Testing a New Type of Fertilizer to Improve Nursery Production of Framework Tree Species for Forest Ecosystem Restoration in Northern Thailand

Panya Waiboonya[1,3*] and Stephen Elliott [2]

[1]Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[2]Forest Restoration Research Unit, Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
[3]Bodhivijjalaya College, Srinakharinwirot University, Tak 63110, Thailand

*****Corresponding author. E-mail: panyawa@g.swu.ac.th*

https://doi.org/10.12982/CMUJNS.2019.0028

Received: *September 11, 2018*
Revised: *February 11, 2019*
Accepted: *February 21, 2019*

ABSTRACT

To improve planting-stock production of native forest tree species for tropical forest ecosystem restoration projects in northern Thailand, we compared a new controlled-release fertilizer, developed by NANOTEC, with our current standard fertilizer treatment for its effects on sapling growth and biomass allocation in a small-scale tree nursery. Eight species were tested: Artocarpus lacucha, Adenanthera microsperma, Acrocarpus fraxinifolius, Hovenia dulcis, Horsfieldia amygdalina, Phyllanthus emblica, Prunus cerasoides and Syzygium albiflorum, using a randomized complete block design with three treatments x three replicates of nine plants per replicate for each of the eight species. The treatments were NANOTEC fertilizer, applied once at doses 0.30 g or 0.15 g per sapling, two weeks after pricking out small seedlings from germination trays into plastic bags 23 cm x 6 cm, compared with 0.30 g Osmocote® 13:13:13 (our current most effective fertilizer treatment). Sapling growth (height, crown width and root collar diameter) was then measured over 121 days. The new NANOTEC fertilizer, at both doses, performed equally as well as Osmocote®. With very few exceptions, differences in mean sapling growth performance, biomass, root:shoot ratio

***and remaining nutrients* (*N, P and K*) *in the potting medium, among all the fertilizer treatments, were not statistically significant, for every individual species and when treatment data were combined for all species*. *Consequently, the locally produced NANOTEC fertilizer, at 0.15 g/tree, could be used as a cost-effective substitute for 0.30 g Osmocote®, provided that its retail price is similar to or lower than that of Osmocote®, when it enters mass production*.

Keywords: Sapling growth, NSTDA, Sapling propagation

INTRODUCTION

The production of saplings of a wide range of native forest tree species is vital for effective forest ecosystem restoration, wherever natural regeneration in insufficiently dense to meet restoration goals. High-quality planting stock ensures high survival and growth of trees, after they have been planted out in the unfavorable conditions that prevail on deforested sites. This results in rapid achievement of the first critical milestone of forest ecosystem restoration: canopy closure and the elimination of light-demanding herbaceous weeds. Consequently, good nursery practices contribute substantially towards restoration success.

The Forest Restoration Research Unit, Department of Biology, Chiang Mai University (FORRU-CMU) has been developing effective restoration techniques since 1994. The unit adapted and further developed the framework species method to successfully and rapidly restore a diverse range of forest ecosystem types across Thailand and in some neighboring countries (Elliott et al., 2013). Originally conceived in Australia, (Goosem and Tucker, 1995), this approach attracts seed-dispersing wildlife into sites undergoing restoration (Wydhayagarn et al., 2009), which promotes rapid diversification of the understory, resulting in accelerated biodiversity recovery and carbon accumulation (Elliott et al., 2013; Kavinchan et al., 2015; Jantawong et al., 2017).

The framework species method depends on the production of high-quality saplings of 20 to 30 tree species that are characteristic of the target forest ecosystem type being restored. FORRU's nurseries on Doi Suthep and at Ban Mae Sa Mai (Chiang Mai Province, northern Thailand) produce more than 50,000 trees per year for this technique. Our nursery staff germinate locally-collected seeds in germination trays, then transfer the seedlings (at the 2-node stage) into plastic bags (23 cm x 6 cm) for growing-on. Weeding, grading, pruning and fertilizer application are carried out, as required, to produce saplings 30-50 cm tall by the optimum planting time (mid-June in northern Thailand).