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# Assessing Tradeoffs among Selected Regulating Ecosystem Services and Crop Yield in Sub-saharan African Agroforestry Systems

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**Abstract**

Agroforestry is one of the climate mitigation and adaptation strategies being used to fight increasing levels of carbon dioxide in the atmosphere, with potential to increase agricultural productivity and climate resilience. Agroforestry systems produce large amounts of fuelwood, food and fodder, while improving soil fertility and regulating water and nutrient cycles, wind speeds, pests, erosion, pollination and microclimate. However, provision of these services varies from place to place and there are also trade-offs. In addition, it has been challenging to quantify all the benefits from agroforestry because of lack of data and a general focus on provisioning ecosystem services. A meta-analysis is conducted to determine the overall effects of agroforestry on crop yield and the tradeoffs with three important regulating ecosystem services that have received significant attention in agroforestry research in sub-Saharan Africa: soil fertility, water availability and erosion control. The meta-analysis focuses on studies reporting provision of these ecosystem services in tree-based and tree-less farming systems in sub-Saharan Africa. The analysis elucidates how tree species differ in their ability to regulate soil fertility, water availability and erosion control, how different crop species respond to the presence of trees, and in which context agroforestry practices are likely to have a positive effect on both crop yield and regulating ecosystem services. By understanding the contexts in which specific agroforestry options are beneficial, and possible trade-offs that may be involved, recommendations can be drawn to inform land use management. This is important in sub-Saharan Africa where land use decisions are increasingly being driven by the commercial value of increased yields and higher economic returns, rather than by environmental and social benefits of multifunctional land uses such as agroforestry.

**Keywords:** Agricultural productivity, Ecosystem services, Meta-analysis, Soil fertility

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