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“Development on the margin”

Degraded Land Rehabilitation of Coltan Mining Sites in Western Rwanda with Local Organic Materials

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Abstract

Little is known about the effectiveness of low-input methods to rehabilitate wastelands from coltan (tantalum) mining in Africa. This study therefore investigated a combination of organic soil amendments to promote the growth of leguminous agro-forestry species on degraded soils of the Gatumba region of Western Rwanda. Three fast-growing leguminous species, *Tephrosia vogelii* Hook., *Leucaena diversifolia* (Schlecht) Benth and *Cajanus cajan* (L.) Millsp. were grown over four months on three substrate types collected from the local mining sites: a pegmatite dump (S1), a technosol (S2), and a pegmatite dump developing into a gleysol (S3). These substrates were amended 1:1 (w/w) with (i) compost (kitchen refuse plus garden waste, S1/S2/S3+CP), (ii) manure (cattle faeces plus bedding and urine, S1/S2/S3+M) and the equal part combination of compost plus manure (S1/S2/S3+(CP+M)). Manure and compost were applied at 5 t dry matter (DM ha⁻¹). For all species, the growth parameters including survival rates (2 months after sowing; MAS), plant height (4 MAS), shoot dry matter (4 MAS) and root dry matter (RDM; 4 MAS) were determined. Survival rate of *T. vogelii* was highest compared to the other species and varied from 39 % (S1+M) to 56 % (S1+CP+M); 50 % (S2+M and S2+CP; respectively) to 61 % (S2) and from 28 % (S3+CP) to 67 % (S3). Irrespective of soil types and species, substrate amended treatments yielded higher plants than unamended controls. *C. cajan* plants were highest averaging 54.4 cm for S1+CP+M, 60.2 cm for S2+CP+M, and 47.9 cm for S3+M. Although heights of *T. vogelii* were smallest regardless of substrate, its shoot dry matter (29.3 g plant⁻¹) and root dry matter (0.9 g plant⁻¹) was highest on S2 due to the combined effects of CP+M. On S3 manure application promoted the shoot development of all species, but most for *T. vogelii* (21.6 g plant⁻¹) corresponding to a 91 % increase compared to the unamended control. Of the species tested *T. vogelii* seems most suitable for the recultivation of degraded mining soils given its high survival rate. Its development can be substantially enhanced by the application of compost or compost+manure.

Keywords: Agro-forestry species, coltan mine reclamation, compost, manure shoot and root biomass, survival rate