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Afforestation of savannah with cocoa agroforestry: a climate-smart sustainable agricultural practice

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Recent studies based on remote sensing showed a gradual expansion of tree cover over savannah and agricultural land in the forest-savannah transition zone of Cameroon¹, part of this expansion is actually due to shaded cocoa. Despite unfavourable conditions in herbaceous savannah (low soil fertility, weed competition and risk of bush fire), farmers have proven that afforestation is achievable using cocoa and specific techniques to build up an associated tree canopy². Full-grown cocoa agroforestry systems created on savannah (S-cAFS) and in forest (F-cAFS) seem to exhibit comparable multi-strata structure. Nevertheless, previous land uses and related canopy structures may have contrasted impacts on production and other ecosystem services over time.

We selected 1 to 70 year-old S-cAFS and F-cAFS, and we used forest and savannah patches as controls³. By combining measurements of cocoa production, litter fall and cycling, soil quality, carbon storage and tree species diversity along this age gradient, we showed that those variables in S- and F-cAFS generally tended to comparable levels after several decades. Results also emphasized the ability of S-cAFS to increase most of the ecosystem services (ES) although the time needed to reach levels found in F-cAFS varied strongly amongst variables (Fig 1). Results also showed the positive contribution of associated plants to ES, particularly C storage and nutrient cycling contributing to REDD+⁴ and sustainability of the cropping system.

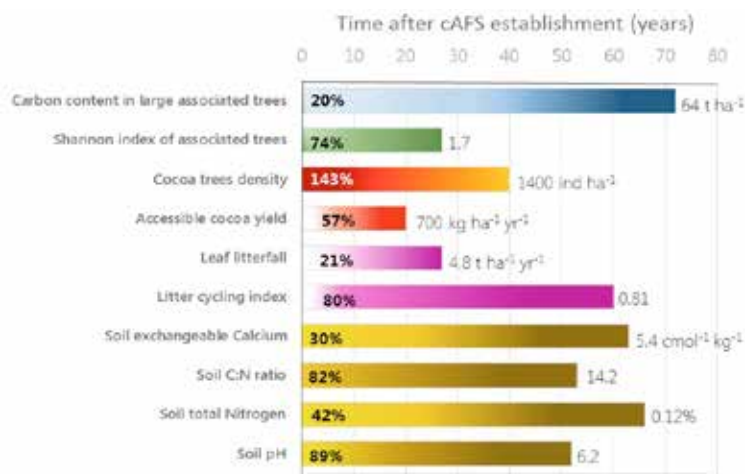


Figure 1: Time (years) needed for cocoa agroforests set up after savannah (S-cAFS) to reach the same values as cocoa agroforests set up after forest (F-cAFS) in term of carbon storage, tree species diversity, cocoa production, litterfall, litter cycling and soil features. These values, displayed on the right side of each bar correspond to a convergence point of each variable for both systems along the age gradient. The initial values for S-cAFS at 0 or 5 years according to the variable, are expressed in % of this convergent reference.

Keywords: Ecosystem services, Soil fertility, Cocoa sustainability, Land restoration.

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