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Welfare Impacts of Biochar as a Soil Amendment on Urban Vegetable Markets in West Africa

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Abstract

Due to the absence of refrigerated transportation, West African cities rely on urban agriculture to meet the vegetable demand of their persistently growing populations. The production of vegetables in urban areas is currently constrained by water shortages, limited access to inputs and shrinking land availability. Consequently the introduction of productivity enhancing technologies may have a significant impact on land use efficiency resulting in increased food security. Urban Food Plus, a research project funded by the German Federal Ministry of Education and Research (BMBF) under its programme GlobE (Securing the Global Food Supply) aims to enhance resource use efficiency in urban and peri-urban agriculture for improved food security in West African cities. The project has been researching the properties of biochar as a soil amendment through central field experiments in Ouagadougou, Burkina Faso and Tamale, Ghana, suggesting biochar-related yield increases for vegetables of 21–34%. Beyond the agro-ecological effects of using biochar, the economic impact of a widespread adoption of the technology on urban vegetable markets has to be established to assess the benefits and costs to consumers and producers. This paper establishes a theoretical framework for the ex-ante evaluation of the impact of productivity enhancing technologies on market prices and on consumer and producer welfare, tailored to the specific market structures, along the whole value chain, of urban vegetable production in Ouagadougou and Tamale. This is done through establishing a market model using secondary time series data of the past 30 years on a regional and national level. Positive producer and consumer welfare changes would suggest higher adoption likelihoods. Additionally decreasing market prices, associated with increased available quantities brought about by the productivity enhancing technology, are expected to lead to improved food security. The analysis covers various plausible scenarios such as differing adoption levels. The results of the analysis pinpoint the adoption level necessary to produce a price change, and specify the welfare change brought about by a widespread adoption of Biochar. This can inform policy makers and farmers alike of the potential benefits of adopting productivity enhancing technologies.

Keywords: Agricultural economics, GlobE, theory based impact assessment, urban agriculture, UrbanFood Plus, welfare