



The potential and sustainability of agricultural land use in a changing ecosystem in southern Greenland

Matthias Hunziker (1), Chatrina Caviezel (2), and Nikolaus J. Kuhn (2)

(1) Physical Geography and Environmental Change, University of Basel, Switzerland (matthias.hunziker@unibas.ch), (2) Physical Geography and Environmental Change, University of Basel, Switzerland

Southern Greenland currently experiences an increase in summer temperatures and a prolonged growing season (Masson-Delmotte et al. 2012), resulting in an increased potential regarding agricultural land use. Subsequently, the agricultural sector is expected to grow. Thereby, a higher hay production and grazing capacity is pursued by applying more efficient farming practices (Greenland Agriculture Advisory Board 2009). However, agricultural potential at borderline ecotones is not only influenced by factors like temperature and growing season but also by other ecologic parameters. In addition, the intensification of land use in the fragile boreal – tundra border ecotone has various environmental impacts (Perren et al. 2012; Normand et al. 2013).

Already the Norse settlers practiced animal husbandry in southern Greenland between 986-1450 AD. Several authors mention the unadapted land use as main reason for the demise of the Norse in Greenland, as grazing pressure exceeded the resilience of the landscape and pasture economy failed (Fredskild 1988; Perren et al. 2012). During the field work in summer 2014, we compared the pedologic properties of already used hay fields, grazed land, birch woodland and barren, unused land around Igaliku (South Greenland), in order to estimate the potential and the sustainability of the land use in southern Greenland. Beside physical soil properties, nutrient condition of the different land use types, the shrub woodland and barren areas was analyzed.

The results of the study show that the most suitable areas for intensive agricultural activity are mostly occupied. Further on, the fields, which were used by the Norse, seem to be the most productive sites nowadays. Less productive hay fields are characterized by a higher coarse fraction, leading to a reduced ability to store water and to an unfavorable nutrient status. An intensification of the agricultural land use by applying fertilizer would lead to an increased environmental impact.

Fredskild B (1988) Agriculture in a marginal area – South Greenland from the Norse landnam (985 A.D.) to the resent (1985 A.D.). In: Birks HH, Birks HJB, Kaland PE et al. (eds) The Cultural Landscape – Past, Present and Future, Cambridge University Press, pp. 381–393.

Greenland Agriculture Advisory Board (2009). Available at: <http://www.nunalerineq.gl/english/landbrug/index-landbrug.htm>

Masson-Delmotte, V., D. Swingedouw, A. Landais, M. S. Seidenkrantz, E. Gauthier, V. Bichet, C. Massa, B. Perren, V. Jomelli, and G. Adalgeirsdottir. 2012. "Greenland Climate Change: From the Past to the Future." Wiley Interdisciplinary Reviews: Climate Change. <http://onlinelibrary.wiley.com/doi/10.1002/wcc.186/full>.

Normand, Signe, Christophe Randin, Ralf Ohlemüller, Christian Bay, Toke T. Høye, Erik D. Kjær, Christian Körner, et al. 2013. "A Greener Greenland? Climatic Potential and Long-Term Constraints on Future Expansions of Trees and Shrubs." Philosophical Transactions of the Royal Society B: Biological Sciences 368 (1624) (August 19): 20120479. doi:10.1098/rstb.2012.0479.

Perren, B., B. Massa, C., Bichet, V., Gauthier, E., Mathieu, O., Petit, C., Richard, H. 2012. A paleoecological perspective on 1450 years of human impacts from a lake in southern Greenland. The Holocene, 22 (9), pp. 1025-1034.