



## **Geomorphic processes in the northern Ethiopian highlands: local and global perspectives**

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The rugged landscapes of northern Ethiopia have been impressed and partly degraded by agriculture since 3 millennia at least. As soils are not silty and as they often bear a dense stone cover, soil profiles have not yet been fully truncated by soil erosion that is concomitant to tilled agriculture. Agricultural practices are well adapted to the environment: the mahrasha tillage tool was developed during the high-tech Axumite period; the cropping systems fit seamlessly to soil catenas; and the farming systems are well adapted to inter-annual variation in rainfall conditions. Whereas, technically, under the traditional circumstances, agricultural adaptation to soil and climate variability is nearly optimal, land management has for long been hampered by unequal access to land and prevalent open access.

In the late 19th-early 20th centuries, stabilised gullies evidenced the existence of at least one subrecent incision phase; a new and strong incision phase started in the 1960s. Gully erosion rates are again decreasing since ca. 2000, in line with increased conservation activities and improved vegetation cover. As a result of interventions for soil and water conservation and other agricultural intensification, total food production in Ethiopia is now higher than ever; also food production per capita in 2005-2010 was 160% of that in 1985-1990.

Further, global climate change will bring higher temperatures and, according to most models, increased yearly rainfall to the Horn of Africa. The impacts of global warming on vegetation growth at higher altitudes will need to be disentangled from impacts of recent human settlement near the afro-alpine areas and on runoff response (hence drainage density and soil erosion) that is anticipated to strongly increase in the openfield landscapes of northern Ethiopia.