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Linking livelihood strategies with a regional level landscape mosaic to explore trade-offs between forest conservation and human wellbeing in a Madagascar biodiversity hotspot

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The north-eastern escarpment of Madagascar contains the island's last remaining large-scale humid forest massifs surrounded by diverse small-scale agricultural mosaics. There is high deforestation mainly caused by shifting cultivation practiced by local land users to produce upland rice for subsistence. Today, large protected areas restrict land users' access to forests to collect wood and other forest products. Moreover, they are no more able to expand their cultivated land, which leads to shorter shifting cultivation cycles and decreasing plot sizes for irrigated rice and cash crop cultivation. Cash crop production of clove and vanilla is exposed to risks such as extreme inter-annual price fluctuations, pests and cyclones. In the absence of work opportunities, agricultural extension services and micro-finance schemes people are stuck in a poverty trap. New development strategies are needed to mitigate the trade-offs between forest conservation and human well-being. As landscape composition and livelihood strategies vary across the region, these strategies need to be spatially differentiated to avoid implementing generic solutions, which do not fit the local context.

However, up to date, little is known about the spatial patterns of shifting cultivation and other land use systems at the regional level. This is mainly due to the high spatial and temporal dynamics inherent to shifting cultivation, which makes it difficult to monitor the dynamics of this land use system with remote sensing methods. Furthermore, knowledge about land users' livelihood strategies and the risks and opportunities they face stems from very few local case studies. To overcome this challenge, firstly, we used remote sensing data and a landscape mosaic approach to delineate the main landscape types at the regional level. Secondly, we developed a land user typology based on socio-ecological data from household surveys in 45 villages spread throughout the region. Combining the land user typology with the landscape mosaic map allowed us to reveal spatial patterns of the interaction between landscapes and people and to better understand the trade-offs between forest conservation and local wellbeing. While shifting cultivation systems are being transformed into more intensive permanent agricultural systems in many countries around the globe, Madagascar seems to be an exception to this trend. Linking land cover information to human-environmental interactions over large areas is crucial to designing policies and to inform decision making for a more sustainable development of this resource-rich but poverty-prone context.