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General models for ecological drivers of poverty

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General models for ecological drivers of poverty

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The livelihoods of the rural poor are nested within ecological communities. The poor rely heavily on their immediate natural environment for subsistence and suffer high morbidity and mortality due to infectious diseases. We show how the dynamics of poverty can be modeled, focusing on four exemplar drivers: infectious diseases, renewable resources, land-use change and population growth. Interactions between these ecological processes and economics can create reinforcing feedbacks associated with persistent poverty, characterized by a stable, low level, equilibrium; or poverty traps characterized by multiple stable equilibria in ecological-economic space. The inherent complexity of these relationships, combined with the spatial/temporal scales at which they occur in the real world, create empirical challenges for estimating parameters and validating the models. We use numerical methods to evaluate the parameter spaces for various combinations of these coupled systems. We find out that bistability is common in simple disease-economic systems compared to more complex coupled disease-renewable resource-economic systems and identify key parameters that are most influential to the outcomes of the systems. Combined, these models provide a general framework for deeper theoretical and empirical explorations of ecological drivers of poverty.