Tropentag, September 20-22, 2023, hybrid conference

"Competing pathways for equitable food systems transformation: Trade-offs and synergies"

Designing socio-ecological landscapes for sustainable outcome: evaluating land-use options on ecosystem-service provisioning in south-western Ghana

Evelyn Asante-Yeboah[1], HongMi Koo[1], Stefan Sieber[2], Christine Fürst[1]

[1] *Martin Luther University, Sustainable Landscapes Development, Germany*

[2] *Leibniz Centre for Agric. Landscape Res. (ZALF), Sustainable Land Use in Developing Countries (SusLAND), Germany*

Abstract

Landscape modification through socio-economic activities is rampant in the south-western part of Ghana, threatening the region's landscape sustainability. Offsetting these threats requires an appropriate approach that can support land-use actors to better design the landscape towards enhanced ecosystem service (ES) provisioning, ensuring continued usage and profitability. This study adopted the geo-design approach, combining stakeholder perspectives and spatially explicit simulations to evaluate land management strategies on ecosystem service provisioning in south-western Ghana. Baseline datasets of land-cover maps and locally relevant ES (Food, fuelwood, marketable products, species diversity, and soil quality regulation) were captured through GIS methodologies and stakeholder workshops, respectively. Seven new land-use options (urban green, mangrove restoration, selective land preparation, rubber mixed stands, open space restoration, relay cropping, and soil conservation) were identified based on selected land-cover types on the study landscape. Combining the land-cover types and land-use options generated land management strategies that were translated into land-use scenarios under stated conditions. The developed land-use scenarios were subjected to a GIS web-based simulation platform where land-use patterns were rearranged to reflect the land-use options embedded in the land-use scenarios. Next, the land-use scenarios were evaluated against the locally relevant ecosystem services, and results were viewed in maps and ES balance tables. Strategies for the effective implementation of land-use scenarios were collectively discussed. The results, based on participants' perceptions, showed land-use options to exhibit higher capacity to provide ecosystem services compared to the current land-cover types except for rubber mixed stand, which was found to exhibit less capacity to provide marketable products compared to the current land-cover type. However, the simulated land-use scenarios resulted in synergies between land-use options and ES provisioning. Participants perceived inclusive collaboration planning among multiple land-use actors on the landscape as an effective means for successfully implementing land-use options. Based on this result, we could infer that this approach of geo-design is a guide to landscape planning in complex socio-ecological dynamic landscapes and has the potential for improving local acceptability and adaptability for sustainable outcomes.

Keywords: Geo-design, land-use options, landscape sustainability, spatial simulations, stakeholder perceptions

Contact Address: Evelyn Asante-Yeboah, Martin Luther University, Sustainable Landscapes Development, Von-Seckendorff-Platz 4, 06120 Halle (Saale), Germany, e-mail: eveyeb84@gmail.com