



# Substantial evidence base for the impacts of agroforestry on ecosystem services outcomes, but limited research on agroforestry's economic and policy intervention impacts

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Photo: Sarah Castle

Diverse system consisting of productive trees, shrubs, crops, and pasture (agrosilvopasture)

**We collated evidence on the impacts of agroforestry on ecosystem services and human well-being outcomes in high-income countries. Our review demonstrated that there is substantial evidence on the impacts of agroforestry practices on regulating ecosystem services. In contrast, evidence on the economic and social outcomes of agroforestry practices, such as profitability, was very limited. There is also a paucity of evidence on the impacts of policy interventions to promote agroforestry. The results highlight the need for additional evaluation of policies as well as the economic and social impacts of agroforestry practices to inform future policy and practice.**

## Why is this Evidence Synthesis Needed?

Agroforestry has the potential to provide sustainable production, increase the diversity of agricultural livelihoods, improve soil and water quality, and mitigate climate change and biodiversity loss. Agroforestry includes a diverse set of practices that intentionally integrate trees and shrubs into agricultural production systems. These systems are designed to generate environmental, economic, and social benefits through complementary interactions between tree, crop and/or animal components of the system. As such, agroforestry provides an opportunity to advance the UN 2030 Sustainable Development Goals. Given these diverse potential benefits, agroforestry has seen both an increase in policy support and scholarly attention in high-income countries over the past several decades. Evidence of the impacts of various agroforestry practices and policy interventions in high-income countries spans many disciplines, thus increasing the need to map the evidence to facilitate knowledge uptake and exchange. This Systematic Map collects and describes the evidence of the impacts of agroforestry practices and policy interventions on ecosystem services and human well-being in all high-income countries published over the last three decades (January 1990 – June 2020).

This Collaboration for Environmental Evidence Systematic Map examines the body of evidence that exists describing the impacts of agroforestry practices and policy interventions on ecosystem services and human well-being in high-income countries. The Systematic Map summarizes evidence from 585 primary articles, 6 ongoing studies, and 41 systematic reviews.

## Main Findings

### *What studies are included?*

This Systematic Map includes studies that evaluated the impacts of agroforestry practices and policy interventions on ecosystem services and human well-being in high-income countries. Studies had to meet four eligibility criteria to be included. First, the study had to focus on farms and/or those who live on them in a high-income country. Second, the study had to pertain to one or more of the 14 types of systems that are defined as agroforestry. Third, the study needed to use a non-agroforestry comparator. Fourth, the study had to evaluate one or more outcomes of interest: ecosystem services (regulating services, provisioning services, cultural services) and human well-being (income and expenditure, assets, health, nutrition, other types of human well-being measures).

### *What evidence exists on the impacts of agroforestry practices on ecosystem services and human well-being in high-income countries?*

A total of 585 primary articles, 6 ongoing studies, and 41 systematic reviews were included in this map. The most frequently studied systems included: trees integrated with cropping systems (silvoarable), trees integrated with livestock systems (silvopastoral), and crops or livestock integrated in forest systems (forest farming). Of the primary studies, over two-thirds studied the impacts of silvoarable practices, mostly hedgerows, windbreaks, and riparian buffers. Over 75% of the included studies evaluated the impacts of agroforestry on regulating ecosystem services, largely consisting of soil and water quality, carbon storage, and biodiversity outcomes. Surprisingly, there was limited research on the profitability of agroforestry systems, with only 5% of included studies evaluating this outcome, which may be an important barrier to expanding adoption of agroforestry practice. Geographically, there were clear concentrations of evidence in the United States (USA), Spain, the United Kingdom, Italy, France, Canada, and Australia for studies on agroforestry practices. Together, these seven countries were the focus for 80% of the studies on agroforestry practices in high-income countries, with the USA alone accounting for 25% of the included studies. Most of the studies were observational (80%), but 20% were on-farm experiments, before-after studies, or surveys.

### *What evidence exists on the impacts of agroforestry policy interventions on ecosystem services and human well-being in high-income countries?*

Of the 585 primary studies, only 33 evaluated the impacts of policy interventions on ecosystem services and human well-being. The policy intervention studies primarily evaluated incentive provision type interventions, including payments for implementing agroforestry practices (e.g., cost-share programs to implement agroforestry practices). There was little evidence on the impacts of other types of policy interventions, including widely implemented interventions such as provision of technical support and training to farmers (e.g., extension services), which represent substantial government investments. None of the policy intervention studies used an experimental design (random assignment), and only one used a quasi-experimental method.

## What are the Implications of the Review Findings?

This Systematic Map can be used by policy makers and researchers to guide further research, policy initiatives, and funding priorities. It may be useful to decision makers looking for quantitative and qualitative evidence on the benefits and potential tradeoffs of promoting agroforestry practices in high-income countries and in temperate regions. The concentration of existing studies on regulating and provisioning ecosystem services provides an evidence base for further evidence synthesis and systematic review. On the other hand, decision makers and researchers could address the knowledge gaps on the social and economic impacts of agroforestry through a strategic research agenda that examines potential outcome pathways as well as barriers to expanding the adoption of agroforestry practices. Similarly, addressing the gap in impact evaluations of agroforestry policy interventions could advance understanding of what types of policies and programs are effective and under what conditions. Finally, additional research is needed on the distribution of agroforestry's benefits in relation to gender, race, and socio-economic status.



Trees integrated with cropping systems (silvoarable)

Photo: Sarah Castle



Trees integrated with livestock systems (silvopasture)

Photo: Sarah Castle

## Synthesis Time Frame

The review authors searched for studies published between January 1, 1990 and June 1, 2020. This CEE Systematic Map was published in March 2022.

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