Forest Conversion and Cropping Systems on Soil Carbon Stock, Carbon Dioxide Fluxes and Yields in Plateau Region, Togo

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Summary

Anthropogenic GHGs emissions are unequivocal since mid-20th century to recent past leading to climate change and global warming with drawbacks. Agriculture contributes to rampant deforestation and both emit 14 and 87% of GHGs, respectively. To such, it urges to quantify the size and intensity of deforestation, forest and land degradation as well as model current land management practices under climate and soil scenarios on future self-crop yields sufficiency for priorities and policy actions. Results will serve as tangible instrument in the implementation of climate smart practices and orientation towards REDD+ projects while facilitating policy-making decisions to curb GHGs and guaranty food security in its all facets, viz: availability, accessibility, storage and utilization.

Introduction

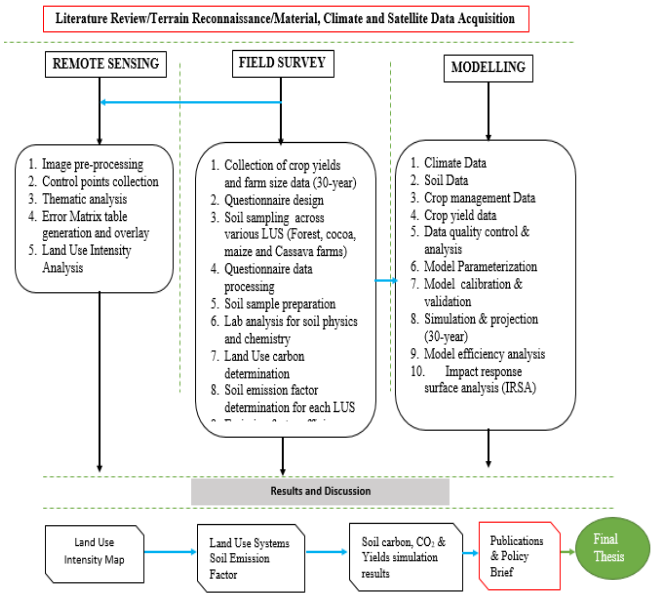
➢ **Some Key Research Gaps:**

To date, literature is replete with various aspects of climate change effects on agro and forests ecosystems dynamics, carbon fluxes and crop productivity (e.g., Houghton, 2005, Gaiser et al., 2009; IPCC, 2014).

However, methods used present their limitations in terms of policy actions. For instance, simple change detection via Land Use Land Cover (LULC) does not give clear indication regarding the speed of change and transition level as well as land use categories with predominance or not (e.g; Zakaria et al., 2012).

In addition, accuracy in the estimation of removal and/or sink of carbon of these systems is questionable due to lack of site based estimation coefficient to the detriment of IPCC estimators with biases level due to pedo climatic and physiologic variabilities (e.g., Chave et al., 2005; Malhi et al., 2006, 2010).

➢ **Overall Flowchart & Scientific Inputs:**



Aims and Objectives

- OB1: Assess the effects of agricultural schemes on forest losses in Togo

- OB2: Compute soil carbon dynamics and carbon dioxide fluxes from land use changes: an intercomparison of measured and IPPC Tiers emission factors for major perianal and annual farming systems in Togo.

- OB3: Simulate soil carbon dynamics, carbon dioxide and yields variations as affected by cropping systems and climate scenarios: Site scale ensemble model (***APSIM*** and ***EPIC***) intercomparison assessment.

Methods

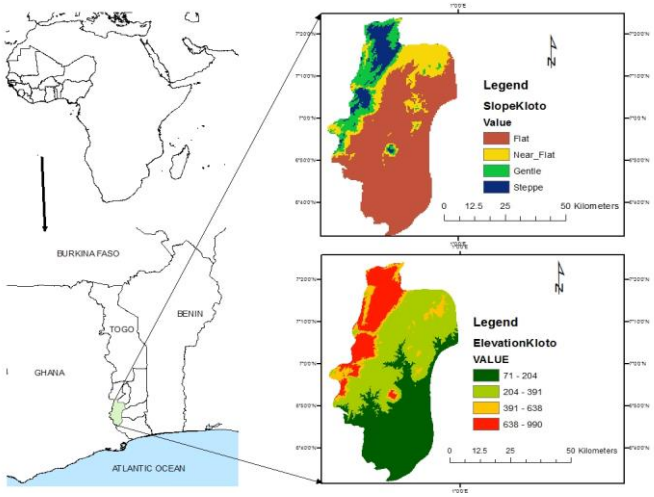


Figure 2. Study Area

- OB1: Optical Remote Sensing Technique (ORST) + Field Data (FD) + Land Use Change and Transition Analysis (LUCTA).
- OB2: Field Data Survey (FDS) + Lab Analysis (LA).
- OB3: Site Scale ensemble process base Models (***APSIM*** and ***EPIC***) Intercomparison assessment: Factors interpolation Approach (FIA).

Selected References

Malhi, Y. (2010). The carbon balance of tropical forest regions, 1990–2005. Curr. Opin. Environ. Sustain. 2, 237–244.

Chave, J. et al. (2005). Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145, 87–99.

Gaiser, T., Abdel-Razek, M., & Bakara, H. (2009). Modeling carbon sequestration under zero-tillage at the regional scale. II. The influence of crop rotation and soil type. Ecological Modelling, 220(23), 3372–3379. https://doi.org/10.1016/j.ecolmodel.2009.08.001.

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