sup>-1</sup> from *B. variegata* at medium spacing. Annual rate of increase of SOC in the 0-45 cm soil depth ranged from 502 to 1410 kg C ha<sup>-1</sup>. The humification rate was determined to be 0.195. Carbon sequestration rate varied from 1.32 to 0.55 t ha<sup>-1</sup> yr<sup>-1</sup> and followed the trend of *D. sissoo* < *B. variegata* < *G. optiva*.

### 1. INTRODUCTION

Increasing demographic pressure along with a large grazing animal population and absence of scientific land use practices has led to serious land degradation problems in India. Nearly 32.67% of India's geographical area is affected by various forms of soil erosion and land degradation. The area reported to be degraded in India varies widely, ranging from 63.9 m ha (Anonymous, 2000) to 187.70 m ha (Sehgal and Abrol, 1994), due to variations in approaches used to define degraded lands. The area under wastelands is estimated to occupy 63.85 m ha, which is 20% of the country's geographical area. The per capita land availability in India has steadily declined from 0.89 ha in

1951 to 0.37 ha in 1991 and is expected to be only 0.20 ha by 2035 (Singh, 2005).

Nearly 80% of the wood in developing countries is consumed as fuel, while in the developed countries the same quantity is used for industrial uses (Goodman 1986). Estimates indicate that by 2025, the demand for green fodder in India would be about 1170 m tones, which is three times the existing supply of 411 m tonnes. Firewood continues to be a major source of energy for domestic use in India. Current production of firewood from forest areas is 98 m tonnes and a net deficit of 86 m tonnes is obtained illicitly from forest areas, leading to irreversible damage to forest ecosystems all over the country and hydrological