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Gully Development in North Ethiopia's Mountains

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Understanding trends in gully erosion, and the relation with changes in its triggers, is important to make sustainable development possible in semi-arid regions suffering from low food security and threatened by climatic deterioration.
The reconstruction of long-term (1868-2009) patterns in gully erosion in North Ethiopia and environmental control, i.e. LUC changes and rainfall pattern changes, requires an extensive database of ground-based photographs (1868-1975), aerial photographs (1964-1992), satellite images (1972-2009), meteorological station data (1950s-2009) and field measurements. Quantifying gully erosion networks and volumes is done from an integrated analysis of historical ground-based photographs, aerial photographs and IKONOS imagery. Therefore, new methodologies are being developed based on fieldwork, digital photogrammetry and Geographic Information Science techniques.
LUC mapping and change analysis for periods prior to satellite imagery and aerial photography is done by developing a new methodology that georeferences LUC boundaries identified on historical photographs to the horizontal plane of the map. For the LANDSAT LUC analysis (1972-2000), images dated 1974-5 were calibrated using photographs of the same period. Therefore, a methodology was developed that involves the development of spectral signatures based on LUC observed on the photographs, and the recording of the location of those LUC units by GPS. Rainfall pattern changes will be analyzed from Rainfall Estimates(2001-2009) and meteorological station data. Early results show that gully erosion was already extensive in the late 19th century, caused by a largely degraded environment and that critical gully expansion occurred after the mid 20th century. Little care was given to land management in 1868 resulting in very low vegetation cover which depleted to a minimum in dry spells like in the 1980s. In recent decades land management practices result in an environmental recovery and decreasing gully erosion.