

Market driven afforestation – trajectories in environmental sustainability under land-use intensification

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In this study, I will analyze how a rapid market driven land-use change from agriculture to forestry currently occurring in the Amhara region in Ethiopia affects environmental sustainability. The main driver for land use change to forestry in the area is to generate additional cash income by producing and selling charcoal and firewood to urban centers. The rapid change, however, has implications for rural livelihood as subsistence farmers shifts to market-oriented production with higher income but also higher uncertainty due to market dependence. Changes from agriculture to forestry may lead to food insecurity if the charcoal and firewood market suddenly fails. It may have an environmental significance since production may depend on short-term exploitation of soil and water resources that can be unsustainable in the long-term. It also has climate change consequences since the plantations sequester carbon and the charcoal substitute other fuels.

This PhD aims to identify and describe positive and negative trajectories in (i) soil fertility and long-term sustainability of agricultural and forest production, (ii) carbon sequestration in biomass and soil at landscape level and (iii) water balance at landscape level and downstream. In order to achieve this, soil and biomass samples will be collected from representative land-use locations in the landscape covering both plantations, grazing land and cropland. Samples will be analyzed for soil nutrient and carbon contents using established standard methods. Models will be built using the resulting data with the aim to construct trajectories in carbon balances, soil fertility, and water balance to do quantitative estimates on a landscape scale. The result from this study will be used as an input for evidence based policy development on environmental sustainability.