

# Agroforestry and yield

## Reference 4

Torralba, M; Fagerholm, N; Burgess, PJ; Moreno, G; Plieninger, T. 2016 Do European agroforestry systems enhance biodiversity and ecosystem services? A meta-analysis. *Agriculture, Ecosystems & Environment* 230: 150-161. doi: 10.1016/j.agee.2016.06.002

## Background and objective

Agroforestry has played an important role in Europe in the past, and traditional agroforestry practices, such as wood pasture and grazed or intercropped orchards, are still practised widely in Europe. During the 20th century, the area of many European agroforestry systems decreased while the remaining agroforestry practices are vulnerable. In 2005, the European Union provided opportunity for national and regional governments to financially support the establishment of new agroforestry systems. The study aimed at answering the following research questions: 1) Does European agroforestry enhance biodiversity and ecosystem services relative to conventional agriculture or forestry (natural and planted forest)?; 2) Which species groups and which categories of ecosystem services are most supported by agroforestry?; 3) What differences arise among different kinds of agroforestry (e.g. silvoarable systems, silvopastoral agroforestry)?; 4) Do biophysical system properties such as temperature and precipitation drive inter-site differences? Here, only results regarding food and timber productions are reported.

## Search strategy and selection criteria

The literature search was performed in August 2014 by generating combinations of keywords in three databases: ISI Web of Science; SCOPUS and CAB abstract. Additionally, the first 50 documents provided by Google Scholar were included and in the end of the process added five papers recommended by three experts in the field. The systematic literature mapping sought to include all scientific publications that provide quantitative data comparing agroforestry with an alternative land use system in a European study area and using indicators that assess biodiversity and ecosystem services.

## Data and analysis

Effect sizes were used as dependent variables to construct a random-effect model (effect sizes nested within studies) and calculate the mean effect size assuming random variation among the observations. Hence 95% confidence intervals were calculated around the mean effect size with bootstrapping of 999 iterations. To assess the effect of the different response variables, sub-group analyses were performed using the explanatory moderators as independent variables.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
53 (31 silvopastoral, 13 silvoarable, 7 mixed)	Agricultural land, pasture, forestry land.	Agroforestry (silvoarable, silvopasture and mixed)	1)Agricultural land, 2)pasture land, 3) forestry land (natural and planted).	Logarithm of ratio of food and timber productions in agroforestry systems to food and timber productions in non-agroforestry systems.	81%

## Results

- When compared with forestry and pastureland, there were non-significant effects of agroforestry on food production.
- When compared with forestry, there were non-significant effects of agroforestry on timber production.
- No data are available for comparison of agroforestry to agricultural land and pastureland.
- NA
- NA

## Factors influencing effect sizes

No factor was analyzed.

## Conclusion

The meta-analysis shows that agroforestry systems can provide similar levels of food and timber as forestry, and similar levels of food production as pasture land. No comparison is available with agricultural land.