Compost use for geotechnical stability

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Introduction

Recycled construction waste may be used to engineer road and railway embankments, however recovered soil is often of low fertility and maybe further damaged during construction by mixing and stockpiling. Vegetation can be used to reinforce slopes but in the early stages of establishment the slope is vulnerable to shallow fail and erosion. We propose the use of compost to improve fertility of reclaimed soil, thus improving the rate of vegetation establishment and slope stabilisation.

Methods

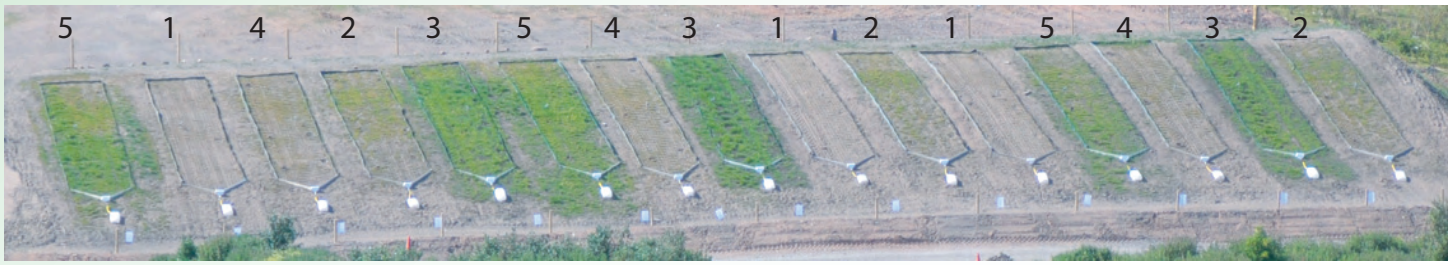


Fig. 1: The slope six weeks after planting. Compost was applied in 5 treatments: 1) no compost control, 2) 35 t ha^{-1} surface appplied, 3) 300 t ha^{-1} surface appplied, 4) 35 t ha $^{-1}$ incorprated to 10 cm and 5) 300 t ha^{-1} incorprated to 10 cm

A slope was constructed of mineral fill waste overlayed with top soil. Compost treatments were applied and an amenity grass mix sown (Fig. 1). Sub plots were hydrologically isolated. For twelve weeks post planting, the slope was sampled for physical (including soil moisture, matric potential, water retention, shear strength,), chemical (pH, DOC, nitrate and ammonium) and biological (percentage cover, root length, sward height) parameters.

Results

Vegetation establishment and soil strength

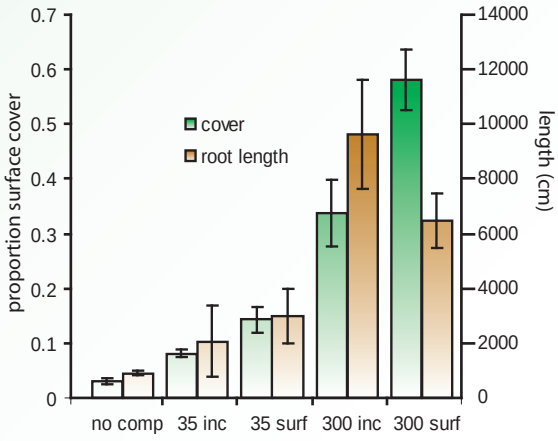


Fig 2: Week 12 proportion of surface vegetation cover in a 0.5 m^2 quadrat and total root length in a 392 cm^3 section of soil core.

The proportion of vegetation cover was significantly higher at week 12 in the high level compost plots, compared to the standard treatment which was higher than the no compost control (Fig. 2). Total root length was also greater in the high compost treatments.

Greater root growth is reflected in the shear strength of the soil: in week 7, 300 t ha^{-1} treatments showed significantly higher peak stress, with 35 t ha^{-1} treatments higher than control. In week 12, 300 t ha^{-1} treatments remained significantly higher than all other treatments (Fig. 3).

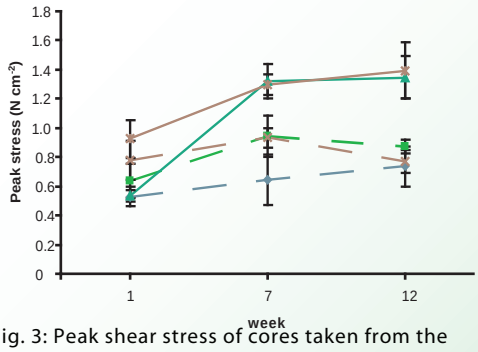
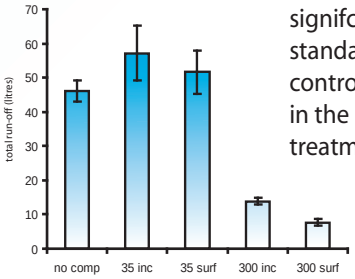


Fig. 3: Peak shear stress of cores taken from the crest, middle and toe of plots. Compost amendments are shown in broken line (35 t ha^{-1}), solid line (300 t ha^{-1}), green (surface applied) and brown (incorporated). The no compost control is shown in grey. Bars show the standard error, n=9.

Run off



Run off volume was signifcantly higher in standard compost and control treatments, than in the high compost treatments (Fig. 4).

Fig. 4: Total run off collected over 12 weeks.

Conclusions

The results show considerable benefit of the use of compost in a stabilising a slope made of degraded soil, as shown through increased plant establishment, shear strength, erosion control and water infiltration rates.

Acknowledgments

This work was funded by WRAP.
The slope was constructed by Delson Contracts Ltd.
Compost and field site were supplied by Dundee City Council.