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"Global food security and food safety:
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Conservation of Ecosystem Services And/or Economic Development in Southern Amazonia (Brazil)?

Gerhard Gerold

Georg-August-Universität Göttingen, Dept. of Physical Geography - Unit Landscape Ecology, Germany

Abstract

Ongoing land use frontier in Southern Amazonia is still a "hotspot" of land use change (LUC) with regional and global feedbacks on Ecosystem Services (e.g. climate change, C-sequestration, hydrology). Since 1970s Amazonian deforestation rates have always increased until 2003/2004, and after a considerable deceleration until 2013 the trend has returned to increase in the frame of the current economic-political crisis. The massive LUC in the Amazon region attracts world-wide attention, because of its key importance for the (i) global and regional climate system, (ii) the global and regional water cycle, (iii) the planets genetic resources and (iv) the carbon storage in the rainforest and cerrado biome. On the other hand Southern Amazon is one of the centres of food production (e.g. soy bean, maize) in Brazil and the state of Mato Grosso is one of Brazil´s largest agricultural producer.

The Brazilian Government and international organisations have developed action programs with high priority on LUC, nature conservation, THG-mitigation and development of sustainable land management practices (e.g. Brazilian ABC-program, National Climate Plan, Amazon Fund) to decrease the ecological impacts on various ecosystem services (ESS). However, a more holistic examination of LUC feedbacks on ESS in the context of regional economic development scenarios, local drivers and actors has not yet been sufficiently advanced. The collaborative interdisciplinary project "carbiocial" (www.carbiocial.de) had investigated, how the Southern Amazon land use frontier will develop in future and which consequences will arise for some ESS (C-stocks and GHG-emissions, water cycle, regional climate change).

To analyse and simulate future LUC and their consequences for ESS (until 2030) different modelling tools were used (THG-modelling with CANDY, DNDC; soil erosion EROSION^{-3}D; water household SWAT, agro-economic modelling MP-MAS; LUC by LandSHIFT). Results of these interdisciplinary work will be presented with conclusions for the future LUC in Southern Amazonia, which in part are contrastive to previous Amazon research results. There are positive developments with integrated cropping systems (frame of ABC-program), there again on local and regional scale farmers have low development potentials for ESS conservation because of socio-economic-political constraints ("governance-problem"), which provoke social-ecological conflicts at the pioneer front in Southern Amazonia.

Keywords: Constraints for ESS, ecosystem services, land use change, LUC-scenarios, modelling, Southern Amazonia

Contact Address: Gerhard Gerold, Georg-August-Universität Göttingen, Dept. of Physical Geography - Unit Landscape Ecology, Goldschmidtstraße 5, 37077 Göttingen, Germany, e-mail: ggerold@gwdg.de