14:00

Moderate C storage, weak conservation ability and the need to renew old cocoa plantations from the Talba forest pioneer front in Centre Cameroon

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In Cameroon, cocoa plantations of the Talba pionner front are set up after partial, yet strong, forest clearing and planted with « hybrid » cocoa trees. Previous studies showed complex relationships between preserved forest trees and cocoa yields, which need to be investigated further. In this peculiar cocoa production zone, we studied a chronosequence of 32 cocoa plantations (8 to 73 years old). We measured cocoa and associated trees diameter, height, shade tree cover and cocoa yield. We also estimated basal area and tree biomass. Talba plantations showed a low density of associated trees (32 trees.ha-1) in comparison to other production zones in the country (80 -150 trees.ha-1) and consequently a 35-55% lower carbon storage in aerial biomass (48 Mg.ha-1). The average shade cover was also low (38%) and positively linked to the basal area of associated trees. Associated trees were preserved for timber (Terminalia superba) and/or for their high economic value (Ricinodendron heudelotii). Introduced trees were mainly for self-consumption (Dacryodes edulis). Specific diversity tended to reduce until [40-60] years old. Hence, in the mid-term, these plantations would lose their already low tree species conservation value if farmers were not rapidly encouraged to keep or renew forest-preserved trees. The age of the plot and, to a much lesser extent, the shade tree cover affected negatively cocoa yield. Other canopy attributes did not affect cocoa yield. Cocoa tree density decreased significantly with plot age. The absence of a relationship between the individual cocoa tree and the plot age suggests that the yield decrease with time was mainly due to a lack of renewal of old cocoa trees through coppicing and/or new seedlings planting. The low number of multi-stem cocoa trees in our study area confirms that rejuvenation of old plantations is a challenge for the farmers towards sustainable cocoa production.

14:00

Does the management of Faidherbia albida trees in Senegalese parklands affect their ecological services to improve millet sustainability?

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Agroforestry systems in central Senegal, commonly referred as parklands, are mostly composed of Faidherbia albida trees scattered in pearl millet or in groundnut crops. Many studies showed that this Nitrogen-fixing legume tree increased millet production and soil fertility. Most studies consisted of comparing millet yield under and far outside the tree crown of isolated, mature and non-pruned trees. However, how the tree density, tree size and pruning intensity within F.albida parklands may affect the tree services is not known yet. To address this question, a network of 73 contrasted F. albida parklands selected over 5 villages was monitored over the rainy season 2019. The sampled parklands showed various combinations of tree density, tree trunk size and pruning intensity. In each sampled parkland, we set up a pair of plots of 16 m2 on millet crop, one under the canopy of a selected F. albida tree, and the other halfway between this tree and the nearest F.albida tree. Our results showed that millet grain and straw yield, soil organic carbon, N and P Olsen were significantly higher under the tree canopies than halfway between two trees. Multiple Linear Regression Statistics indicated that higher tree density had a significant positive effect on the millet grain yield, and the tree size had a significant positive effect on the soil variables. Unexpectedly, high tree pruning, removing about 60% of the potential tree canopy area, had no significant effect. We concluded that tree density and size may increase F. albida tree services and thus, the millet crop sustainability. Moreover, the current tree pruning intensities allowed farmers benefit simultaneously from direct provisioning services of F. albida trees, and from their indirect services regarding soil fertility and millet yield. These results may help reasoning innovative management practices for these parklands.

14:00

Inverted phenology of Faidherbia albida paced with the dynamics of the water table

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Faidherbia albida is an emblematic species of agro-sylvo-pastoralism in African semi-arid areas. It combines inverted phenology (strong growth, N-fixation and production of highly palatable fodder during the dry season, ideal for livestock), defoliation during the rainy season (ideal for minimizing competition with crops) and use of deep resources mainly (riparian in its natural habitat, phreatophyte in parklands, deeply rooted, avoiding drought stress, using mostly groundwater (isotopic evidence), ideal for recycling). What could drive the inverted phenology then? Past research most often sought to correlate its peculiar phenology with climate variables, but hardly considered its deep roots and phreatophyte behavior. We set up a collaborative observatory (Faidherbia-Flux) in a Senegal parkland in 2018 and monitored the foliar phenology of 15 adult trees (LAI2000), radial growth, sap flow and wood water content (capacitive probes). We also monitored the dynamics of soil humidity (TDR profiles) and water table fluctuations (5-6 m, piezometers). Drainage did reach the water table, but its maximum level was delayed till the end of the wet season, corresponding to the time when Faidherbia emitted new leaves. 100% foliage was maintained until the end of December, concurrently with a maximum growth, sap flow and water table level. From January to July (driest period), we observed a slow decrease in the water table level, foliage and transpiration, all reaching minima by the end of July (start of the defoliated phase), but no drought stress. Interestingly, wood rehydrated till end of the rainy season (September-October). Considering such coincidences between deep hydrological (delayed rewatering), wood rehydratation and phenological phases (inverted phenology), we suggest that this deeply rooted and phreatophyte species adjusts its phenology according to the water table and wood water content, shedding leaves when those levels reached minimum and bursting only when they resumed to maximum.