

Humans as a soil-forming factor in mountain ecosystems – effects of land use legacies on functional properties of mountain soils

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Land use by subsistence hillfarming communities

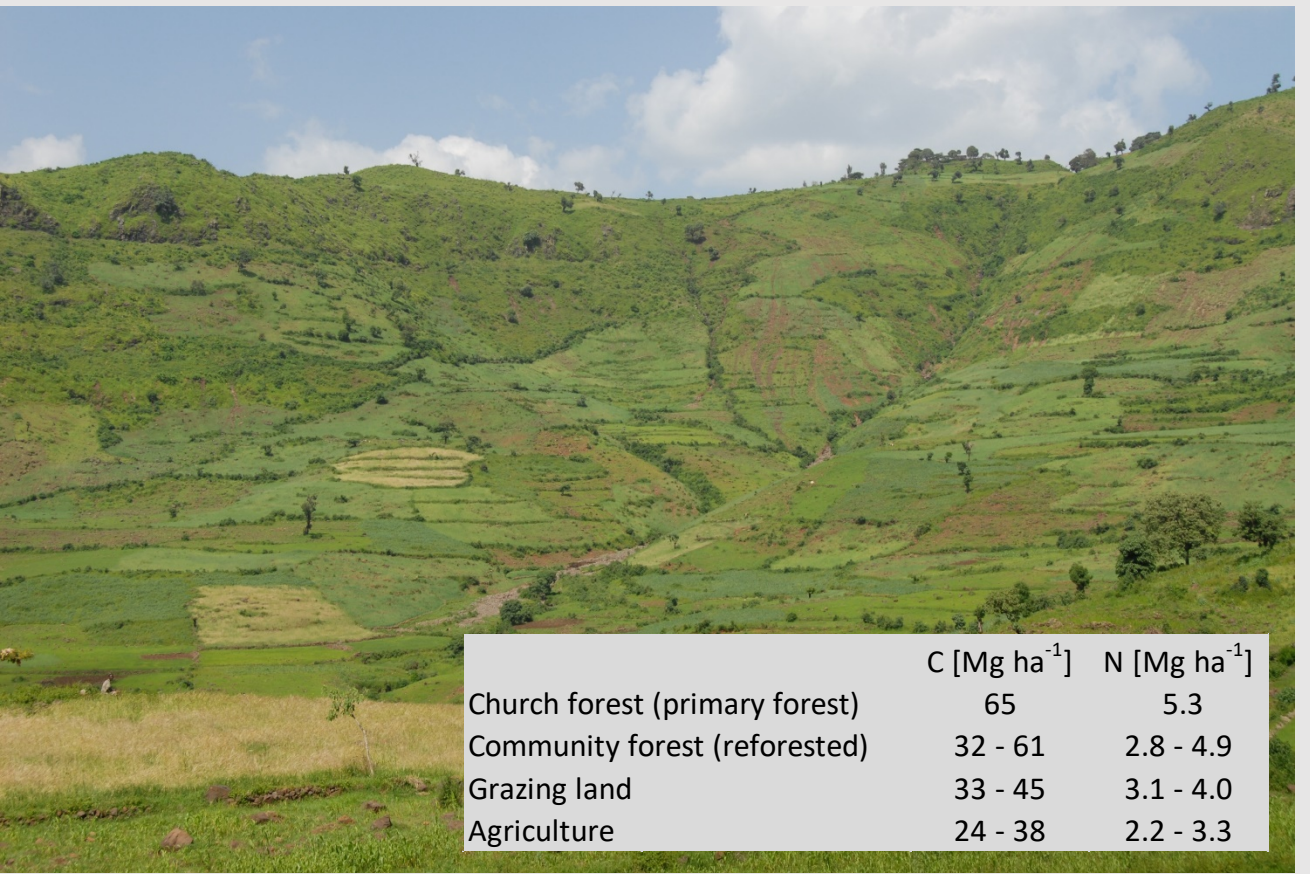


Grazing causes soil compaction, erosion and altered nutrient cycles



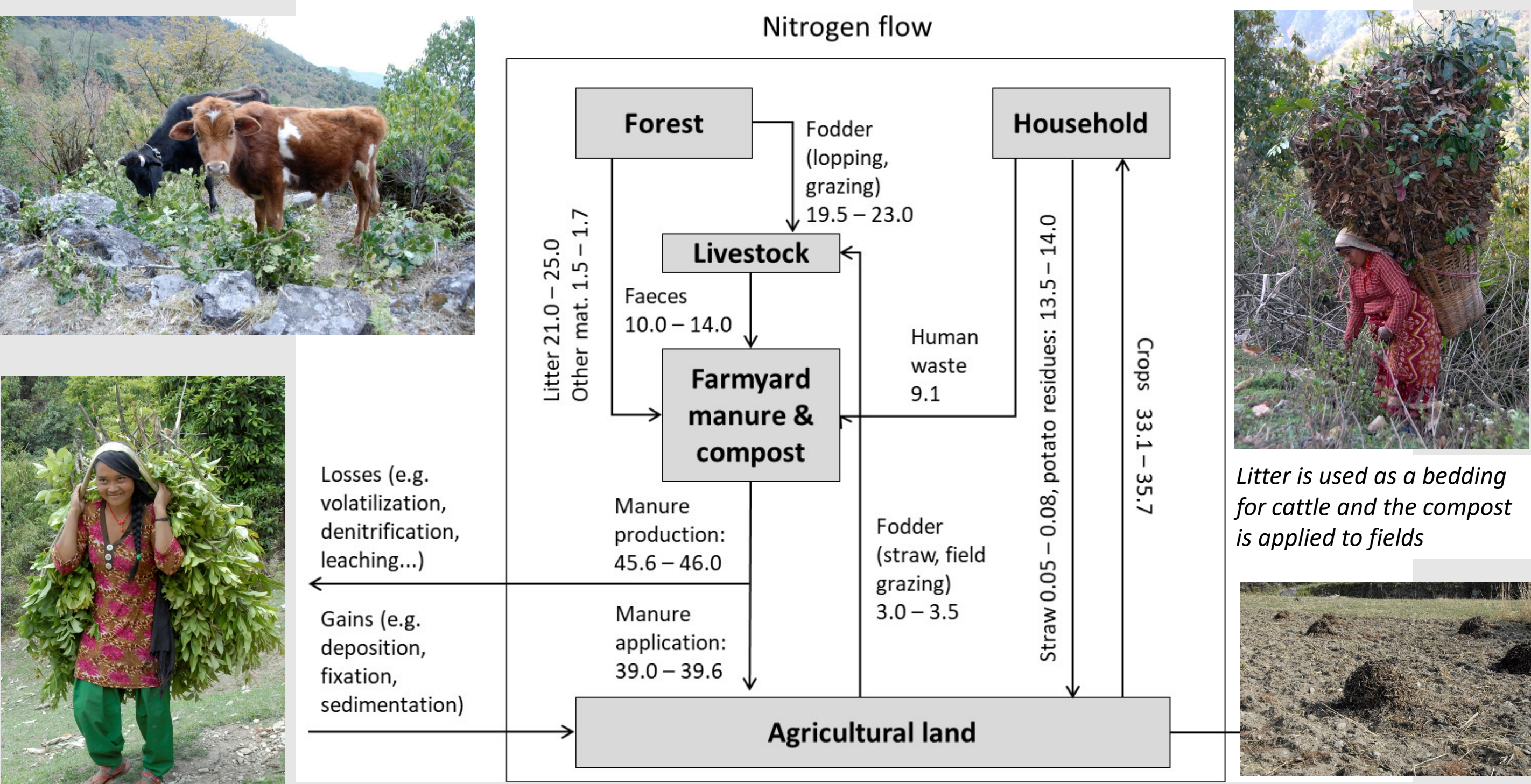
Conversion of forest to arable land may lead to severe **soil degradation** (*Soil erosion rates from arable land in the Ethiopian highlands: 40 t ha⁻¹* (Hurni et al. 2010))

Topsoil (0-15 cm) carbon and nitrogen pools reflect the disturbance gradient (example from two case study areas, Feyisa Beyene 2012)



References:
Feyisa Beyene T. 2012: Field Indicators of Soil Physical and Chemical Properties as an Aid for the Development of Sustainable Management Strategies in Northwest Ethiopia. Dissertation, University of Natural Resources and Life Sciences Vienna, 229 p.
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Giri A. and Katzensteiner K. 2013: Carbon and Nitrogen Flow in the Traditional Land Use System of the Himalaya Region, Nepal Mountain Research and Development 33(4):381-390.
Glatzel G. 1991: The impact of historic land use and modern forestry on nutrient relations of Central European forest ecosystems . Fertilizer Research 27, 1-8.
Hurni H, et al. 2010. Land degradation and sustainable land management in the Highlands of Ethiopia. In: Hurni H, Wiesmann U, editors; with an international group of co-editors. Global Change and Sustainable Development: A Synthesis of Regional Experiences from Research Partnerships. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 5. Bern, Switzerland: Geographica Bernensia, pp 187–207.
Tyrol Soil Survey 1988: Bericht über den Zustand der Tiroler Böden 1988. Amt der Tiroler Landesregierung, Innsbruck, Austria .

Mountain farmers have developed **sophisticated nutrient management methods** including ,tapping‘ resources from neighboring (forest) systems



Nutrient flows in two communities in the buffer zone of Sagarmatha National Park, Nepal (Giri & Katzensteiner, 2013)

Soil has a memory

Impacts of grazing can be recognized for centuries



Round shaped subcutaneous karst features indicate former soil/vegetation cover; vegetation indicates nutrient enrichment in front of the cowshed remnants

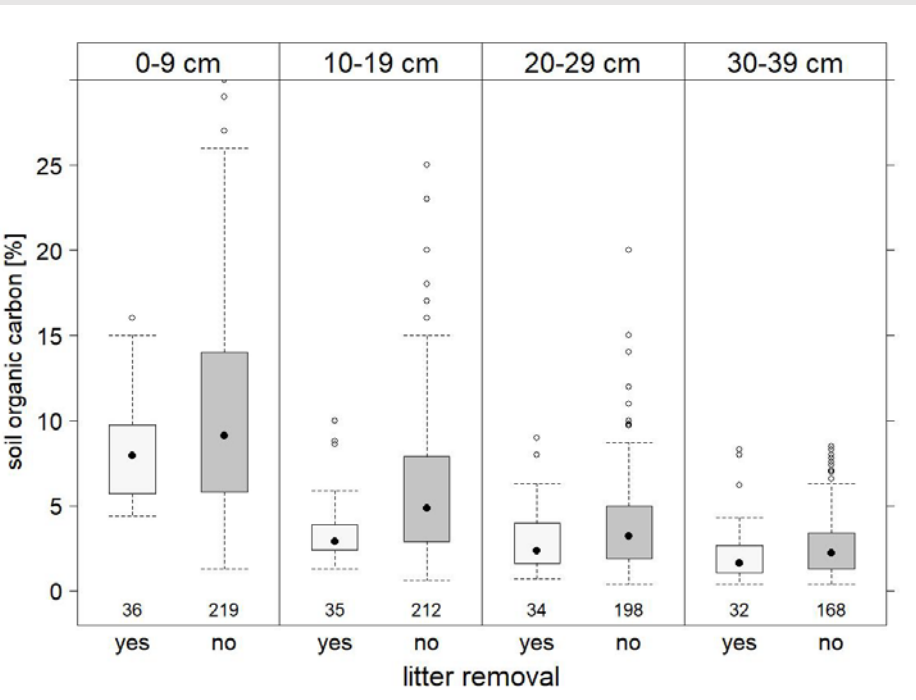
Abandoned farm terrace in Nepal



Soil properties reflect former land use



Litter raking and (forest) grazing was common in the Austrian Alps -Soil properties reflect historic utilization even after practices have long been abandoned: lower pH-values, base saturation, soil carbon and nitrogen concentration (Glatzel, 1991)



Soil carbon concentration in Tyrolean forest soils (data source: Tyrolean Forest Soil Survey 1988, prep. Simon A.)