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*The red-tailed lizard (Vanzosaura rubricauda) has lost more than 70% of its range in the Cerrado*

## ANALYSIS

# DESTROYING NATIVE VEGETATION TO PRODUCE BEEF AND SOY IS THE MAIN DRIVER AFFECTING BIODIVERSITY IN THE CERRADO AND AMAZON

The organization has gathered data from different scientific sources and concluded that the problem affects all Brazilian biomes, but the Cerrado is where habitat loss was proportionally higher in recent decades, with a direct impact on the various forms of life that make this typically Brazilian biome one of the most biodiverse spots on the planet, but also one of the most threatened.

The world is on alert. The loss of natural habitats and the accelerated disappearance of species are the visible face of the crisis that affects the planet's biodiversity. Published by WWF in 2020, the latest version of the Living Planet Report<sup>1</sup> showed an average drop of 68% in monitored populations of mammals, birds, amphibians, reptiles, and fish between 1970 and 2016.

Assessing the global status of biodiversity, that is, the variety of all living things, is a complex task. There is no single measure that can capture all changes in the web of life, the report cautions. However, most indicators point to significant losses of species in recent decades.

The Living Planet Report warns that the damage can be seen in all regions of the globe. In Brazil, it is no different. And the Cerrado and the Amazon are two of the epicenters of the biodiversity loss crisis that also encompasses other South American biomes. This is an unfortunate similarity of these two Brazilian biomes, so biologically different: the Cerrado, the most biodiverse savanna in the world and, the Amazon, the most extensive tropical forest rich in species and ecosystem services.

Considered one of the hotspots<sup>2</sup> of diversity of life on the planet, the Cerrado accumulates evidence that the rapid occupation of the biome by agriculture since the 1950s<sup>3</sup> – mainly for soy and beef production – resulted in a drastic

1 <https://livingplanet.panda.org/pt-br/>

2 <https://www.conservation.org/docs/default-source/brasil/HotspotsRevisitados.pdf>

3 [https://jbb.ibict.br/bitstream/1/357/1/2004\\_%20Conservacao%20Internacional\\_%20estimativa\\_desmatamento\\_cerrado.pdf](https://jbb.ibict.br/bitstream/1/357/1/2004_%20Conservacao%20Internacional_%20estimativa_desmatamento_cerrado.pdf)



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loss of natural vegetation coverage with significant impacts on the region's biodiversity.

The Cerrado corresponds to a quarter of the national territory and covers 12 states and the Federal District. In addition to being considered the “cradle of the waters” and the “water tank” of Brazil, the biome is the habitat of numerous endemic species for fauna and flora.

Six million hectares of native vegetation were lost in the biome in the last ten years, half of which (3.1 million) occurred in the so-called “Matopiba”<sup>4</sup> region, which includes parts of the states of Maranhão, Tocantins, Piauí and Bahia.

The importance of this region for biodiversity is that it houses 44% of what is still preserved in the biome and has become one of the most threatened regions in the country.

In 2020, of the original Cerrado area, only 54.4% remained with native vegetation; another 44.9% were already converted for human uses, mainly pastures (23.7%), followed by agriculture (13.2%). Although livestock accounts for most of the occupation of the biome, the latest analysis by MapBiomias<sup>5</sup> has drawn attention to the rapid pace with which agriculture has advanced in recent decades in the region.

From 1985 to 2020, the areas used for agriculture grew fivefold (460.7%) in the biome, with an expansion of 21.6 million hectares. Meanwhile, pastures advanced over 8.7 million hectares in the same period, an increase of 22.7%. In all, the area used by agriculture has grown by 26.2 million hectares in the last 36 years.

The Brazilian Amazon, one of the most biodiverse global regions and an important carbon sink, sees deforestation levels increase every year. The growth in exploitation in the region has taken place since 1970 with the implementation of the export oriented logic of mining, logging, soy, and beef products<sup>6</sup>.

These activities threaten the existence of the forest, and ultimately lead to deforestation, environmental degradation, and the loss of biodiversity.

Approximately 17% of the forest has already been converted, another 17% degraded<sup>7</sup> and only between August 2020 and July 2021, another 13,235 km<sup>2</sup> of forest was destined for clear-cutting, an increase of more than 21% compared to 2020, and the highest value in the last 15 years.

To better understand what the loss of native vegetation means to the biodiversity of the Cerrado and the Brazilian Amazon and add more evidence to propose public policies and conservation actions for the species of these biomes, WWF-Brasil with the support of the consultancy Gondwana, coordinated by researcher Cristiano de Campos Nogueira, prepared a study relating the impact on biodiversity from converting native areas to produce soy and livestock. This study was produced under the Eat4Change project and funded by the European Union.

### METHODOLOGY

In order to understand the status of the Cerrado and Amazon species most affected by deforestation (especially by the production of soy and livestock), we overlapped the area already converted in these biomes with the original distribution of each species. The distribution area was obtained from maps generated by IUCN in consultation with experts available at <https://www.iucnredlist.org/>.

The species evaluated were those threatened with extinction or with limited geographic occurrence, belonging to the following groups: mammals, birds, amphibians, lizards, and snakes. These terrestrial vertebrates were chosen because they are the most studied species and for which we have information on both their distribution and threat level. All endangered species from the two biomes were listed, both globally (based on the IUCN List) and regionally (based on national lists). Additionally, species with restricted distribution (less than 50,000 km<sup>2</sup>) were included, which, due to their small area of occurrence, are particularly vulnerable to deforestation.

Among the 486 species evaluated are 183 birds, 101 amphibians, 118 mammals and 84 lizards and snakes. Of

4 <https://www.wwf.org.br/?60466/An-Inside-View-of-Matopiba>

5 <https://mapbiomas.org/en>

6 Science Panel for the Amazon (2021). Executive Summary of the Amazon Assessment Report 2021.

7 PRODES – Estimate of clear-cut deforestation in the Legal Amazon for 2021 is 13,235 km<sup>2</sup> in: <https://www.gov.br/inpe/pt-br/assuntos/ultimas-noticias/divulgacao-de-dados-prodes.pdf>



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these, 171 species occur in the Cerrado and 187 in the Amazon and 128 species share both biomes (Figure 1).



**Figure 1** – Diagram showing the total number of species assessed according to the biome of occurrence, highlighting species that occur in both biomes.

The impact of habitat loss on each species was estimated based on two types of data that were cross-referenced: maps of the distribution of each species, available for download on the IUCN website, and land use data for the Cerrado and the Amazon (Source: MapBiomas, 2019).

The impact of human activities over time was calculated using different perspectives of land use change:

- Total impact on the species: considering the loss of the species' distribution area caused by land use change until 2019
- Historical impact on the species: considering the loss of area of the species distribution caused by land use change until 2014
- Recent impact on the species: considering habitat loss between 2014 and 2019

These values were also calculated focusing only on the impact of soy and pasture, allowing to understand the contribution of each of these activities in the impact on species.



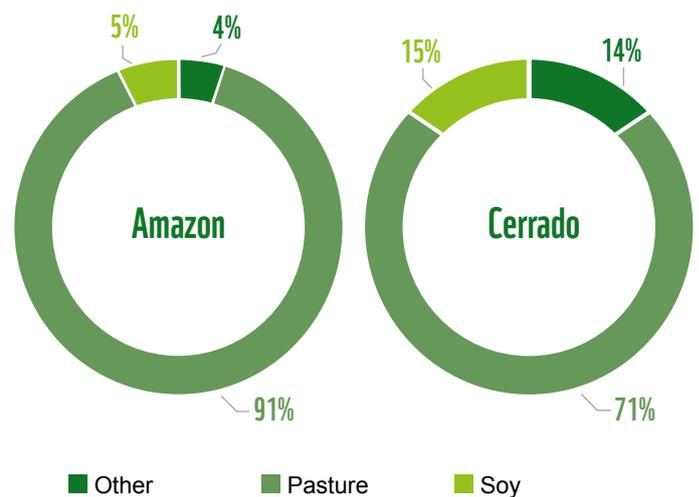
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Domestic cattle (*Bos taurus*) in a pasture with native forest in the background, in the region of Alta Floresta, state of Mato Grosso

## RESULTS

1. In both the Cerrado and the Amazon, native vegetation was primarily replaced by areas of pasture and soy

MapBiomas data indicate that the main activities responsible for land use modification in the Cerrado and Amazon are pastures and soybean plantations (Figure 2). By 2021, these commodities already occupied more than 40% of the Cerrado (23.7% pasture; 7.3% agricultural and pasture mosaic; 8.9% soy), and 14% in the Amazon (13.5% pasture; 1.2% soy) from the original area of these biomes.



**Figure 2** – Coverage of the converted areas of the Cerrado and the Amazon until 2019, showing the area occupied by pasture and soy.

2. The change in land cover and occupation in the Amazon and Cerrado has eliminated part of the species' area of occurrence

The overlap of the each species' distribution with the converted areas shows that practically all the evaluated species (484 of 486) were negatively impacted by deforestation. Among the higher impacts are area losses of: 68% for Brazilian Merganser (*Mergus octosetaceus*), 70% for Cock-tailed Tyrant (*Alectrurus tricolor*), 70% for Goiás Parakeet (*Pyrrhura pfrimeri*), 72% for the red-tailed lizard (*Vanzosaura rubricauda*) and 53% for the marsh deer (*Blastocerus dichotomus*).



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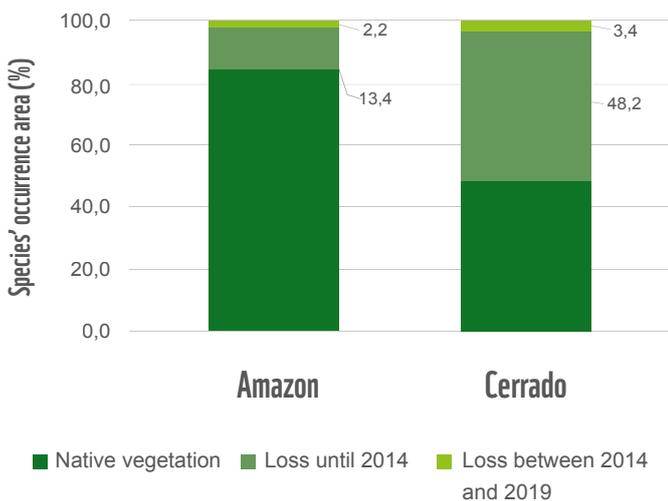
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Marsh deer (*Blastocerus dichotomus*), at Porto Jôfre, Mato Grosso

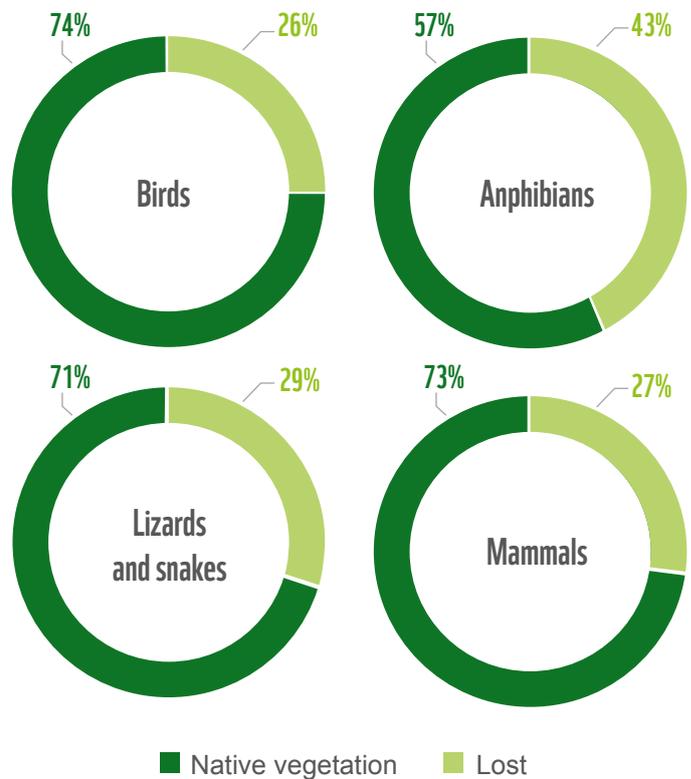
Since the distribution of the species overlap, deforestation in one place will affect several species at once. The total sum of the area of all species juxtaposed is about 530 million km<sup>2</sup> – of this total, the lost area in the Cerrado was 88.1 million km<sup>2</sup> and in the Amazon 56.3 million km<sup>2</sup>. This represents 51% of the total species' occurrence areas in the Cerrado, and 15% in the Amazon (Figure 3).



**Figure 3** – Percentage of the total sum of the distribution of species evaluated in each biome by: remaining areas, historical losses until 2014 and recent losses (between 2014 and 2019).

When evaluating the total sum of occurrence area lost by species group, we see that, proportionally, amphibian species were the ones with greater accumulated losses, with about 43% of the total area of distribution of 107 species converted into other uses (Figure 4).

An example is the arrow frog (*Hyloxalus chlorocraspedus*) that can only be found in the municipality of Porto Walter, in the western region of the Acre state, in an area with high conversion rates that caused the loss of 68% of the species' habitat. This species belongs to the Dendrobatidae family, which is known for having representatives with skins rich in molecules with medical importance for the development of medicines such as analgesics.

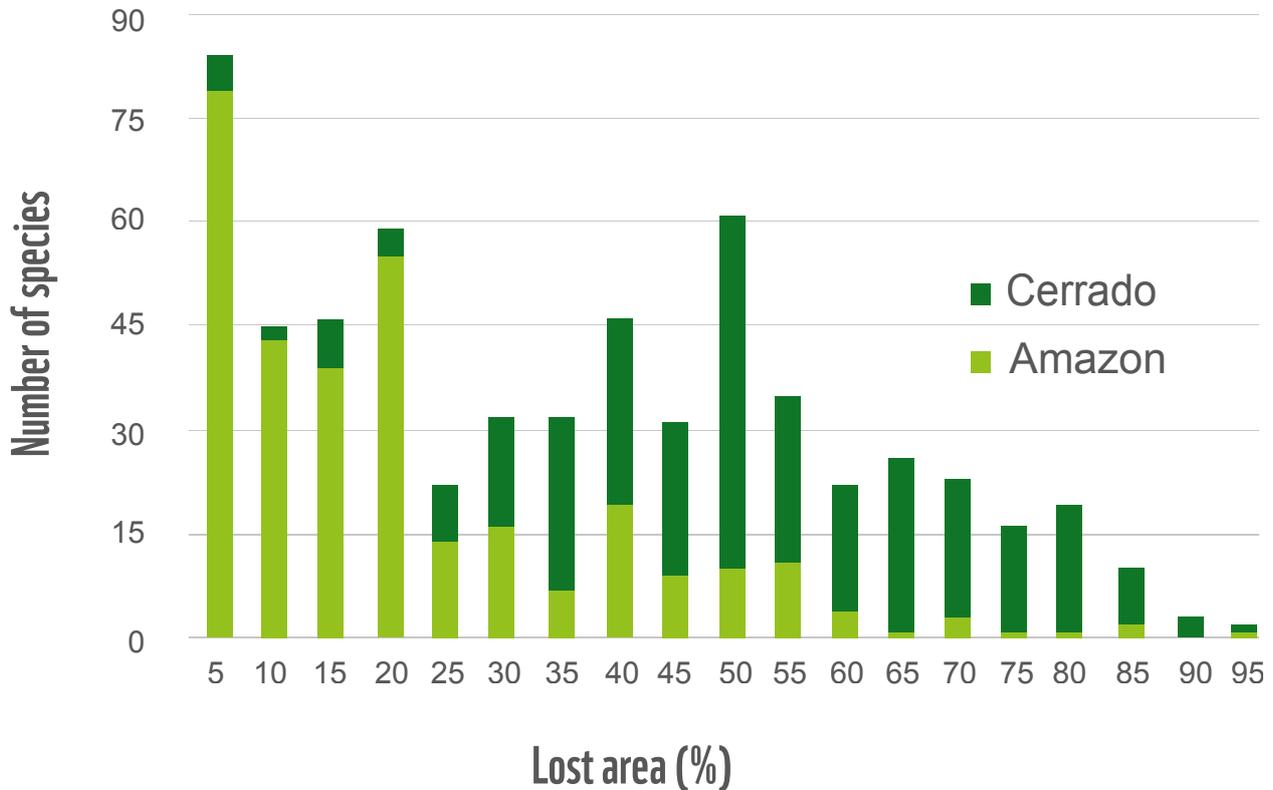


**Figure 4** – Percentage of the total sum of the distribution areas of each group that are found in remnants of native vegetation or have already been converted to other land uses.

When detailing the impact of deforestation for each of the species, we see that the losses ranged from less than 1% to 93% of the species' area of occurrence. Most species lost between 25% and 65% of the original distribution area, and for species from the Cerrado the losses are greater. While in the Amazon the largest number of species lost up to 20% of their original distribution area, in the Cerrado most species lost between 30 and 70% of their original area. These differences are explained by the fact that the impact on the Amazon is still concentrated on the southern and southwestern edges of the biome, while the conversion of the Cerrado is more widespread.



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**Figure 5** – Number of species (by biome) in each range of occurrence area loss.

Even so, practically half of the evaluated Amazonian species lost more than 20% of the area of occurrence, with some reaching 70% to 90% of loss (Figure 5).

The situation could be doubly bad for species affected by losses in both biomes. For the bird Bananal Antbird (*Cercomacra ferdinandi*), which is endemic to the wetlands of the Araguaia-Tocantins River basin, having an area of occurrence of 107,500 km<sup>2</sup> in the Cerrado and 49,700 km<sup>2</sup> in the Amazon was not enough to safeguard it from the risk of extinction. The alteration of the river's flooding cycles by dams and the replacement of native vegetation by pasture caused 74% of the area of occurrence in the Amazon and 35% in the Cerrado to disappear, which created a lose-lose situation for the species.

### 3. Losses of species' occurrence area grew by up to 20 times from 2014 to 2019 and are concentrated in the southern portion of the Amazon and the MATOPIBA region in the Cerrado

As the pace of deforestation has grown in the Amazon and Cerrado in recent years, the reduction of species'

occurrence area has continued to accumulate between 2014 and 2019, with a reduction in the total area of 2.2% in the Amazon and 3.4% for the Cerrado, for all the species studied. The percentage value may seem small, but the concentration of deforestation in some regions has had a great impact on some species.

Species such as the Rondon's Marmoset (*Mico rondoni*), as the name suggests, only occur in the state of Rondônia, one of the most deforested regions of the Amazon. With an original area of occurrence of 72,000 km<sup>2</sup>, the species had already lost 40% of its area by 2014 and by 2019 saw another 9% disappear. Even outside the deforestation arch, species with restricted distribution such as the Cazuza's Saki (*Pithecia cazuzae*), and the Anavilhanas lizard (*Loxopholis ferreirai*), saw losses within their areas of occurrence multiply by more than 10 times in the last five years alone.

The increase in losses is also great in the north and northeast regions of the Cerrado, in the Matopiba region – an example that relates deforestation advancing over the Cerrado and the loss of biodiversity is the legless lizard (*Bachia oxyrhina*). Endemic to Jalapão and described



Sandstone formation at Chapada das Mesas in the Matopiba region

by science only in 2018, it saw conversion rates double between 2014 and 2019 in its distribution area.

Given the lack of protection, many areas of the Cerrado and, probably, a significant portion of its species, have already been lost, but this scenario does not need to be repeated in the new frontiers of occupation. Thus, policies such as zero deforestation with land use planning that prioritizes the use of already converted areas can prevent the disappearance of more species.

In the Center-South region of the Cerrado, which has an old and consolidated occupation, the existence of protected areas represents the last refuge for several species. These populations dramatically depend on the maintenance and consolidation of the protected areas already created, but also on restoration actions planned to maximize the connection between isolated areas. This is the case of the Lesser Nothura (*Nothura minor*) which has already lost more than 72% of its original area and occurs almost exclusively within protected areas, such as the National Parks of Emas, Brasília and Serra da Canastra.

#### 4. Deforestation impacts endemic species, environmental service providers and flagship species

The analysis included 136 endemic species: 48 for the

Cerrado and 88 for the Amazon, which have more than 95% of the occurrence area restricted to these biomes. The average occurrence area losses for these species were 17% for the Amazon and 35% for the Cerrado, which is worrying since these species do not occur in any other biome.

An example of the acute impact on endemic species is the Brasília Tapaculo (*Scytalopus novacapitalis*), named after its restricted occurrence in the vicinity of the country's capital. Described after the construction of Brasília, it already had more than 56% of the original area lost, being a testament to the impact of the rapid and poorly planned conversion of the native areas of the region.

One of the aspects that aggravates this crisis is that most of the species are unknown to the population in general, such as small amphibians and reptiles. Thus, those who produce and consume the products of deforestation cannot imagine the scale of the impact.

Among the species that until 2019 lost more than 80% of the area of occurrence are, in the Cerrado, the tree frog *Dendropsophus cerradensis* and, in the Amazon, the Northwestern Tocantins Oval Frog *Elachistocleis carvalhoi*. Both have restricted occurrence areas (less than 50km<sup>2</sup>), thus, any change of the environment has a great impact on these species.

But even species known as “flagships” do not escape

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the impact. This is the case of the giant armadillo (*Priodontes maximus*) and the maned wolf (*Chrysocyon brachyurus*) that had more than half of their habitat lost. Others lost almost 80%, such as the Southern Tiger Cat (*Leopardus guttulus*) and the Azara's Capuchin (*Sapajus cay*).



Giant armadillo (*Priodontes maximus*)

The Southern Three-banded Armadillo (*Tolypeutes tricinctus*) – chosen by FIFA as the official mascot of the 2014 World Cup – barely escapes the devastation in its area of occurrence. In a period of five years, the animal saw a 9% increase in the soy plantations within the limits of its habitat, in the Matopiba region.

The widespread impact on species is a wake-up call. When several species lose most of their habitats, it means that key parts of ecosystems are disappearing. The impact on species associated with wetlands and gallery forests such as amphibians, for example, indicates that we are also impacting water resources.

However, the loss of species itself represents the loss of functions that can have direct socio-economic impacts. For example, the mussurana snake (*Clelia clelia*) has already lost 48% of its range in the Cerrado. This is a sad number for a harmless snake that feeds on species such as jararacas and rattlesnakes and for this reason it was stamped on the 10,000 Cruzeiros banknotes alongside scientist Vital Brazil in the 90s.

Another symbol of the potential socio-economic impact of the loss of species is the Brazilian Gracile Opossum (*Gracilinanus microtarsus*), which, like Australian kangaroos, carry their young in a ventral pouch. The

species has already lost about 67% of its habitat in the Cerrado despite belonging to a group of voracious predators of insects. Ironically, the sister species, the Agile Gracile Opossum (*Gracilinanus agilis*) is known to be a predator of the main pest related to soy, the brown stink bug (*Euschistus heros*). Thus, the maintenance of the Agile Gracile Opossum's habitat in areas with soy plantations represents a smaller amount of brown stink bug, making it a win-win situation.

### CONCLUSION

In times of an unprecedented global extinction crisis, maps of habitat loss and lists of highly impacted organisms are key elements for better actions to protect natural habitats and species.

Due to the continuous suppression of natural ecosystems that has intensified in recent years, species that were already losing their habitats are concentrated in the remaining areas, which in turn are increasingly fragmented and degraded. We are reaching a critical point where continued deforestation and conversion in these areas seriously threatens the existence of these species. It is a fact that we urgently need to stop deforestation and the conversion of natural ecosystems for several reasons, and these data reinforce this argument from the species loss standpoint.

The loss of species is only one facet of the impact of the conversion of natural habitats. It is already widely documented that the loss of vegetation cover compromises environmental services such as the maintenance and regulation of the availability of water resources. Thus, when we lose the habitat of species such as the Brazilian Merganser associated with rivers and springs, this indicates that the damage directly affects other natural resources as well – an additional warning in times of water scarcity.

The production of commodities, especially soy and beef, are among the biggest drivers of environmental degradation today, and the way they are produced threaten the planet's ability to even produce food in the future.

The variety of food we produce and consume, how and where it is produced, how much is lost or wasted are factors that will determine whether we will be able to

provide a healthy diet, within environmental limits, for everyone<sup>8</sup>.

Biodiversity – at genetic, species and ecosystem levels – makes production and livelihood systems better able to withstand shocks and respond to environmental, social, and economic changes. A high degree of diversity across species, varieties, races, populations, and ecosystems can help create and maintain healthy soils, pollinate plants, purify water, provide protection from extreme weather events, or any other vital service. In other words, the loss of biodiversity is not only an environmental issue, but also a development, economic, global security, ethical and moral issue.

However, if the analyses reveal a dramatic scenario for the biodiversity of the Amazon and Cerrado, the findings can also be seen as a starting point for conservation actions to stop habitat loss and avoid extinctions in megadiverse regions of the globe.

To stop the rate of species loss, it is necessary to immediately eliminate deforestation and degradation caused by beef and soy productions, as well as other vectors, which is even a demand from importing countries to continue buying Brazilian agricultural products. There are numerous market commitments requiring zero deforestation in the beef and soy chains and, throughout 2021, we saw new legislation and regulations being prepared by major players in this topic, including: the European Union, the United States, and the United Kingdom.

In addition, we need to focus restoration efforts on key areas, in legally protected reserves close or even within largely converted or deforested areas and beyond, seeking to regain connectivity to preserved areas and allowing sufficiently large habitats for the species, ensuring their permanence and the ecosystem health necessary for the maintenance of all life on the planet.



*Panoramic aerial view of cattle pasture of a farm in the Amazon rainforest, Pará. An illegally burned forest in the background.*

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