Tropentag, September 16-18, 2015, Berlin, Germany

"Management of land use systems for enhanced food security: conflicts, controversies and resolutions"

Empirical Analysis of the Cost Effectiveness of Smallholder Ecosystem Services in Kenya

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Abstract

Smallholder farmers in parts of sub-Saharan Africa engage in sustainable (conservation) farm management practices and participate in agri-environmental schemes that generate additional on-farm revenues through payment for ecosystem services (PES). However, smallholder farmers that are inadequately compensated for the forgone income for providing marginal ecosystem services pay a higher price compared to those farmers that are over-compensated especially if the joint agricultural output is complementary, supplementary or competitive. Therefore stakeholders are confronted with the challenge of evaluating all possible interaction between agricultural production and ecosystem services when making strategic decisions.

A possible solution for decision makers is to access the marginal cost of ecosystem services and effectiveness of agri-environmental schemes based on farm level bio-economic interaction. Theoretical classification of marketed agriculture output and non-marketed ecosystem services into complementary, supplementary or competitive relationships, depending on the minimum farm-level non-marketed ecosystem services, is proposed in this study. These joint production classifications are associated with diverse opportunity cost which is central to this study. A flexible transformation function and cross sectional data on 120 smallholder farmers with agroforestry certification in parts of rural Mount Kenya is use to empirically test the theoretical model.

The results seem to suggest that the joint production (agricultural output and ecosystem services) of a substantial number of smallholder farms in Kenya may not have a complementary relationship. Furthermore, the biophysical linkage between non-market ecosystem services and marketed outputs strongly influence the marginal cost of ecosystem services. Agri-environmental schemes could be designed in a more efficient manner if they target certain smallholder farms based on aforementioned classification and offer a range of contracts to encourage competitive bidding.

Keywords: Agroforestry, agri-environmental scheme, efficiency, payment for ecosystem services

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