

New hope for BROWNFIELD sites

A strategy offering the 'most cost-effective and least environmentally disruptive way of bringing erstwhile redundant land back into biomass production', reports **Dr Terry Mabbett**, has emerged from research work carried out by a postgraduate student at Imperial College London. The preliminary findings of Penny Morris, on the college's forest protection and conservation MSc course, indicated the potential for use of 'simple' chemical reagents in situ to clean up heavy metal-contaminated soil without resorting to complete removal or containment of the soil.

Considerable areas of brownfield site could be rehabilitated and planted with fast-growing trees like poplar and willow if it were not for contamination of the soil by heavy metals including arsenic, cadmium, copper, zinc and lead.

Trees freely take up these metals as ions as they grow with substantial concentrations often accumulating in the tissue. Such trees have been planted and employed for phytoremediation of contaminated soils but, at the end of their life cycle, metal ions still have to be removed from wood and safely disposed of when trees are felled.

Much better all round is the establishment of trees that eat insects, birds and other animals that feed and/or breed on them, cleaning the soil of contamination prior to planting. This is best achieved in situ remediation technologies for hazard limitation without total removal or complete containment of soil.

Penny Morris used synthetic manganese oxides as potential soil amendments to immobilise heavy metals and reduce their availability to trees and other plants. She conducted experiments at three UK locations where soils were contaminated with heavy metals from different sources.

She set up soil batch experiments to investigate the effect of manganese (IV) oxide on extractable arsenic (As), cadmium (Cd), copper (Cu), lead (Pb) and zinc (Zn) concentrations when applied in isolation or as a co-amendment with green waste compost. Off-the-shelf manganese (IV) oxide, at 0.25%, 0.5% and 1.25%,



Fast growing willow is ideal for rehabilitation and afforestation of brownfield sites.

failed to achieve significant reduction in any extractable metal concentration and is not considered a useful remediation product.

With green compost waste in the 'equation', results differed for extractable Cd, Cu, Zn and As concentrations, depending on soil properties. Pb ions were already strongly bound within the soil complex prior to application and therefore additional soil amendments like phosphates are required.

Penny then set up 'spiked' batch experiments to investigate the metal sorption capacity of different chemical

forms of manganese oxide without soil as an interacting factor. Activated manganese (IV) oxide and manganese (III) oxide showed high metal sorption capacity. Both oxides absorbed more than 99% of As in solution and activated manganese oxide absorbed over 99% of Zn in solution.

Experiments to determine the effect of manganese (III) oxide on the bioavailability of these metals indicated reduced As uptake by plants, further supported by final soil batch experiments in which manganese (III) oxide significantly reduced extractable concentrations of arsenic (As).



New LAMBERHURST agency

Lamberhurst Engineering Limited*, the UK distributor of Ferrari Tractors, Pellenc electric pruners, Seppi and Berti mulchers have been appointed UK agents for Caroni Spa. Caroni's roots go back more than 50 years: from being a small business founded by Stefona Caroni, the firm has now become a productive manufacturer of automotive components and agriculture and ground care machinery throughout the world.

The machinery can be used with any tractor and on any type of ground for maintenance, tending and cleaning of landscaped areas: from parks to motorway verges, golf

courses to home gardens.

Grass choppers, stalk shredders, front, central, rear and multiple mowers, collecting baskets, rotary tillers for different types of soil and bio-shredders are just some of the special attachments available for tractors. More than 10000 units are produced each year and sold throughout the world.

Managing director, Andrea Caroni, said he is delighted to be working with a British engineering company which places great emphasis on excellence at all stages, from parts supply and technical assistance through to machinery sales.

* 08456 121141.