From Forest Nursery Notes, Summer 2007

137. © Comparison of slow-release nitrogen yield from organic soil amendments and chemical fertilizers and implications for regeneration of disturbed sites.
Claassen, V. P. and Carey, J. L. Land Degradation & Development 18:119-132. 2007.

LAND DEGRADATION & DEVELOPMENT

Land Degrad. Develop. **18**: 119–132 (2007)

Published online 19 December 2006 in Wiley InterScience (www.interscience.wiley.com). **DOI**: 10.1002/ldr.770

COMPARISON OF SLOW-RELEASE NITROGEN YIELD FROM ORGANIC SOIL AMENDMENTS AND CHEMICAL FERTILIZERS AND IMPLICATIONS FOR REGENERATION OF DISTURBED SITES

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Received 10 July 2005; Revised 13 March 2006; Accepted 12 June 2006

ABSTRACT

Soil amendments are commonly used to regenerate nutrient levels on disturbed construction sites or mined lands prior to revegetation. Management of nitrogen (N) inputs to the degraded substrates is difficult because the low level of ambient fertility on disturbed substrates requires large total N inputs to sustain revegetative growth, but it also requires low N bioavailability in order to avoid weedy invasion and eutrophication of local watersheds. Commonly available soil amendment materials have a wide variety of N contents and release rates, making specification of appropriate N amendments difficult. We compared N release rates of a variety of organic-based soil amendments and chemical fertilizers in long-term aerobic incubation chambers in the lab and at a field revegetation site. The N release rate from these amendments fell into four general groups: (1) rapid N release from soluble chemical fertilizer formulations, (2) longer, controlled N release from chemical-based, slow-release formulations, and a two-phase release pattern (rapid initial phase, slower second phase) from (3) organic-based blends, as well as (4) unsupplemented municipal yard-waste composts. The release rates from organic-based amendments were about three times faster in the 30°C laboratory incubations than in the cool, moist winter growing season at a field site in the Central Valley of California. Relative rates of N release can be compared between amendment materials to help guide selection of N amendments, according to the plant-growth goals of the revegetation project. Copyright © 2006 John Wiley & Sons, Ltd.

KEY WORDS: *nitrogen; mineralization; composts; biosolids; soil nitrogen pools; revegetation; soil amendment*

INTRODUCTION

Drastically disturbed substrates, from which all topsoil and biological activity has been removed by construction, mining, or erosion (Box, 1978), commonly require chemical fertilizers or organic amendments to regenerate soil fertility (Bradshaw and Chadwick, 1980; Munshower, 1994). Soil organic amendments made from yard waste composts, biosolids/compost mixes or from organic by-products are increasingly common, and can effectively improve soil physical properties as well as improve fertility (Aggelides and Londra, 2000; Anikwe, 2000; Barajas-Aceves and Dendooven, 2001). The rate of N release from amendments, however, varies greatly, ranging from rapid release rates from soluble chemical fertilizer formulations to slower but extended periods of mineralization of N from stabilized organic materials. Because N has a strong influence on plant growth, and competition (McLendon and Redente, 1992; Wedin and Tilman, 1996; Stevens *et al*., 2004), N availability and the rate of N release from the amendment materials can be a predominant factor in the development and eventual composition of the revegetated plant community.

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Contract/grant sponsor: California Department of Transportation, Research Technical Agreement 53X461.