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Natural Resource Impacts on Rural Livelihoods: An Analysis of Land Degradation and Living Standards in Tanzania

There is a growing interest in how natural resources may contribute to the economic prospects of the poor. Nowhere is this more important than in Africa, where poverty remains high and pressure on natural resources, such as forests and water, is growing. Besides the many direct benefits they can offer, forests and trees can indirectly affect the quality of agricultural land on which most rural poor depend. With increasing impacts of climate change, stemming in part from forest exploitation, dynamic tradeoffs are becoming more acute to low-income rural households, who must choose if and how to invest in agriculture and whether to protect forests and trees. This paper aims to contribute to the understanding of indirect forest and tree cover contributions to household incomes in Tanzania by determining how the resulting increase in soil quality may contribute to agricultural yield and agricultural technology use. Agriculture in Tanzania accounts for nearly a quarter of GDP and employs half of the country's workforce. The key channel through which this is hypothesized to occur is improved soil quality and moisture retention. This link has been shown to be important in the Tanzanian context Winowiecki et al. (2015) and requires additional study to fill a potential "knowledge gap" among farmers regarding perceptions of soil quality and how they influence agricultural production (Sheahan et al., 2014). Since forests and trees may also have impacts on agricultural inputs, such as fertilizer and irrigation technology, we also test impacts on these inputs, as well as net returns to farming. Empirically, the link between tree cover, soil quality, and agricultural production is tested using a geo-referenced, three-period household-plot panel dataset matched to high-resolution environmental variables from 2008--2013. Matching techniques are explored during the first two panel years in order to improve treatment and control comparison groups. The data covers three panels of nationally representative agricultural and socio-economic data at the household, farm and crop levels in Tanzania, collected between 2008--2013 as part of the World Bank's Living Standards Measurement Study (LSMS) survey. The LSMS data is then matched at the plot level using high resolution environmental data on key ecosystem variables, including woody cover, soil organic carbon, soil moisture, and distance to forests. Preliminary results indicate a positive contribution of trees to soil quality and permanent intercropping to agricultural returns for select staple crops. This heterogeneity of impacts across different crops suggests that different types of farmers may benefit differently from environmental and development policies targeted at certain geographic areas or at crop producers. More broadly, results from this research can better inform policymakers regarding natural resource management and targeted poverty alleviation in developing countries, particularly in light of increasing natural resource and economic effects of climate change.

Keywords: poverty, agriculture, Tanzania, forests, trees, soil