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The effect of commercial export farms on drought risk and adaptation of agropastoral communities in the drylands of Kenya

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Drought poses a thread in the already existing water challenges in dryland regions. Drought hazard and risk are, however, not merely a natural phenomenon. Instead they are shaped and influenced by human behaviour and interventions. This raises questions about how to distribute the limited available water in an equitable manner, especially in drought prone areas such as drylands where water is key to people's livelihood and fragile ecosystems.

In the Horn of Africa Drylands (HAD) conflict over water and vegetation is prominent. On top of that, large-scale land acquisitions (LSLAs) are increasing the competition of water, putting local communities at increased risk. A key impact of increasing LSLA's is the decrease in water and land availability for vulnerable agropastoral communities. For such communities, drought adaptation is key to reduce drought risk, especially under climate change. Despite these recent studies, there is still a lack of research that includes the influence of upstream-downstream dynamics on drought risk and adaptation behaviour with a focus on the impacts of agropastoralists.

This study, therefore, further develops an agent-based model (ADOPT-AP) to investigate how upstream large scale commercial farms influence downstream drought risk and adaptation of agropastoralists. We apply and test the ADOPT-AP model for the Ewaso N'giro north catchment in Kenya. Main novelties of our method are the ability to capture heterogeneous and dynamic drought-human interactions (including different water users) in a spatially-explicit manner. After the model has been calibrated and validated, we test how commercial exporting farms affect drought risk and impact of downstream communities by simulating different scenarios. We show for various drought periods how both drought characteristics (soil moisture, discharge and groundwater levels) and impacts (milk production, crop production, distance to water) differ among the scenarios.