Tropentag, September 20-22, 2023, hybrid conference

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

Technology suitability maps for bioenergy potential in Togo

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Abstract

Energy transition in Togo is crucial to counteract deforestation and the effects of climate change. The production of bioenergy from agricultural residues and household waste offers a promising solution, but the identification of suitable regions, residues and technologies can be challenging due to a lack of data availability. Here, we present an approach to assess the regional bioenergy potential in Togo by calculating the technology specific input amount and the spatial availability of substrate for bioenergy applications based on categorised agricultural residues and household waste. We analyse the chemical components of agricultural residues from different crops and conducted feasibility tests to categorise them based on their suitability for biogas or pyrolysis. Spatially disaggregated crop production data from the International Food Policy Research Institute (IFPRI), crop-to-residue ratios and household waste data are then used to identify and locate the available residual biomass. We use resampling algorithms, focal statistics and technical parameters of bioenergy facilities to calculate the amount of substrates available for bioenergy production on a regional and local scale. We further calculate the biogas potential of major poultry farms in Togo, based on the potential manure quantities and the agricultural residues in vicinity to the farm. The regional suitability for bioenergy applications depends on the category of residues but is generally greater in southern Togo. All suitability analyses can easily be adapted by changing the values of the underlying assumptions. It is therefore planned to extend the models as an interactive web tool where users can directly adjust the values of the underlying parameters (e.g. residue collection rate, plant size). Overall, our approach provides valuable insights into the regional bioenergy potential in Togo and can inform policy decisions to promote sustainable development. By using chemical component analyses and crop production data, we were able to identify suitable regions and residues for bioenergy applications and calculate the availability of substrate for biogas or pyrolysis production.

Keywords: Bioenergy, crop production data, GIS, technology suitability maps, Togo

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