

Agroforestry and biodiversity

Reference 3

Plexida, S; Solomou, A; Poirazidis, K; Sfougaris, A. 2018 Factors affecting biodiversity in agrosylvopastoral ecosystems with in the Mediterranean Basin: A systematic review. *Journal of arid environments*, 151, 125-133. doi: 10.1016/j.jaridenv.2017.11.017

Background and objective

Global land-use change has caused declines in biodiversity through the direct loss of habitats, degradation of soil and water, overexploitation of native species, and the introduction of exotic species, leading to the degradation and unsustainable use of 60% of the ecosystem services examined during the Millennium Ecosystem Assessment. While there is clear experimental evidence of the linkage between biodiversity loss and the deterioration of ecosystem functions, the structure (shape and strength) of this relationship remains contentious. To perform a quantitative assessment of the relationship between biodiversity measurements and landscape characteristics in agrosylvopastoral systems of the Mediterranean basin.

Search strategy and selection criteria

The databases used included Google (<http://google.com>), Google Scholar Web of Science, Scirus, and Scopus. Search terms were run in separate or limited combinations, depending on the requirements, or limitations, of the database used. In addition, we identified scientific articles, books, and reports by consulting published studies, including major review articles. Papers were rejected because they did not address a biodiversity issue or did not take place in the terrestrial ecosystem of the Mediterranean Basin. Among the studies reviewed, some were excluded from the systematic review, due to their lacking information necessary for the analysis (e.g., sample size, mean or standard deviation of species richness). All studies included in the review used quantitative methods in their analyses. If a study considered more than one taxon, more than one parameter (e.g., diversity and abundance), or more than one measure of comparison, we treated them as independent studies, resulting in the inclusion of 154 papers.

Data and analysis

We found 18 studies that provided suitable data for conducting a meta-analysis of species richness for the different taxonomic groups in terrestrial ecosystems with dense or open vegetation, allowing comparisons. The heterogeneity of the effect sizes was estimated using the Q-statistic. All meta-analyses were conducted using MetaWin 2.0. The effect sizes were analyzed using a random effects model. The output of each statistical test consisted of the mean effect size for the analysis with an accompanying bias-corrected bootstrapped 95% CI and a total heterogeneity statistic (Q). A two-way ANOVA was also performed to examine the effects of habitat type and taxa and their interaction on the species richness of biodiversity indicators.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
18	Different agrosylvopastoral ecosystems of the Mediterranean Basin area.	Dense(r) vegetation.	Less dense vegetation.	Hedge's d comparing seven taxonomic groups (plants, birds, invertebrates, reptiles, fungi, mammals, and amphibians) between ecosystems with dense vegetation and open (or with less dense vegetation) agrosylvopastoral ecosystems.	81%

Results

- As open and closed habitats often represent very different biological environments, the analyses were conducted separately. The estimated mean effect size was significantly different from zero (open habitats: $E_{++} = 2.98$, 95% CI = -4.47 to 8.67 , Bias-corrected CI 1.97 to 2.20 ; closed wooded habitats: $E_{++} = -0.21$, 95% CI = -5.06 to 4.64 , Bias-corrected CI -2.93 to -2.42), indicating that open habitats have fewer species than other closed wooded habitats.
- With respect to taxon type, plants, birds, and invertebrates represent the most useful indicators when evaluating biodiversity in Mediterranean environments, even though these groups have different spatial requirements. The estimation of species richness depends on its ecological importance, as well as on the design of the study.
- Herbaceous plants represent most taxa in agroecosystems, making them a key group for conserving biodiversity. As a result, plants had the highest species richness in comparison to other taxa. In managed woodlands, plants had the highest average species richness, whereas birds had the lowest.
- NA
- NA

Factors influencing effect sizes

Ecosystem type, experimental design, number of study sites, habitat characteristics, and landscape structure influence the average species richness.

Conclusion

Open agrosylvopastoral habitats have fewer species than other closed wooded habitats.