

A balancing act: using biowastes for rehabilitation of degraded land

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Most municipal biosolids have high levels of nutrients and organic matter. Hence biosolids are used to rehabilitate mined land where topsoil supplies are inadequate. This paper reports the efficacy of biosolids for rehabilitation of coal mined lands in Waikato. A trial established in 2007/08 investigated effects of 0, 50, 100, 200 and 400 dry T/ha biosolids mixed into ash overburden before planting pasture. Biosolids were also applied to the surface of about 40 ha of 1- and 2-year-old pine seedlings at agronomic rates (30 to 50 dry T/ha). We measured plants and soils in 2015/16 in control and biosolids areas. The pines were at canopy closure.

Effects of biosolids differed with site, plant species, and bio-solid source. Conventionally-rehabilitated (control) soils are nutrient deficient despite basal fertiliser additions (e.g., Olsen P =5 mg/kg; Total N 0.22%). A single, incorporated application of about 100 dry T/ha biosolids achieved sustained N and P enhancement (Olsen P >80; Total N ~ 0.3%) resulting in dramatically higher pasture biomass. This increased resistance to surface erosion and reduced invasion of wind-blown weeds such as pampas. Pine trees also showed increased growth rates, however the over-riding factor controlling pine productivity was soil drainage. Areas with poor drainage (low slopes and/or absence of ripping) had unacceptable tree mortality and poor form. Reduced tree value was not mitigated by biosolids application at this stage.

Plant available moisture was increased at the highest biosolids rate (400 T/ha), but at this rate the 'fresh' biosolids with higher N content suppressed pH to 4.5 (from ~ 5.7) and increased extractable Al to levels that inhibit legumes. Metal concentrations showed a strong dose-related gradient, and were influenced by the source of biosolids. A single 200 T/ha rate, incorporated to 300 m depth maintained concentrations of all metals at less than half the resource consent ceiling values