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Title: Conservation of soil organic carbon, biodiversity and the provision of other ecosystem services along climatic gradients in West Africa

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Abstract

Terrestrial carbon resources are major drivers of development in West Africa. The distribution of these resources co-varies with ecosystem type and rainfall along a strong Northeast-Southwest climatic gradient. Soil organic carbon, a strong indicator of soil quality, has been severely depleted in some areas by human activities, which leads to issues of soil erosion and desertification, but this trend can be altered with appropriate management. There is significant potential to enhance existing soil carbon stores in West Africa, with benefits at the global and local scale, for atmospheric CO₂ mitigation as well as supporting and provisioning ecosystem services. Three key factors impacting carbon stocks are addressed in this review: climate, biotic factors, and human activities. Climate risks must be considered in a framework of global change, especially in West Africa, where landscape managers have few resources available to adapt to climatic perturbations. Among biotic factors, biodiversity conservation paired with carbon conservation may provide a pathway to sustainable development, and biodiversity conservation is also a global priority with local benefits for ecosystem resilience, biomass productivity, and provisioning services such as

foodstuffs. Finally, human management has largely been responsible for reduced carbon stocks, but this trend can be reversed through the implementation of appropriate carbon conservation strategies in the agricultural sector, as shown by multiple studies. Owing to the strong regional climatic gradient, country-level initiatives will need to consider carbon sequestration approaches for multiple ecosystem types. Given the diversity of environments, global policies must be adapted and strategies developed at the national or sub-national levels to improve carbon storage above and belowground. Initiatives of this sort must act locally at farmer scale, and focus on ecosystem services rather than on carbon sequestration solely.

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