Remote sensing of complex land use change trajectories—a case study from the highlands of Madagascar

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Abstract

Madagascar is often portrayed as a global environmental hotspot with widespread deforestation and environmental degradation. Quantitative and spatially explicit data on ecological change are, however, scarce and current estimates are often based on simplistic representations of deforestation and land use change. Significant uncertainties in current estimates therefore remain. The present study was conducted to assess deforestation and other important complex land use change trajectories in the eastern highlands of Madagascar. A timeseries of satellite imagery dating from 1972 to 2001 was used to analyse overall change and rates of change between different land use types in the study area. Forest cover in the study area was approximately 8060 ha in 1972 and 4278 ha in 2001. Rates of deforestation were not, however, constant throughout this period, but varied from 52 ha yr_1 (1972–1992) and 341 ha yr_1 (1992–1999). The increased rates in the 1990s were attributed to turbulent political conditions on the island during the latter period and shows the complex relationships between social, political and ecological processes governing deforestation and land use change processes. Accessibility (distance to villages and roads) and elevation were shown to be the most important predictors of deforestation risk in the study area. Intensive cultivation of slopes (*tanety*) increased by about 3400 ha (~65%) during the study period, a significant part of which came from cultivation of grassland savanna (net increase ~ 1700 ha). These trends were found to be indicative of increasing pressure on available land resources in the region, leading to extensive cultivation of marginal grasslands and ultimately significant soil fertility decline.

Keywords: Madagascar; Deforestation; Land use change; Remote sensing; Image classification

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