



Toward local estimation of the impacts of agroforestry on soil organic carbon and agricultural production in Sub-Saharan Africa

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The potential of agroforestry to sequester carbon and increase yield scale is still largely uncertain at the global scale (e.g., between 1.0 to 7.4 t C ha⁻¹y⁻¹ in soil), and local precise estimations remain scarce. A main difficulty is the size and completeness of current database on the subject. For example, Kuyah et al., 2019 identified only 61 and 73 papers on Agroforestry for yield and soil organic carbon (SOC) in sub-Saharan Africa. In fact, most of the meta-analyses despite the aim to be systematic gather only a small part of total available evidence. Here, we produced the largest database on these subjects by collating all existing meta-analyses in sub-saharan Africa and complete it with a comprehensive systematic review. Our database of more than 270 primary studies covering 22 countries contains more than 3500 paired-comparison between agroforestry and non agroforestry systems, with details of species cultivated, pedo-climatic conditions and agricultural practices. We applied machine learning algorithms to explore effects of local moderators on SOC and yields, and thus provide precise local estimation of the potential of agroforestry. We confirm that, overall, agroforestry had a positive effect on both yield and carbon sequestration, with an average increase of about 70% and 20% respectively. We produce estimates of the potential SOC sequestration potential and yields for the various type of agroforestry systems (e.g. alley cropping, parkland,...) in the different agro-ecological zones (AEZ). We also observed that day-to-night temperatures, Soil moisture at the end of the growing season and Temperature Annual Range were main determinant of the performance of agroforestry systems. Our results will allow to map local performance of agroforestry and thus provide guidance for local decision makers.