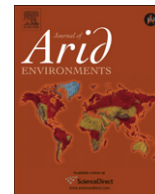


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Think note

Nursing the caatinga back to health

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ABSTRACT

We argue for the use of nurse plants as an effective way to restore the Brazilian semiarid biome (the caatinga) – Brazil's most neglected ecosystem. This is a very topical issue in the light of the current publicity and controversy surrounding the alterations to the Brazilian Forest Code. We want to alert policy makers and land-owners to potential new ways to restore the Caatinga.

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The semiarid caatinga of northeastern Brazil is a complex mosaic of thorn-scrub, xerophytic vegetation bordered by the Atlantic and Amazonian forests to the east and the west, and the cerrado to the south. The fauna and flora of the caatinga show highly variable levels of species diversity and endemism among taxonomic groups. While only 10 out of 143 recorded species of mammals are endemic (Oliveira et al., 2003), there are at least 318 endemic species of succulents or woody plants (Giulietti et al., 2004) and probably many more yet to be discovered. Mares et al. (1985) suggest that the low level of endemism in the mammals of the caatinga may be a result of the high degree of climatic unpredictability and the high mobility of this taxon that allows them to use more humid refuges during drought conditions.

The extreme unpredictability of the climate creates very stressful environments for sessile organisms such as plants and is an important consideration in the design of restoration projects. Theory predicts that the importance of facilitative interactions increases as environmental conditions become more stressful (Bertness and Callaway, 1994). If this is correct (cf. Holmgren and Scheffer, 2010), traditional restoration techniques based on the reduction of competition may be particularly ineffective in the

caatinga biome. A possible (and as yet untried) alternative that directly exploits the process of facilitation is the use of nurse plants – adult plants, normally shrubs, that have a positive effect on the emergence and survival of seedlings (Gómez-Aparicio, 2009; Niering et al., 1963; Suzán-Azpiri and Sosa, 2006). Facilitation through nurse plants is normally caused by their positive impacts on the surrounding microclimate – under drought conditions shrubs may increase soil nutrient and moisture content and act as a buffer against high radiation and temperatures (Callaway, 1995; Padilla and Pugnaire, 2006).

There are several reasons to believe that restoration based on nurse plants would be particularly appropriate and effective in the caatinga. First, the extreme spatial and temporal variability in rainfall and the high temperature means that water stress is the key biophysical variable that determines seedling survival. Second, preliminary research indicates that facilitative interactions may be widespread in the caatinga and exert an important influence on community structure. Meido (2008) describes how the proximity of the shrub *Trischidium molle* (Fabaceae) increased germination of other species from the seed bank in the Catimbau National Park, Northeast Brazil. Third, reproduction of woody plants in the caatinga ecosystem depends upon biotic vectors that can promote cross-pollination and gene flow (Leite and Machado, 2010). Thus, the use of nurse plants that are highly attractive to pollinators may increase pollinator visits to the target plants (Padilla and Pugnaire, 2006). Finally, nurse plants have been demonstrated to be effective

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for reforestation projects in the Mediterranean basin, another ecosystem that is subject to periodic and extreme droughts (Gómez-Aparicio et al., 2004). More generally, Gómez-Aparicio (2009) demonstrated that semiarid and tropical systems are more likely to produce positive neighbor effects than mesic temperate systems.

Demonstrating the effectiveness of nurse plants in the caatinga and developing clear restoration protocols for this unique biome should be a priority. Many restoration projects in Brazil are poorly thought out and planned and there continues to be a large gap between research and restoration practices within the country (Souza and Batista, 2004). Closing this gap requires that effective and ecosystem specific restoration methods are quickly and effectively converted into policy and practice. Moreover, recent and well publicized changes in Brazil's forest protection legislation have opened a brief window of opportunity for improved restoration practices. The country's Forest Code, which dates back to 1965, was significantly altered last April by the Chamber of Deputies (Law N° 12.651). Presidential vetoes have ensured that, for now at least, there is still an obligation for farmers to restore vegetation on hills and river banks as these areas have the status of permanent preservation areas in the original Forest Code. It should be noted that at the present time these areas are largely indistinguishable from surrounding agricultural land in that they have been extensively degraded by cattle and the influence of slash-and-burn agriculture. Farmers have been given a deadline of five years to restore these protected areas in their properties. After this period, only the owners of rural properties who prove to have restored impacted areas will be entitled to agricultural financial credits.

Based on previous experience, and in the absence of further modifications of existing legislation, there is likely to be a rush by farmers to restore areas that have been illegally deforested. Thus, there is considerable urgency to develop cheap and effective methods of restoration for highly degraded biomes such as the caatinga. The use of nurse plants is one such method, but it will be

a race against time to demonstrate this to policy makers and land-owners in Brazil's most neglected ecosystem.

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