



Legal deforestation can jeopardize plant diversity conservation in an agricultural frontier in the Brazilian Cerrado: a spatial explicit contribution to Santana and Simon (2022)

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Abstract

The work of Santana and Simon (2022) provides a unique database on angiosperm flora in the Cerrado's agricultural frontier (known as MATOPIBA), revealing that its plant biodiversity remains largely unknown. However, ongoing deforestation combined with areas that can still be legally deforested, has the potential to jeopardize plant conservation in the region if measures to prevent land clearing are not adopted. Based on the databased provided by the authors, high resolution vegetation maps and land tenure data, it is demonstrated that almost 5 Mha of Cerrado vegetation has been converted from 1990 to 2020, and further 10.1 Mha can still be legally cleared, which 1.58 Mha in small, 2.25 Mha in medium and 6.27 Mha in large farms. This has practical implications for biodiversity conservation in the MATOPIBA and, thus, the clearing of “areas where populations of endemic and threatened”, as well as rare, species occur should be avoided. In general, the whole region should be better sampled in order to fill the knowledge gap on its plant diversity, but certain areas could be prioritized to optimize sampling efforts and provide botanical information that inform conservation plans with the objective to avoid the extinction of endemic, threatened and unknown species. Proactive conservation measures are yet palliative because the current environmental legislation still allows the suppression of large extensions of Cerrado vegetation – likely to be converted to mechanized agriculture as soon as it becomes profitable.

Keywords MATOPIBA · Forest Code · Biodiversity · Land clearing · Land tenure

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The work of Santana and Simon (2022) provides a unique database on angiosperm flora in the most active Brazil's agricultural frontier, revealing that its plant biodiversity remains largely unknown. At least 2,517 species were found in their defined study area (DSA), a sub-region of ~30Mha within the so-called MATOPIBA, a 73 Mha territory in the northern Cerrado. Their database includes 54 endemic species and 38 species threatened by extinction (6 endemics), expanding the local knowledge on the Cerrado flora, a region where nearly 30% of the tree species are rare, especially due to restricted geographic range and scarce populations (Maciel and Martins 2021). One of the main results of Santana and Simon (2022) is that georeferenced occurrences of angiosperms are still scarce in DSA (0.08 record/km²), what supports the claim of the authors that “regional compilation could well surpass 5000 species” by increasing sampling effort.

The main issue of concern that deserves attention, absent in the discussion of Santana and Simon (2022), is the fact that ongoing deforestation combined with areas that can still be legally deforested, has the potential to jeopardize plant conservation in DSA if a proactive zero deforestation policy is not adopted in the Cerrado (Brandão Jr et al. 2020). In this sense, the very first conclusion of Santana and Simon (2022), that “deforestation in areas where populations of endemic and threatened species occur should be avoided in order to minimize the impact of habitat loss on plant populations”, could be strengthened with spatial information on the current and potential habitat loss in DSA. Based on vegetation maps (SM Fig. 1) from MapBiomass project (Souza et al. 2020), the net Cerrado loss in DSA was 4.7 Mha in the period of 1990 to 2020 (Fig. 1), of which 1.38 Mha (29%) in cells with occurrence of endemic/threatened species (28% of the cells). This highlights that, in the last 30 years, ~150,000 ha were deforested each year and any special effort to avoid deforestation was observed where populations of endemic/threatened species occur. However, there is still room for land clearing in DSA under the compliance with environmental legislation.

Private farms in Brazil are obligated by the Forest Code (FC – Law 12.651/2012) to maintain a portion of protected vegetation (Legal Reserve - LR), which varies from 80% of the farm area in the Amazon, to 35% in the transition of the Amazon/Cerrado, and 20% in the rest of the country (Metzger et al. 2019). Given the “surplus” of farm vegetation above these thresholds, the strict compliance with the FC allows the legal deforestation of 17.2

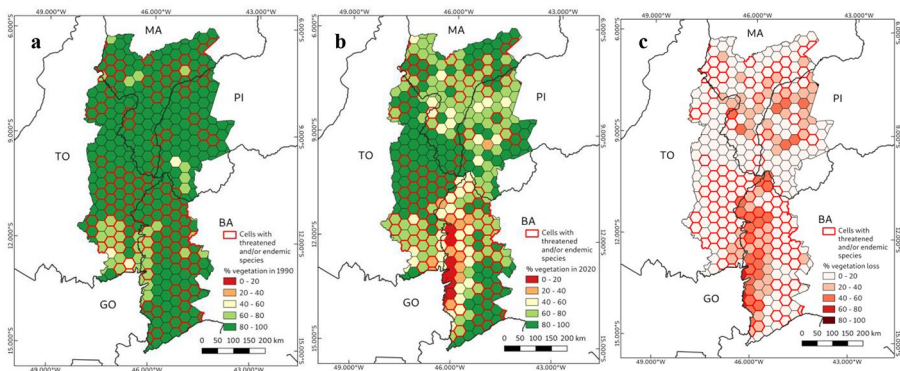


Fig. 1 % of vegetation cover in (a) 1990 and (b) 2020; and (c) difference (%) of vegetation cover between 1990 and 2020. Hexagons with red border are the cells where endemic and/or threatened species are found

Mha in the MATOPIBA (Polizel et al. 2021). In DSA, the analysis of vegetation “surplus” (SM Fig. 2), following Polizel et al. (2021), reveals that further 10.1 Mha can still be legally cleared (Fig. 2), which 1.58 Mha in small, 2.25 Mha in medium and 6.27 Mha in large farms. Considering the cells with occurrences of endemic/threatened, 4.37 Mha of Cerrado are allowed to be converted, being 0.54 Mha in small, 0.83 Mha in medium and 3 Mha in large farms. Even sounding absurd at a first glance, the strict compliance of the current Brazilian environmental legislation could result in almost 15 Mha of cleared Cerrado in DSA,

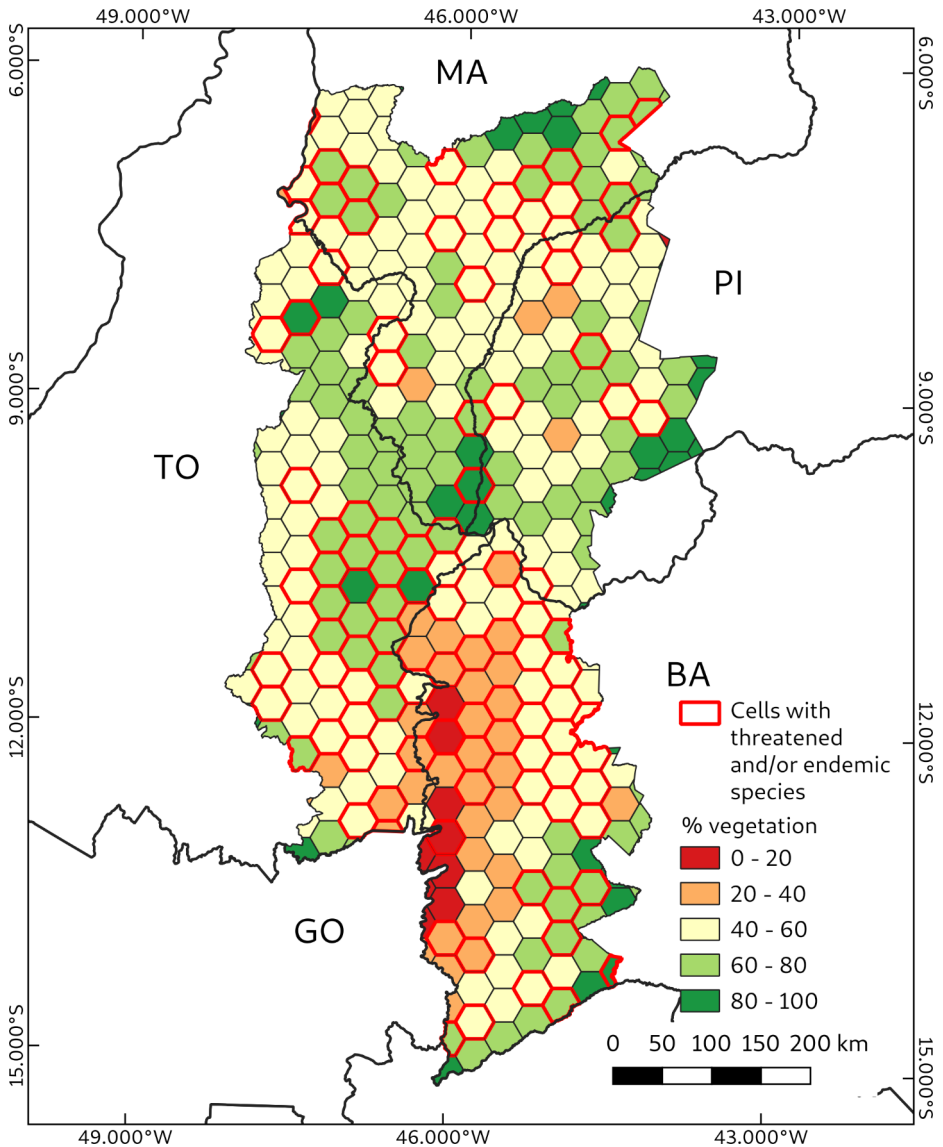


Fig. 2 Potential vegetation cover (%) if all legal deforestation in private farms is realized. Hexagons with red border are the cells where endemic and/or threatened species are found

or nearly a half of the region. Although the allowed deforestation in cells with endemic/threatened species is ~40% of the possible legal land clearing, this information is probably underestimated by the fact that 30% of the endemic/threatened records are concentrated in protected areas (PAs), which cover a minor portion of the landscape.

As the authors claim, more sampling efforts are needed to provide “better data on composition and distribution of species” that are “considered to be of high conservation value” (Santana and Simon 2022). However, almost the entire DSA should be better sampled to reach the national average of 0.41 record/km² (SM Fig. 3), which is still considered far from adequate to better estimate the local biodiversity in the tropics. Given cuts in budget for scientific and conservation activities in Brazil (Overbeck et al. 2018), combined with the pressure for agricultural expansion in the MATOPIBA (Polizel et al. 2021), it is unlikely that the region is minimally sampled in the short term before some thousands of hectares are lost. Thus, certain areas could be prioritized to optimize sampling efforts and provide botanical information that inform conservation plans with the objective to avoid the extinction of endemic, threatened and even unknown species. Examples of potential unprotected areas worth of focusing future sampling efforts are those cells with occurrence of endemic/threatened species and lower potential vegetation cover if all the legal deforestation is realized (red hexagons with red borders in Fig. 1). Better sampling the areas where deforestation is potentially more harmful to the composition of the landscape may provide useful information for policies aiming plant biodiversity conservation. Furthermore, the biodiversity of the PAs still remains scarcely mapped, with about a half of them completely unsampled by the time of the work of Oliveira et al. (2017). The ongoing relaxation of the Brazilian protection laws to allow private economic exploitation of PAs (including the *Jalapão* State Park, in DSA) also poses important threats to biodiversity, so further sampling efforts are necessary inside PAs too.

In order to “to minimize the impact of habitat loss on plant populations”, a series of proactive conservation measures should be taken, such as the extension of the Soy Moratorium to the Cerrado (Soterroni et al. 2019), the adoption of the 35% LR threshold in the whole MATOPIBA, and the expansion of the network of PAs. Anyway, these measures are only palliative because the environmental legislation still allows the suppression of large extensions of Cerrado vegetation, that are likely to be converted to mechanized agriculture as soon as it becomes profitable (Baldi et al. 2006). Only a zero-deforestation policy could avoid the clearing of “areas where populations of endemic and threatened”, as well as rare, species occur. Otherwise, legal deforestation can jeopardize plant diversity conservation in the agricultural frontier of the Brazilian Cerrado.

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Data Availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

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