EGU24-16115, updated on 23 Apr 2024
https://doi.org/10.5194/egusphere-egu24-16115
EGU General Assembly 2024

The Potential of Remote Sensing for Enhancing a Sustainable Agricultural Intensification under a Changing Climate in West Africa

Jonas Meier[1], Frank Thonfeld[1], Verena Huber Garcia[1], Kenneth Aidoo[2], Niklas Heiss[1], and Ursula Gessner[1]

[1]German Aerospace Center (DLR), German Remote Sensing Data Center (DFD), Wessling, Germany (jonas.meier@dlr.de)
[2]United Nations University (UNU), Institute for Natural Resources in Africa (INRA)

The challenges of climate change in West Africa are closely linked to food security in the region. Rising temperatures and increasingly variable precipitation threaten traditional rain-fed agriculture relying on the rainy season. Climate change is affecting the rainy season in West Africa in multiple ways, e.g., by shifting the onset, shortening its duration and increasingly interrupting the growing period by dry spells. An increase of extreme weather events such as heavy precipitation or storms add another risk to agriculture. The risk of crop failures hits an already vulnerable system. Since a large portion of food is imported the West African countries are vulnerable to external economic shocks. Furthermore, West Africa has one of the highest population growth rates in the world, its population will increase to 1.2 billion people by 2050. To guarantee sufficient food supply and to achieve the Sustainable Development Goals (SDG), a sustainable intensification of agriculture is needed (i.e., increasing yields without additional land consumption and without adverse effects on climate change) and mitigation and adaption strategies against the negative effects of climate change are required. Remote sensing has proven to be a suitable instrument to measure and evaluate both, mitigation and adaptation actions in a reliable and cost-effective way. Depending on the method of cultivation, agriculture causes different amounts of greenhouse gas (GHG) emissions. Remote sensing can provide information about biophysical development as input and reference data for land surface models to assess the produced GHG under different cultivation practices. Since the negative impact of climate change on agriculture is already measurable and visible, adaptation measures are highly important. They differ in terms of their complexity, their technical feasibility and their costs. Adaptation measures can be for example a change in land management, the choice of crop variety or technical innovation like weather forecast or irrigation systems. In various interdisciplinary research projects (CONCERT, COINS, AgRAIN), we selected adaptation measures of varying complexity and monitor and evaluate them using remote sensing-based analysis, mainly on Sentinel-1, Sentinel-2 and Planet data. The analyses range from land cover and land use mapping to crop classification, crop suitability modeling, field boundary delineation, identification of management events, and site-specific productivity measurements. We employ a range of methodologies, including random forest regression, convolutional neural networks (CNN), fuzzy logic approaches, and time series analysis. The results serve as a basis for local stakeholders and decision-makers, enabling the implementation of proven adaption measures to enhance resilience against climate change and

promote sustainable agricultural intensification.