



Human-appropriated natural land cover in Nigeria are related to urbanization and cropland expansion from 1986 to 2022

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Evaluating how land cover is being transformed is essential to identify patterns necessary to infer the change trajectories and the driving factors. This study considers the case of Nigeria, where various natural ecosystems are being converted and for which a current national scale assessment at high spatial resolution is lacking. Producing 30 m Landsat-based time-series data, we analyze change among land cover types (i.e. tree-covered area, grassland, wetland, waterbody, cropland, artificial surface, and otherland) across seven agroecological zones. The annual change intensity was assessed at multi-levels across three time-intervals (i.e. 1986-2000, 2000-2013, 2013-2022). Distinguishing between natural land cover and human activity-related land-use, we estimate the extent of change signifying how humans have appropriated natural land cover (HANLC) over almost four decades. Focusing on major processes of observed change patterns, transitions between categories were aggregated into three HANLC classes for each time point (i.e. 1986, 2000, 2013, 2022). The HANLC classes are: 1) Cropland expansion, 2) Settlement and infrastructure development (SID), and 3) Natural regeneration and afforestation (NRA) comprising areas of NLC recovery. The first and second classes are areas where HLU expanded into NLCs. We then estimated the extent and changes of HANLC during the three time-intervals. The latter formed the basis for identifying the drivers and processes underlying the observed HANLC changes across AEZ and at the national level.

Insights from analysis at the interval level reveal that land transformation accelerated from 2.7% yr⁻¹ during 1986 – 2000 to 3.3% yr⁻¹ during 2000 – 2013 and peaked at 4.5% yr⁻¹ during 2013 – 2022 in all agroecological zones (e.g. rainforest, mangrove), except in Sudan savannah and Sahel savannah where speed was higher in 2000–2013 as grasslands were increasingly cultivated. Cropland expanded almost two-fold (22% to 37%), whereas tree-cover declined from 50% to 31% and wetland from 7% to 3.7% over the 23 years. Much loss of natural land cover (e.g. tree-cover, grassland, and wetland) to cropland occurred in 2000–2013 (22%) when most irrigation schemes in Nigeria were established. In contrast, the loss of mostly natural land cover to settlement (0.6%) during 1986 – 2000 increased to 0.9% in 2000–2013 and to 2.0% in 2013–2022. Of all agroecological zones, the mangrove zone was most disturbed as its persisting land cover areas reduced from about 80% during 1986 – 2000 to 69% in 2000–2013 and to 5% in 2013–2022. The amount of persisting land cover increased in the Sudan savannah at 16% in 1986 – 2000, 44% in

2000–2013 and 49% in 2013–2022. Processes of human-appropriated natural land cover in Nigeria are related to urbanization and cropland expansion into natural areas with some instances of natural regeneration, especially in croplands and abandoned settlement areas. Studies to identify measures to halt the high rate of conversion of natural land covers to croplands are thus needed.

Relevant links:

- <https://doi.org/10.1080/10095020.2024.2362759>
- <https://zenodo.org/doi/10.5281/zenodo.8205098>