Case study: Landscape and regeneration

Quality compost helps Scottish quarry cut costs

The case for greener brownfield regeneration

Lafarge Cement’s Dunbar Works in East Lothian, Scotland, manufactures over a million tonnes of cement each year for construction projects across Scotland and the north of England. Over three million tonnes of material are required each year from the Works’ limestone quarry to produce cement; this is done by using an opencast strip mining technique, moving east to west in 30-metre wide strips between 800 and 900 metres long. Although progressive restoration follows this strip mining, the natural topsoils are sandy, stony and nutrient poor – rendering restoration to a good agricultural standard difficult.

The purpose of the project was to examine the potential for quality compost to improve poor quality replaced topsoils to standards sufficient for woodland, rough grazing and pasture.

Method
WRAP selected Dunbar Works as an ideal trial site to investigate the benefits of mixing quality compost with existing poor-quality topsoils to improve their condition. Although Dunbar Works now employ a process of rolling restoration, replacing removed topsoils as the quarry is extended, this has not always been the case, with some topsoil stored on the site for more than a decade without re-use. This project mixed quality compost with these stock-piled soils.

Improving the soil in this way is expected to support a range of applications, including:
- improvement of rough grazing land;
- water holding and erosion prevention on slopes; and
- establishment and growth of native woodland.

As a large proportion of the restoration work involves growing grassland and woodland, the improvement of soil could significantly enhance the final results.

The project ran between November 2006 and November 2007. Initial results are outlined overleaf, but further evaluation will continue until at least 2009. The BSI PAS 100 compost was sourced from Scottish Water Waste Services in Deerykes, near Glasgow, and SAC (Scottish Agricultural College) have been providing scientific advice for the site.

Results
When incorporated into the top 25cm of topsoil, the compost had beneficial effects on a number of important soil chemical and physical properties including organic matter content, bulk density, water holding capacity and cation exchange capacity.

- Establishment of natural vegetation in amenity grassland was faster and more complete (in terms of percentage soil cover) in the soils which had compost incorporated at 10% of the top 25cm by volume, in comparison with un-amended soils and soils which had had compost incorporated at only 5%.

Key facts
- The trailblazer project used compost to improve the condition of poor quality, restored topsoils, and also allowed Lafarge to take advantage of a soil resource that had been stockpiled on site for a number of years with no other prospect of re-use.
- The trailblazer site has used 2,300 tonnes of BSI PAS 100 compost to help restore the topsoils.
- In general, for restoring soils to rough grazing and pasture, the greater the volume of compost, the better the quality of the soil.
- For restoring soils to woodland, a 10% addition of compost to the top 40cm of restored soils provided the best initial establishment rates.
Establishment of ryegrass in a quality sward was fastest and most complete (in terms of percentage soil cover) in soils which had compost incorporated at 25% of the top 25cm by volume, in comparison with un-amended soils and soils which had had compost incorporated at 5, 10, 15 or 20%.

Early results suggest that there may be benefits to native tree establishment and growth if compost is incorporated at 10% into the top 40cm of topsoil used for tree plantings, particularly with regard to improved survival rates of some species. However, monitoring over a longer term is required in order to draw definitive conclusions.

Conclusion

The compost has helped the soil in a number of ways, including boosting its organic matter and plant nutrient content. There was some evidence that it had improved soil physical properties too, which is important in land restoration. The trial has also enabled the compilation of valuable information relevant to the quarrying and mining industry across the UK, as it looks to restore land for agricultural use. This trial has shown that by incorporating compost as part of the restoration process, the soils become more robust and therefore capable of supporting agricultural applications.

Jeremy Elvins, Lafarge Cement’s National Minerals Manager, explains further: “We were interested in taking part in the project as we had a shortage of topsoil and the quality compost appeared to be the best form of organic matter to use for replicating natural top soil conditions, both physically and nutrient-wise. We also needed to ensure that the compost blends did not produce any unacceptable leachate, so by using a fully tested and approved material we were assured of this.

“Crucially, this project builds on our track record of sustainability at the Works.”

In due course, Lafarge Cement are also interested in examining whether compost use could reduce erosion on a sloping section of the restored site, as well as its role in restoring land to a higher quality than the pre-mined land. This will help with community relations and could mitigate the apparently damaging effects of mineral extraction.