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## A Framework of Biophysical Measurements, Innovation Platforms and Modelling for Agricultural Stakeholders’ Landscape-Scale Decisions

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### Abstract

Low productivity of non-responsive soils, limited land for cattle grazing to produce sufficient manure and lacking financial resources for fertiliser substantially limit food production and threaten food security in many densely populated areas not only of Western Kenya.

Legume-led crop rotations and intercropping have been promoted by many projects, but have not been well-adapted nor adopted. Crop-livestock integration has been suggested as possible improvement but in the absence of sufficient land and of proper manure management, animals usually compete with soils for plant residues.

While many technical biophysical solutions work in principle or under specific settings, they need acceptance by those to implement them. This becomes even more complex as farm-scale solutions need to be upscaled to the landscape level, where collective action or access to decision-makers are crucial.

We present the interdisciplinary approach of the CONNESSA consortium (CONNEcting knowledge, scales and actors; An integrated framework for adaptive organic resource management, targeting soil aggradation and agroecosystems’ resilience in SSA) illustrated by a case study in Kenya.

We follow a flexible site-specific sequence of biophysical field experiments, innovation platforms (IP) and modelling exercises to derive policy recommendations. The case study included field experiments at 3 sites in W-Kenya, replicated at 4 farms per site on effects of manure and fertiliser combinations on maize and legume yields; experimental data were later employed for modelling. Crop-livestock integration, legume-based soil conservation and tree planting scenarios were formulated by farmers, extension officers and NGO during an IP at one site, Sabatia. Scenarios were simulated over various years for a 20 km<sup>2</sup> watershed using the Land Use Change impact Assessment tool (LUCIA). Model results were evaluated during a second IP followed by another round of more in-depth modelling.

We discuss in how far the combined modelling-IP approach can inspire stakeholders' development scenarios and lead to better ownership / acceptance of suggestions and improved collective action. Parallels and contrasts between Sabatia and a twinned case study in Burkina Faso are shown in order to derive generic conclusions.

**Keywords:** Actors, connecting knowledge, innovation platforms, landscape modelling, scales, soil degradation