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Dynamics of land productivity in the Maradi region, Republic of Niger

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Abstract

In the Sahelian region, land degradation remains one of the major environmental challenges, having a significant impact on land productivity. Dependent on climatic and edaphic conditions and land use patterns, land productivity in the Maradi region is analysed in terms of spatiotemporal distribution of rainfall variability using a cartographic approach based on the exploitation of MODIS satellite imagery, in this case the Normalized Difference Vegetation Index (NDVI), and the application of landscape ecology principles, the study made it possible to spatialize productivity and identify its evolutionary trends over the last twenty years (2001-2020). Based on the maximum annual NDVI value, six vegetation cover classes were defined and, by comparing average NDVI values, used to monitor cover over intermediate periods (2001-2005, 2006-2010, 2011-2015, 2016-2020), corresponding to the periodic fluctuations observed in rainfall (every 5 years). The results show that in 2020, the “medium” vegetation cover class occupying mainly the central-southern and northern regions, while the “very low” vegetation cover class, present in the central part of the study area, occupies the smallest proportion. In fact, within 20 years, the landscape matrix has moved from the “low” to the “medium” vegetation cover class. Between 2001 and 2020, a progressive trend characterizes the “medium”, “dense”, and “very dense” vegetation cover classes. On the other hand, the “slight” vegetation cover class has seen a significant decrease in this area. In general, a significant improvement in land productivity was observed mainly in the central-south and northern areas with a 26.5 % increase, while a productivity decrease was only observed in 5.7 %. A correlation analysis between the spatial distribution of productivity and rainfall variability as well as agroecological practices could support the hypothesis of land degradation neutrality and help decision-making in the context of sustainable land management in Niger.

Keywords: Climatic variability, landscape changes, NDVI vegetation index, regreening