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Using Bayesian networks to evaluate the vulnerability of smallholder farmers in increasingly globalized markets

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Abstract: Agricultural systems in northern Laos are undergoing a rapid transformation from subsistence-based to increasingly export-oriented production of cash crops such as rubber, banana, and sugarcane, with important consequences for local livelihoods and ecosystem services. Our work aims first to identify the drivers of these land use and land cover (LULC) changes, and in turn to understand the impact of such changes on livelihood vulnerability. We define the vulnerability of the local system (in this case the village) in terms of its exposure and sensitivity to stress, as well as its resilience, i.e., its capacity to cope with the stress, either by ‘absorbing’ it or by adapting. Our case study areas are located in two regions of northern Laos characterized by different levels of market integration and export orientation. We present how we back-propagate desired future states of livelihoods using a land-use decision Bayesian network to define the resilient ecological, economic, and social states of the system.

Keywords: Socio-ecological system resilience; vulnerability; Laos.