Agroforestry and biodiversity

Reference 1

Santos, PZF; Crouzeilles, R; Sansevero, JBB. 2019 Can agroforestry systems enhance biodiversity and ecosystem service provision in agricultural landscapes? A meta-analysis for the Brazilian Atlantic Forest. Forest Ecology and Management 433, 140-145. doi: 10.1016/j.foreco.2018.10.064

Background and objective

Agroforestry systems have been recommended as an environmentally friendly practice and cost-effective strategy of land management for forest landscape restoration. This is achieved by reconciling agricultural production and biodiversity conservation or enhancement at the landscape level. However, there are different types of agroforestry systems that contribute differently to biodiversity conservation and provision of ES. This study aims to quantify the effects of different agroforestry systems on biodiversity enhancement and ES provision in agricultural landscapes within the Brazilian Atlantic Forest. Here, only results regarding biodiversity are reported.

Search strategy and selection criteria

An extensive literature review was conducted using the SCOPUS, Web of Science, and Google Scholar datasets, employing a combination of the following key-words: Agroforest, Agrosilvopastoral, Silvopastoral, Atlantic Forest, and Brazil. It was also conducted the search using the same words in Portuguese. 1)studies conducted in the Brazilian Atlantic Forest, 2) studies comparing agroforestry and conventional production systems (agricultural, forestry monocultures, or pasture lands) with old-growth forests (the reference system), 3) studies showing quantitative measures of biodiversity and ES, and 4) studies with replicates for both agroforestry or conventional production systems and reference systems (old-growth forests).

Data and analysis

We conducted 10,000 bootstraps using only one comparison in each study to generate the mean effect size and the 95% confidence intervals. Outliers were removed to achieve normally distributed residuals, which were checked by plotting. All statistical analyses were performed using the software R, version 2.12.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
72	Land use in Brazilian atlantic forest.	1)biodiverse agroforestry systems (>5 different plant species), 2) simple agroforestry systems(<5 different plant species), 3) conventional agriculture or pasture.	Old-growth forests	Logarithm of ratio of biodiversity (mammals, birds, herpetofauna, invertebrates, plants) parameters (species richness, species abundance, species similarity, species diversity) in agroforestry systems to biodiversity parameters in reference systems (natural forests).	62%

Results

- Agroforestry and conventional production systems had lower values of mean effect size of biodiversity than old growth forest.
- In biodiverse agroforestry systems, values of biodiversity were 15% higher than in simple agroforestry systems, and 45% higher than in conventional production systems.
- Simple agroforestry systems had higher mean effect sizes of biodiversity (30%) when compared to conventional production systems
- NA
- NA

Factors influencing effect sizes

Type of agroforestry is the main factor influencing the outcomes.

Conclusion

Biodiverse agroforestry systems are most similar to natural forests, in terms of biodiversity conservation. Results highlight the influence of the type of agroforestry system over the maintenance of biodiversity in the Brazilian Atlantic Forest. From an applied perspective, these similar results highlight the fact that agroforestry systems are an alternative method to recover degraded lands in human-dominated landscapes and can reconcile production and conservation.