Physical and chemical characteristics of composted wastes can be altered to make them suitable for large scale habitat recreation

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Using composted wastes for large scale land restoration and vegetation re-establishment has the potential to mitigate declining levels of soil organic matter (SOM), offset anthropogenic emissions of CO_2 and increase biodiversity. However, the physical and chemical characteristics of composted wastes make them unsuitable for recreating several important European habitats without modification.

Above a certain 'threshold' level of fertility, the species richness of grasslands is generally inversely related to the availability of nutrients, particularly phosphorus (P). Composts often have neutral pH, relatively high available nitrogen (N) and P and poor moisture retention hence applying large nutrient additions in compost to bare sites may result in species poor grassland. The high nutrient availability and neutral pH of composted wastes also makes them unsuitable for establishing upland acidic plant communities of conservation priority, for example heather (*Calluna vulgaris*) moorland.

Composts can be tailored to meet the requirements of target species by careful selection and mixing of wastes prior to composting and by mixing industrial by-products with the finished compost. Results from pot trials demonstrate that the pH of green waste compost is reduced by 3 pH units by including elemental sulphur (a by-product from the petrochemical industry) at 1.5 % total dry weight. This increases the availability of P with a consequent three-fold increase in the productivity of perennial ryegrass (*Lolium perenne*). Whilst this agronomic benefit of increased plant available P in compost is clear, this approach should be used with caution since acidification also increases the mobility of several undesirable metals present in compost and may have a negative impact on grassland species richness. For land restoration, excess P can be efficiently precipitated using iron rich wastes (from mining or water treatment) creating compost of low pH and available P more suited to ericaceous plants.

The suitability of six composts created in-vessel from different combinations of green waste, paper mill fibre (from paper recycling) and treated sewage sludge for reinstating biodiverse mesotrophic (meadow) grassland on the site of a former steelworks (Shotton, Flintshire, UK) is being assessed using a randomised complete block field experiment sown with seed harvested from a meadow SSSI. Plant and insect diversity and soil properties will be followed for at least two years and the similarity of the experimental plots to the target habitat assessed. The aim of field experiments established recently at Blaenau Ffestiniog (Gwynedd, UK) is to return areas of bare slate waste to upland acidic grassland and heather moorland. We are testing the hypothesis that including fine mineral slate waste in compost increases its plant available water content and consequently the survival of heather.

When co-composted with organic wastes or when added to composts, many industrial wastes and by-products possess chemical or physical properties that improve suitability for land restoration. However current waste management legislation is a constraint on research into the use of many potentially beneficial waste additives.