

# Tree and shrub seed dispersal in pastures: The importance of rainforest trees outside forest fragments<sup>1</sup>

Javier LABORDE<sup>2</sup>, Sergio GUEVARA & Graciela SÁNCHEZ-RÍOS, Instituto de Ecología, A.C., km 2.5 Carretera antigua a Coatepec # 351, Congregación El Haya, Xalapa 91070, Veracruz, Mexico, e-mail: javier.laborde@inecol.edu.mx

**Abstract:** Forest recovery in tropical pastures is limited by seed dispersal, mainly because the seed dispersers of woody plants avoid deforested areas. In Los Tuxtlas, Mexico, we fenced in isolated fig trees that had been left to provide shade in pastures. We monitored seed deposition under their canopies over a year and sampled the established vegetation after 3 y. Dispersal distances were estimated for captured seeds and established plants, assuming that the nearest conspecific adult rooted within 75 m of the fig tree was the mother. Seventy tree and shrub species were captured in seed rain, with a cumulative density of 833 seeds·m<sup>-2</sup>·y<sup>-1</sup>. After 3 y, 77 species of trees and shrubs had established (density: 4.0 plants·m<sup>-2</sup>). Seeds < 7 mm in diameter were frequently dispersed over distances greater than 75 m across the pasture. Larger seeds were dispersed over shorter distances and in much lower numbers, but once they had arrived at the isolated fig trees, germination and establishment success was higher than it was for small seeds. Rainforest trees isolated in pastures have an enormous potential for catalyzing and accelerating secondary succession by acting as regeneration nuclei. Because of their location, they are also extremely important seed sources for forest recovery, provided that they are visited by pollinators and seed dispersers.

**Keywords:** dispersal limitation, landscape matrix, secondary succession, seed size, seed sources.

**Résumé :** La reforestation de pâturages tropicaux est limitée par la dispersion des graines, principalement parce que les agents de dissémination des graines des plantes ligneuses évitent les aires déboisées. À Los Tuxtlas au Mexique, nous avons clôturé des figuiers isolés qui avaient été laissés dans des pâturages pour procurer de l'ombre. Nous avons suivi pendant un an la déposition de graines sous leur canopée et échantillonné la végétation établie après 3 ans. Les distances de dispersion pour les graines récoltées et les plants établis ont été estimées en considérant que le figuier adulte le plus près dans un rayon de 75 m de l'arbre étudié était le parent maternel. Soixante-dix espèces d'arbres et d'arbustes ont été récoltées dans la pluie de semences avec une densité cumulative de 833 graines·m<sup>-2</sup>·y<sup>-1</sup>. Après 3 ans, 77 espèces d'arbres et d'arbustes s'étaient établies (densité : 4,0 plants·m<sup>-2</sup>). Les graines de < 7 mm de diamètre étaient fréquemment dispersées sur des distances de plus de 75 m dans le pâturage. Les graines de plus grande taille étaient dispersées sur de plus courtes distances et en nombres beaucoup moins élevés, mais une fois arrivées près des figuiers isolés, leur succès de germination et d'établissement était plus élevé que pour les graines de petite taille. Les arbres des forêts tropicales humides isolés dans des pâturages ont un potentiel énorme de catalyser et d'accélérer la succession secondaire en tant que noyau de régénération. De par leur localisation, ils sont aussi des sources extrêmement importantes de graines pour la reforestation en autant qu'ils soient visités par des pollinisateurs et des agents de dissémination des graines.

**Mots-clés :** limitation de la dispersion, matrice de paysage, sources de semences, succession secondaire, taille des graines.

**Nomenclature:** Ibarra-Manríquez & Sinaca, 1995; 1996a,b.

## Introduction

As recently as the 1960s extensive areas of the Americas were still covered by tropical rain forest (TRF), but many of these areas have since been transformed into human-made pastures. The destruction and fragmentation of TRF to make way for pastures has drastically reduced the exceptional biodiversity of the humid tropics, particularly in the Americas (Toledo & Ordóñez, 1998). In addition to the disheartening loss of biodiversity, the anthropogenic transformation of these landscapes has been so severe that the prospect of forest recovery in areas with extensive agriculture is almost nonexistent, and the resilience of the ecosystem is in jeopardy. An understanding of the factors

and processes that affect forest regeneration positively and negatively in the pastures located in these fragmented landscapes is of paramount importance. As mentioned by Holl (2002), the study of forest recovery in pastures is crucial not only for implementing successful restoration projects, but also for broadening the theory and our understanding of succession.

Current pasture management practices, such as the frequent weeding of woody plants and high stocking densities, quickly exhaust the resprouting capacity of woody stumps and roots, and they also deplete the soil seed bank of woody plants, replacing it with the abundant seeds of grasses, forbs, and weeds. After just a few years of pasture use the sole route for the establishment of woody plants is seed dispersal from nearby sources into the pasture (Janzen, 1986; Guevara *et al.*, 1992; Holl, 1999; Wijdeven & Kuzee, 2000;

<sup>1</sup>Rec. 2006-12-18; acc. 2007-07-13.

Associate Editor: Maria Luisa Martínez.

<sup>2</sup>Author for correspondence.