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A land cover change study in the Highlands of Northern Ethiopia using a flight of aerial photographs dating back to the 1930s

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In the Highlands of Northern Ethiopia, land degradation is claimed to have occurred over a long time mainly due agricultural practices and lack of land management. However, quantitative information on the long term land use, cover and management change is rare. The knowledge of such historical changes is essential for the present and future land management for sustainable development, especially in an agriculture-based economy. Hence, this study aimed to investigate the changes of land use, cover and management around Hagere Selam, Northern Ethiopia, over the last 80 years (1935 – 2014). We recovered a flight of ten aerial photographs at an approximate scale of 1:11,500, realized by the Italian Military Geographical Institute in 1935, along a mountain ridge between 13.6490°N, 39.1848°E and 13.6785°N, 39.2658°E. Jointly with Google Earth images (2014), the historical aerial photographs were used to compare changes over the long time. The point-count technique was used by overlaying a grid of 18 x 15 points (small squares) on 20 cm x 15 cm aerial photographs and on Google Earth images representing the same area. Occurrence of major land cover types (cropland, forest, grassland, shrubland, bare land, built-up areas and water body) was counted to compute their proportion in 1935 and 2014. In 1935, cropland, shrubland and built-up areas were predominant while other land cover types were not observed. On the Google Earth images, all categories were observed except forest. The results show that in both times cropland was the dominant land cover followed by shrubland. The proportion of cropland at present (70.5%) is approximately the same as in the 1930s (72%), but shrubland decreased and bare land, grassland and built-up areas have increased. Hence, the large share of cropland was maintained over the past long period without allowing for woody vegetation to expand its area, while some cropland was abandoned and converted to grassland and bare land. The increased proportion of built-up areas also explains the shrinking of shrubland. On the studied flight of aerial photographs, forests were not existing in 1935 and have not been restored until present. The increased area of open water, on the other hand, is related to the ongoing land rehabilitation activities carried out in the region. These results confirm previous studies that severe land degradation has occurred in the Highlands of Northern Ethiopia over a long time, due to early (pre-1935) cropland expansion and deforestation.