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Spatially explicit representation of climate-smart agriculture in Ghana: A participatory scenario process

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Abstract

Africa is the continent with the lowest total and per capita greenhouse gas (GHG) emissions. Nevertheless, to meet global emission reduction targets, scenarios indicate that mitigation measures will be needed also in low- and middle-income countries. In Ghana, agriculture is one of the main drivers of land-use change and contributes to the emission of greenhouse gases. Against this backdrop, climate-smart agriculture (CSA) and forestry (CSF) is widely promoted as an approach to reorient rural development under conditions of global change. The concept incorporates climate change mitigation practices in the agriculture, forestry and other land use sectors (AFOLU) that address the need to achieve food security and other development goals (e.g., enhanced resilience), but in a way that also minimises GHG emissions. Operationalisation of these promising measures is still lacking and potential synergies and trade-offs are often not considered in current national-scale assessments. Therefore, decision support tools are needed to help in understanding the status quo, as well as to prioritise and thus implement appropriate mitigation options. In this contribution, we present the method and first results of the participatory scenario development process that we conduct as part of the BMBF-funded project GreenGaDe in Ghana. Our objectives are (1) to analyse the feasibility and societal acceptance of various low-emission agriculture and forestry practices, as well as (2) to identify their potential locations and spatial extent at the national level. Scenario assumptions are based on the results from a participatory stakeholder process (interviews and local workshops) in combination with desktop analyses. In the first step, we develop storylines (qualitative scenarios) that integrate stakeholder knowledge about CSA and CSF with global boundary conditions derived from the shared socioeconomic pathways (SSPs). In the second step, we translate these qualitative scenarios into quantitative scenarios (e.g., GIS maps and emission inventories) using spatial simulation models for calculating land-use changes and environmental impacts (e.g., agricultural expansion, GHG emissions). Our results may help to identify feasible climate mitigation potentials in the AFOLU sector in Ghana as a prerequisite to define national climate policies and to accelerate adequate economic investments to support CSA and CSF measures.

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