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Living on landslides: land use on unstable slopes in a rural environment of the Rift flanks west of Lake Kivu (DR Congo)

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Whereas landslides have been widely studied in terms of dangerous phenomena and land degradation processes, they may also be a source of opportunities for local communities in developing countries. Indeed, landslides modify topography, soil characteristics or local hydrology, which may lead to favorable conditions for human settlements, agriculture, or mining activities. However, little is known about the factors that influence landslide valorization. The aim of this study was to assess, based on the characteristics of the landslides and land user's perception of risk, the extent, modes of valorization and degree of satisfaction in exploiting landslides in the Kalehe region on the rift flanks west of Lake Kivu. Seventy landslides were selected out of 785 inventoried landslides by stratified sampling according to three criteria (type of movement, size, and position of landslide on the rift flanks). In addition, the landslides were characterized in terms of the local lithology, their age and depth. A survey was carried out with farmers exploiting these landslides. In addition, a comparative study of land uses in and outside the landslides was performed. We collected opinions from 82 farmers on 57 landslides of the 70 initially selected due to accessibility or safety constraints. All visited landslides were exploited except for three. All respondents knew about landslides, and more than 75% could report signs of landslide activity on their parcel. Almost 90% of these farmers consider the landslide risk to be high to very high, especially in the case of recent landslides and those with a flow movement. Compared to adjacent flanks, land values are higher and farmer satisfaction greater inside landslides characterized by less steep slopes, higher fertility, deeper soils, wetter soil, and lower stoniness, which is preferentially associated with old, deep-seated, and large landslides with a slide movement. On the contrary, land in recent landslides is cheaper. Farmer satisfaction is lower inside these landslides that are less wet, less fertile, shallower, or richer in sand content than the adjacent flanks. Spatial analysis revealed a differentiation in land uses in the landslides compared to the surrounding flanks. Subsistence crops occupy a larger proportion inside the landslides, while eucalyptus plantations and pastures have higher proportion outside. Statistical tests revealed that landslide characteristics significantly explain the differences in land use proportions for subsistence crop, forest, and banana land uses. Landslides less favorable for valorization are generally small, with very steep topography. This study shows that almost all landslides are being exploited by farmers and that farmers adapt their land use to the type of landslide. Some types of landslides further offer more favorable conditions for cropping that land outside landslides.

Despite the high perceived risk of landsliding, human settlement on unstable slopes would be justified because any future hazards are outweighed by the immediacy of the benefits. Better understanding the reasons for the settlement of rural populations on unstable landslides may help devise better risk mitigation strategies.