How multifunctionnal are agroforestry parklands? A landscape scale assessment of multiple ecosystem services from a F.albida parkland in Senegal

Louise Leroux, CIRAD, Senegal
*** Cathy Clermont-Dauphin, IRD, France**
Moussa Ndienor, ISRA, Senegal
Christophe Jourdan, CIRAD, France
Olivier Roupsard, CIRAD, Senegal
Josiane Seghieri, IRD, Burkina Faso

16:30

Faidherbia albida agroforestry parklands are widespread in Sub-Saharan Africa under 250-600 mm of annual rainfall. Given its potential to provide a large spectrum of ecosystem services (ES) largely displayed in the literature, F.albida parklands are now widely recognised as a promising option to meet the 2030 UN SDGs. However most evaluations were carried out at the tree scale and a landscape scale assessment of the multiple ES they provide and their interactions is still lacking. Our aim is to provide a first characterization of the spatial supply of multiple ES and their relationships. Our study was conducted in 2019 in the groundnut basin of Senegal. We combined observed data for 11 ES indicators (including provisioning, regulating and supporting/regulating services) from 136 sampling points with remote sensing-derived data. First, the spatial distribution of each ES supply was modelled using machine learning approaches. The ES indicators were modelled with accuracies ranging from 68% to 96%. Results indicated that the majority of ES indicators remained below ES potential values over the study area by 25% to 50% suggesting that there is potential for increasing the ES supply in the F.albida parkland. Second, combining a scoring approach with a spatial co-occurrence method, we identified the dominant relationships among ES and we analyzed their distributions according to the distance from F.albida trees. We showed that losses, synergies and tradeoffs accounted for 41%, 40% and 19% respectively of the dominant relationships. Synergies were predominant between 0-10 m from the trees. Above this threshold, synergies started to decrease as one moved away from the trees while the proportion of losses and trade-offs relationships increased. By providing spatially explicit information on multiple ES relationships, our results can contribute to the development of evidence-based innovative management of agroforestry parklands and, more generally, multifunctional landscapes.