



Performance of tree species and natural vegetation after rain water conservation in ravine land based on biomass, carbon stock and soil properties

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Abstract

Deep ravines along the Chambal river represent the worst form of land degradation by runoff water. Performance of seven tree species in terms of growth, biomass production, carbon stock (CS) and soil properties was observed after 8 years of plantation tree species and rejuvenation of natural vegetation (NV) on the degraded ravine land. The ravine area was treated with embankment type water harvesting structures (WHS) targeting complete control of runoff and support the vegetation. The total biomass CS was significantly higher in *A. nilotica* (13.44 Mg ha⁻¹) followed by *A. indica* (8.97 Mg ha⁻¹) and lowest in *A. catechu* (3.17 Mg ha⁻¹). The soil CS was significantly higher in *L. leucocephala* (4.67 Mg ha⁻¹) followed by *A. indica* (4.62 Mg ha⁻¹) and lowest in *A. catechu* (3.86 Mg ha⁻¹). Similarly in NV, higher biomass and CS were recorded with small trees followed by grasses, shrubs, climbers, and herbs. Under *A. nilotica* afforestation with NV, the highest mean annual CS rate was found to be 2.46 Mg ha⁻¹ yr⁻¹. Tree plantation of *L. leucocephala* led to maximum improvement of organic carbon (OC), water holding capacity (WHC) and a sum of all macronutrient availability followed by *A. indica*, *D. sissoo* and *A. nilotica* in treated ravine land. Combined ranking in terms of survival, height, the diameter of stumped height (DSH) and biomass yield showed that the preferred choice for tree species was in the order of *Acacia nilotica* > *Azadirachta indica* > *Prosopis juliflora* > *Leucaena leucocephala* > *Balanites aegyptiaca* > *Dalbergia sissoo* > *Acacia catechu*.

Keywords: Carbon stock, Deep gully, Soil properties, Tree species, Water harvesting structures