

RHEMTULLA, JEANINE [S24-P103]

History matters: how path dependence and land-use legacies shape biodiversity, ecosystem function, and livelihoods in a swidden-fallow system

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Swidden-fallow cultivation is both a major driver of tropical deforestation and an important livelihood for many forest-dependent peoples. Secondary forest regrowth during the fallow period has the potential to restore important ecosystem services (e.g., soil fertility, biodiversity, timber and other forest products) that are critical to maintaining the long-term socio-ecological sustainability of these systems. How well these functions recover, however, may depend in part on the history of management, which, in turns, depends on the land-use decisions of individual households. In a subsistence peasant community in the Peruvian Amazon, we investigated how asset poverty (defined in terms of total household land holdings) affects land-use practices (crop choice, length of swidden cycles) and forest dynamics at the landscape scale. We then tested whether differences in land-use history (resulting from differential land-use practices) create persistent legacies in plant species composition and soil nutrient cycling, and thus the ecological sustainability of the system. Finally, we examined how land-use choices and ecological legacies combine to affect the baskets of ecosystem services and livelihoods derived from forests. We conducted detailed household surveys ($n \approx 90$) in 2007 and 2011, and visited, mapped, and reconstructed yearly land-use/cover history for fields and forest fallows ($n \approx 680$) from the mid-1960s to 2011 in a small community (886ha) near Iquitos, Peru. We sampled soils and tree species composition, and estimated potential revenue from charcoal, timber, and NTFPs in a subset of forest fallows, fruit orchards, and cultivated fields. We found path dependency in farmers' land-use choices whereby initial land holdings have long term influence on crop choice and fallow length, thereby creating a land-use trap for poorer farmers. Ecological legacies were also apparent. Historical cropping intensity was correlated with soil fertility decline, while time since initial clearing affected biodiversity levels. Farmers who could afford to plant fruit orchards benefitted from increased regulating and provisioning ecosystem services with negligible long-term impacts on ecosystem function. The results suggest that history matters: farmers may be trapped by land-use choices informed by past conditions while fallow recovery is influenced by previous use. Path dependency in the evolution of land holdings and the legacies of land-use management thus strongly influence both the well-being of forest people and the dynamics of forest clearing and regrowth.