Patterns of Change in Irrigation and Land Cover in Western Bahia, Brazil

Antonio Victor Galvao da Fonseca, Department of Geography
antfonseca@clarku.edu

AAG Painel Session

Background

Some of the most active agricultural frontiers in the world are located in the Cerrado biome in Brazil. Remote sensing and GIS provide information that allows the analysis of time series and patterns of irrigation expansion. However, inconsistent datasets or inadequate techniques could cause misinterpretations.

Objective

Develop an approach to analyze changes in time series maps through the gains and losses of one category using Google Earth Engine (GEE).

Study Area and Data

Two MapBiomas datasets are used: i) pivot irrigation data and ii) land use and land cover maps. Both datasets are generated from Landsat satellite images using machine learning and provide annual data from 1985 to 2022. See https://brasil.mapbiomas.org/

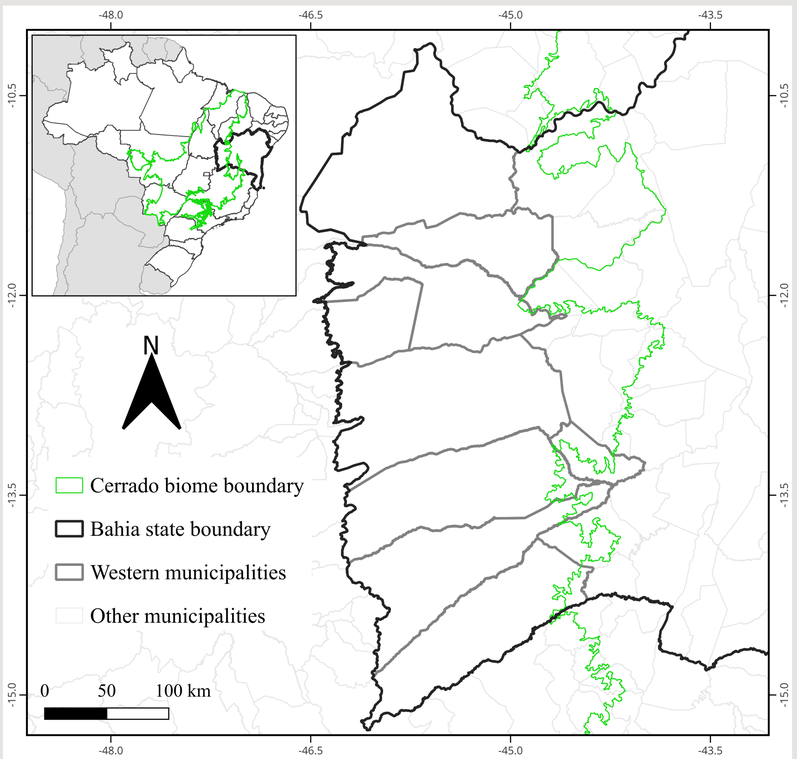

Figure 1. Location of the nine municipalities in Western Bahia, Brazil.

Method

My method produced annual historical maps of pivot gains and pivot losses between 1985 and 2022. Then, the pivot maps were intersected with the annual land use and land cover maps to identify where pivot gains and pivot losses occurred (Figure 2).

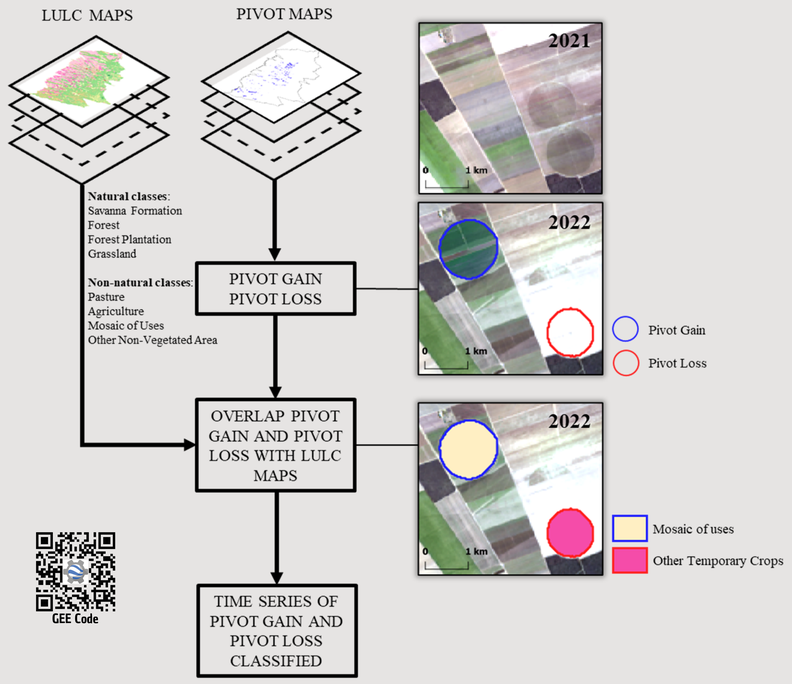

Figure 2. Methodological steps to implement pivot gain and pivot loss classification protocol in the Google Earth Engine. The satellite images are temporal mosaics from the Landsat-8 sensor for the months between June to August, i.e., the dry season.

Result

Integrating time series of pivot irrigation gain and loss and land use and land cover maps allows us to identify patterns of landscape change.

From 1985 to 2022, irrigated agriculture had more pivot gains than pivot losses. Pivot gain occurred more in non-natural than natural areas (Figure 3).

The Crops category experienced the greatest change among non-natural land covers, while Savannah Formations report the most extensive loss among natural land cover types (Figure 4).

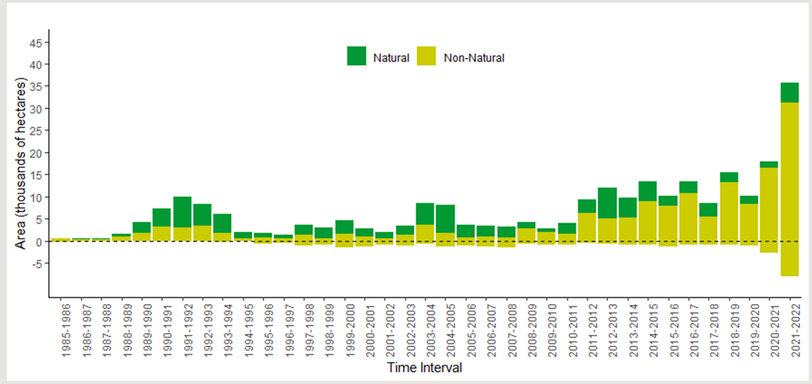

Figure 3. Pivot gain and pivot loss area from 1985 to 2022. The bars above the horizontal dashed line indicate where pivot gain occurs, and the bars below the horizontal dashed line indicate where pivot loss occurs.

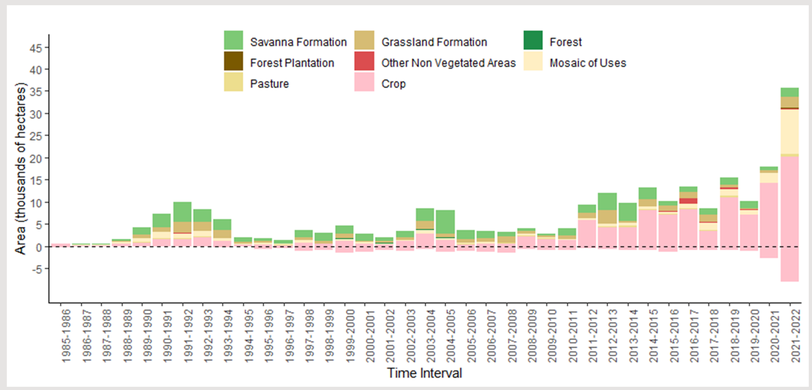

Figure 4. MapBiomas classes area where pivot gain and pivot loss occur. The bars above the horizontal dashed line indicate which class the pivot gain occurs, and the bars below the horizontal dashed line indicate which class the pivot loss occurs.

Conclusion

1. The method highlights the predominance of irrigation pivot gains in non-natural areas and the loss of savannah formations.
2. My GEE code brings together different time series maps, which help users and producers by identifying patterns of change.
3. The users can adapt and replicate the method across remote sensing and GIS applications, extending beyond the MapBiomas dataset and Bahia study area. The code is available at https://shre.ink/gain-loss-gee.

Acknowledgments

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