Comparing Cropland-Driven Deforestation Estimates Across Brazilian Biomes Using Global and Regional Datasets

Author: Cainã Max Couto da Silva

Introduction

Accurate quantification of cropland-driven deforestation is crucial for understanding land-use change dynamics and developing effective conservation policies. This study compares two prominent datasets—Global Forest Watch (GFW) and Mapbiomas (MB)—to assess cropland-driven deforestation across Brazilian biomes from 2010 to 2018.

Methods

Cropland-driven deforestation was analyzed using 30m resolution satellite imagery from both datasets using Google Earth Engine. For GFW, the forest was defined as areas with ≥10% tree cover in 2000, while MB used a comprehensive land-use classification system. Deforestation events were classified as cropland-driven if the area was converted to temporary cropland (defined by MB classes 18, 19, 39, 20, 40, 62, 41) within a 5-year window following forest loss.

The repository storing the scripts and instructions to reproduce this analysis is provided **here**.

Results

The analysis revealed distinct spatial and temporal patterns in cropland-driven deforestation between the two datasets. GFW consistently showed lower estimates than MB across all biomes, both in absolute area and when normalized by biome size (Figure 1).

A key finding consistent across both datasets was a declining trend in cropland-driven deforestation starting from 2012, observed in both absolute and relative terms. MB data showed peak conversion rates of approximately 350,000 ha in 2012 in the Cerrado biome. When normalized by deforested area, the Pampa biome showed the highest conversion rates in the MB dataset, with up to 70% of the deforested regions transitioning to cropland. Notably, this pattern was not evident in the GFW dataset (Figure 1).

Discussion

The observed differences between datasets can be attributed to three main methodological factors:

1. Initial forest definition: GFW's fixed tree cover threshold from 2000 excludes areas that MB might classify as native vegetation, particularly in savanna ecosystems like the Cerrado.

2. Classification approach: MB's regionally calibrated system might capture Brazil-specific land-use transitions more precisely than GFW's globally standardized methodology.
3. Temporal framework: The different baseline periods (GFW's fixed 2000 baseline versus MB's annual classifications) might affect how deforestation events are identified and classified.

These methodological differences highlight the importance of using multiple datasets for comprehensive land-use change assessment. Future monitoring efforts could benefit from combining GFW's consistent global methodology with MB's detailed regional classification system, particularly in regions with complex vegetation dynamics like Brazilian savannas.

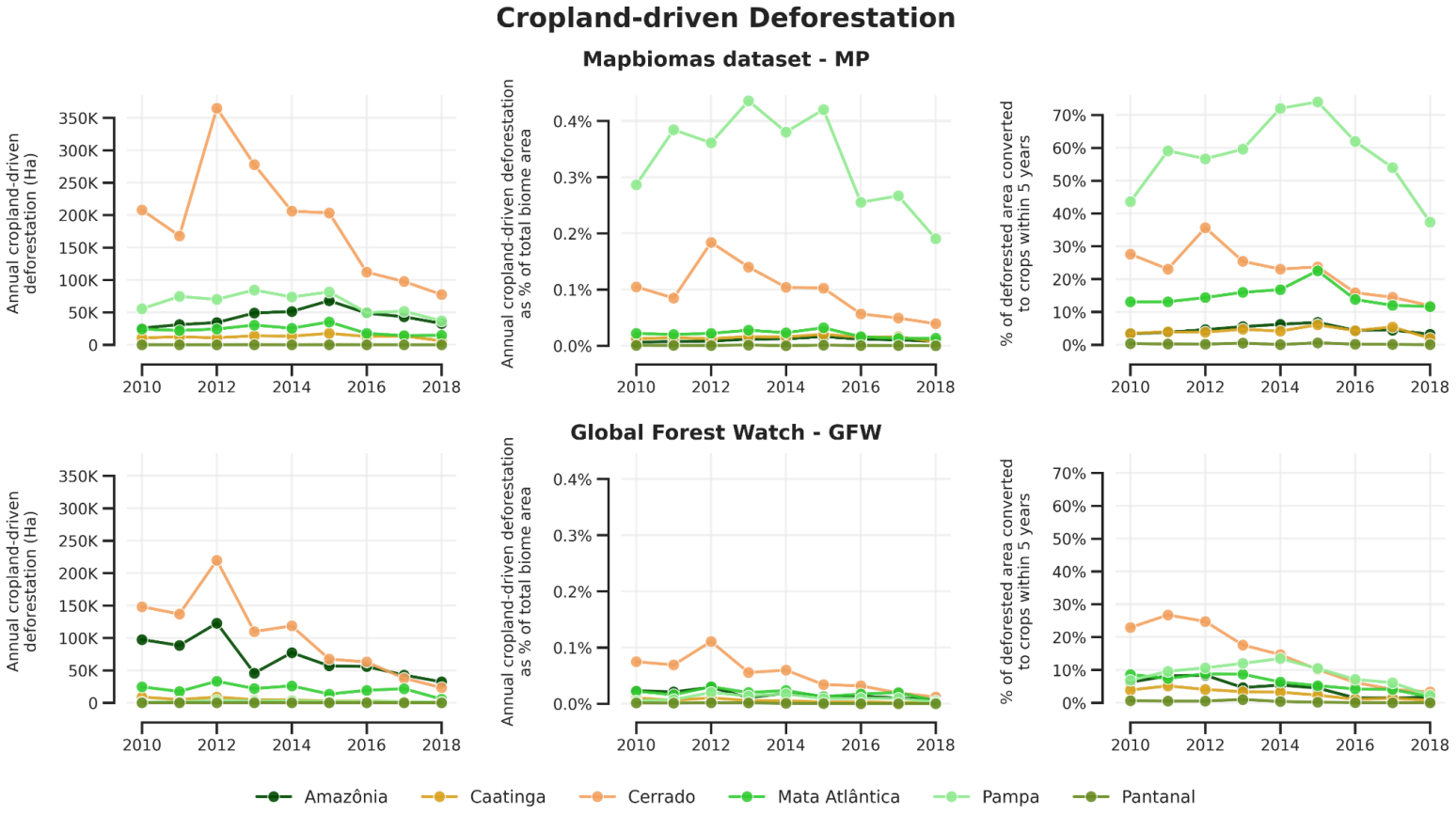

Figure 1. Cropland-driven deforestation using Mapbiomas and Global Forest Watcher. The upper panel shows the total cropland-driven deforestation in Ha (left), and the cropland-driven deforestation normalized either by the biome area (center) or forest area (right). Accordingly, the lower panel has the same cropland-driven deforestation structure for the Global Forest Watcher dataset.