Modelling the Opportunity Cost of Reforestation in the Upper East Region of Ghana

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Abstract

Payments for environmental services (PES) have become increasingly popular tools to promote forest conservation as well as re- and afforestation including in developing countries. A common challenge in the design of PES in developing country contexts is to balance conservation and poverty alleviation goals. Addressing this challenge requires targeting strategies that integrate knowledge about farm-household characteristics and the potential for additional ecosystem service provision. In this article we test alternative approaches to predicting farm-household opportunity costs of reforestation contracts against a revealed preference benchmark derived from hypothetical auctions conducted in twelve communities, across three neighbouring districts, in the Upper East Region of Ghana with a final sample of 219 observations.

Our prediction models are based on household survey data gathered by Tambo and Wünscher (2011), and subsequent GPS-tracked measurements of the farms' plots to derive geo-spatial variables, both typically associated with opportunity costs according to theoretical and empirical literature, for example, on the sustainable livelihoods framework, and chronic poverty and remote rural areas.

A hierarchical linear model turned out to produce the best prediction of revealed preference estimates albeit at generally low levels of accuracy. Community specific effects remain one of the strongest predictors of revealed opportunity costs, suggesting that model-based targeting strategies can substantially over- and underestimate actual opportunity costs. The regression models, nonetheless, provide important insights in terms of farm-household level determinants these costs. We find, for example, that rainfall dependent farmers with a subsistence orientation and spatially scattered plots tend to have particularly high opportunity costs of joining reforestation programs.

Keywords: Agriculture, Ghana, hierarchical linear model, Opportunity Cost, payment for environmental services, reforestation, sustainable livelihoods framework

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