

8. Land cover changes along tropical highland agroforestry systems: call for an improved climate adaptation

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Tropical highland ecosystem resources strongly depend on climate variability and associated water availability. This work aimed at better understanding the interactions between agro-forestry systems (cocoa and coffee) and livelihoods resulting in Land Use/Cover Changes (LUCCs) along the Rungwe tropical highlands in southern Tanzania. GIS- based analysis and remote sensing methods (World view II, Landsat Thematic Mapper and Enhanced Thematic Mapper+) were undertaken to detect and map changes among four main agro-ecosystems, namely food, cash crops, forest and irrigated agro-ecosystems. Image analysis validated with geo-coding surveys evidenced significant LUCCs since 1993 along with a ca. 3% area-per-decade increase in cocoa, a ca. 6% area-per-decade decrease in coffee, and a ca. 4 % area-per-decade decrease in natural forest cover. The latter was associated with a loss of natural species such as the fire and drought-resistant miombo trees, a critical issue under currently drier conditions. In addition, primary data collection, household questionnaire surveys and key informant interviews showed that market-driven factors of LUCCs were straightforward, as illustrated by the replacement of major agro-forestry systems and/or the emergence of valuable cash crops (*e.g.* potato) through time. LUCCs mainly impacted crops and vegetation diversity, also resulting in increased land fragmentation. In the absence of climate-smart resource management, the land cover competition between food and cash crops was stressed as a critical threat over livelihood security. Trends in cocoa, tea and new avocado agro-forestry systems developed at the expense of coffee must be further understood as a balance between climate trends, population growth, political influences and infrastructure development.

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