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RESEARCH ARTICLE

Improving Planting Stocks for the Brazilian Atlantic Forest Restoration through Community-Based Seed Harvesting Strategies

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Abstract

High-diversity reforestation can help jumpstart tropical forest restoration, but obtaining viable seedlings is a major constraint: if nurseries do not offer them, it is hard to plant all the species one would like. From 2007 to 2009, we investigated five different seed acquisition strategies employed by a well-established tree nursery in southeastern Brazil, namely (1) in-house seed harvesters; (2) hiring a professional harvester; (3) amateur seed harvesters; or (4) a seed production cooperative, as well as (5) participating in a seed exchange program. In addition, we evaluated two strategies not dependent on seeds: harvesting seedlings from native tree species found regenerating under *Eucalyptus* plantations, and in a native forest remnant. A total of 344 native tree and shrub species were collected as seeds or seedlings, including 2,465 seed lots. Among these, a subset of 120 species was obtained through seed harvesting in each year. Overall, combining several strategies for obtaining planting stocks was an effective way to increase species richness, representation of some functional groups (dispersal syndromes, planting group, and shade tolerance), and genetic diversity of seedlings produced in forest tree nurseries. Such outcomes are greatly desirable to support high-diversity reforestation as part of tropical forest restoration. In addition, community-based seed harvesting strategies fostered greater socioeconomic integration of traditional communities in restoration projects and programs, which is an important bottleneck for the advance of ecological restoration, especially in developing countries. Finally, we discuss some of the limitations of the various strategies for obtaining planting stocks and the way forward for their improvement.

Key words: forest nurseries, functional groups, high-diversity reforestation, restoration genetics, seedling production, tropical forest restoration.

Introduction

One of the nine attributes of restored ecosystems proposed in the Society for Ecological Restoration (SER) Primer is the presence of "a characteristic assemblage of the species that occurs in the reference ecosystem and that provides appropriate community structure" (SER 2004). However, historical degradation of some natural ecosystems has compromised their resilience, so that active restoration is frequently needed to reintroduce a large pool of typical native species from tropical rainforests (Chazdon 2008; Holl & Aide 2011; Rodrigues et al. 2011).

In the Brazilian Atlantic Forest region, low forest cover and fragmentation (Ribeiro et al. 2009), extirpation of avian frugivores (Silva & Tabarelli 2000), and on-going degradation of forest remnants (Tabarelli et al. 2010) have reduced seed dispersal, which in turn hinders enrichment of restoration areas through natural processes (Souza & Batista 2004; Bertoncini & Rodrigues 2008). Indeed, poor seed dispersal is one of the main factors limiting restoration success in tropical areas worldwide (Holl et al. 2000; Donath et al. 2003; White et al. 2004). Hence, to reestablish a significant proportion of the plant diversity of a tropical forest restoration site in human-dominated landscapes, a significant pool of native species should be intentionally reintroduced. To face these challenges, high-diversity reforestation can be an effective restoration methodology in the early stages of a project or program (Larvajaara 2008; Rodrigues et al. 2009, 2011).

In this context, nurseries assume an important role by providing desirable and—ideally—well-identified planting stock

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