



Data extracted in June 2020

This fiche summarises the impact of Agroforestry on EROSION CONTROL. It is based on a review of 4 peer-reviewed synthesis research papers, each involving 48 to 138 individual papers.

This fiche is part of a set of similar fiches synthesising all the impacts of agroforestry presented in the general fiche

1. WEIGHT OF THE EVIDENCE

- **CONSISTENCY OF THE IMPACT:** Out of the 4 synthesis papers dealing with this type of impact, 3 show positive effect of agroforestry on soil erosion control: 2 compared to land use without trees (cropland) in Sub-Saharan Africa and Tropical zones, and one compared to forests in Europe. One synthesis paper reports an uncertain effect in Western Africa. See the table below for details.

Impact	Comparator	Effects (all studies)				Effects (only studies including EU)			
		Positive	Negative	No effect	Uncertain	Positive	Negative	No effect	Uncertain
Soil erosion control	Land use without trees	2	0	0	0	0	0	0	0
	Forests	1	0	0	0	1	0	0	0

- **QUALITY OF THE SYNTHESIS PAPERS:** [The quality score summarises 16 criteria assessing the quality of three main aspects of the synthesis papers: 1) the literature search strategy and studies selection; 2) the statistical analysis; 3) the potential bias. The scores can be found in the Excel database with all the data extracted from the synthesis papers]

As shown in the “Quality score” of the table in section 2, the quality level ranges from 50% to 81%. The least frequently satisfied quality criteria were those related to the dataset availability (none of the papers), presentation of individual effect sizes (1 out of 4), weighting of individual studies (2 out of 4), analysis of heterogeneity of the effects (satisfied in 2 synthesis papers out of 4) and analysis of publication bias (2 out of 4).

- **NUMBER OF SCIENTIFIC PAPERS:** The number of papers included in each synthesis paper ranges from 48 to 138.

2. IMPACTS

The main characteristics and results of the 4 synthesis papers are summarized in the table presented below. For details follow this link

	Reference	Population	Geographical scale	Intervention	Control	Conclusion	Quality score	Global effect
1	Muchane, MN; Sileshi GW; Gripenberg, S; Jonsson, M; Pumariño, L; Barrios, E. 2020	Crop production systems in tropics.	Humid and sub-humid tropics in all continents.	1) simultaneous agroforestry where trees and crops occur on the same piece of land during the same cropping season (e.g. alley cropping, intercropping, multi-storey agroforests); and 2) sequential agroforestry where trees and crops occur on the same piece of land but in a temporal sequence as part of a rotation (e.g. improved fallows).	Crop monoculture.	Agroforestry practices significantly reduce soil erosion rates, compared to crop monocultures. The provision of organic inputs by agroforestry trees through litterfall and prunings contributes to soil cover. Trees can also provide physical barriers to soil erosion. This combined with the predominance of reduced/no-tillage practices in agroforestry is likely an important reason for the lower soil erosion rates.	75%	Positive, compared to crop monocultures.
2	Kuyah, S; Whitney, CW; Jonsson, M; Sileshi, GW; Oborn, I; Muthuri, CW; Luedeling, E. 2019	Agricultural systems in sub-saharian Africa.	Sub-Saharan Africa.	Agroforestry practices: alley cropping, dispersed intercropping, hedgerow, planted fallow, and crops planted under tree canopies in parkland agroforestry systems.	Non-agroforestry practices (includes sole cropping, continuous cropping without trees, and plots outside tree crowns in the case of parklands).	Agroforestry practices significantly reduce soil erosion rates, compared to non-agroforestry cropping. This happened for all types of agroforestry, type of soil, ecological zone, elevation, type of perennials used.	81%	Positive, compared to non-agroforestry practices on cropland.
3	Torralba, M; Fagerholm, N; Burgess, PJ; Moreno, G; Plieninger, T. 2016	Agricultural land, pasture, forestry land in the EU.	Europe	Agroforestry (silvoarable, silvopasture and mixed).	1) Agricultural land, 2) pasture land, 3) forestry land (natural and planted).	When compared with forestry, agroforestry (either silvopasture or silvoarable) had a significant positive effect on erosion control.	81%	Positive, compared to forestry (natural and planted).
4	Sinare, H; Gordon, LJ. 2015	Cropland and pastureland in Sudano-Sahelian zone of West Africa.	Sudano-Sahelian zone of West Africa.	Presence of woody vegetation.	Not specified	No clear conclusion available.	50%	Uncertain

3. KNOWLEDGE GAPS

[They are extracted from each meta-analysis, synthesized and consolidated]

- Few primary data available for comparisons of agroforestry to cropland, pastureland and forest in Europe (three synthesis papers out of 4 did not report data for Europe). This fragmented structure of the primary data should be taken into account, especially when focusing on trade-offs between ecosystem services. The synthesis paper for Europe compares only individual provisioning services (e.g., woody biomass production or grass production), and not the full amount of food, timber, or biomass produced.

4. SYSTEMATIC REVIEW SEARCH STRATEGY

Keywords	TOPIC: (agroforestry OR "agro-forestry") AND TOPIC: (meta-analy*)
Search dates	No time restrictions
Databases	Web of Science and Scopus, run on 15 May 2020
Selection criteria	Three main criteria led to the exclusion of a study: (1) the study does not deal with agroforestry; (2) the study does not assess the environmental and climate impacts of the farming practice on erosion control; (3) the study is neither a meta-analysis nor a systematic review. Studies that passed the relevance criteria were subject to critical appraisal carried out on article by article basis. We finally selected 4 meta-analysis.