Tropentag, September 14-16, 2022, hybrid conference

"Can agroecological farming feed the world?
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Land use transformation of oasis systems in the Aïr Mountains of Niger

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Abstract

Irrigated oasis agriculture in the Aïr Mountains of northern Niger is an example for integrated crop-livestock farming under very harsh agro-ecological conditions. Very little is known about these century old agro-pastoral systems in remote mountain areas within the Saharan desert. This study aims at analysing land use changes (LUCs) of two oases systems on Mont Bagzam, a massif in the South of the Aïr Mountains, as well as assessing the use of water resources. LUCs were quantified for 1955 to 2021 using GIS-based mapping of agriculture and natural vegetation based on aerial photographs, LANDSAT and Google Earth images. Questionnaires conducted with a total 40 farm households and local records about agricultural production were analysed in order to quantify changes in agricultural production patterns. The results of remotely sensed data and ground truthing from March to May 2021 indicate an increase of actively used agricultural land in the two oases from 5 ha in 1955 to 13 ha in 2003 and to 83 ha in 2021. New fields are mainly cultivated with the cash crops onion (*Allium cepa* L.), potato (*Solanum tuberosum* L.) and garlic (*Allium sativum* L.) around the old oasis centres. The construction of an unpaved road in 2017 linking the villages on Mont Bagzam to nearby marketplaces and to the regional centre of Agadez has greatly facilitated the sale of cash crops, leading to enhanced cultivation. Normalized Difference Vegetation Index (NDVI) analyses show an increase of the high density vegetation (cropland and trees) share from 0.1 % in 1994 and 2003 to 1.8 % in 2020. The moderate density vegetation (shrubs and grassland) share from 1.2 % in 1994 and 2003 has increased to 9.9 % in 2020, while there are no notable effects of changes in annual precipitation. Between 2019 and 2021 farmers in the two oases established 18 additional wells to the 17 already existing ones, all equipped with diesel pumps. Changes in soil properties and calculated ground water extraction above recharge levels indicate threats for agricultural sustainability and related livelihoods of agro-pastoral communities on Mont Bagzam.

Keywords: Agro-pastoral system, land use, natural resource extraction, oasis agriculture, time series

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