



IMPACT OF EU SUPPLY CHAINS ON DEFORESTATION AND BIODIVERSITY IN BRAZIL'S PANTANAL: A GLOBAL WETLAND UNDER THREAT

The urgent need for the EU Deforestation Regulation to protect 'other wooded land' and 'other natural ecosystems'



Protecting People and Planet

A report by the Environmental Justice Foundation



Protecting People and Planet

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Hyacinth macaw



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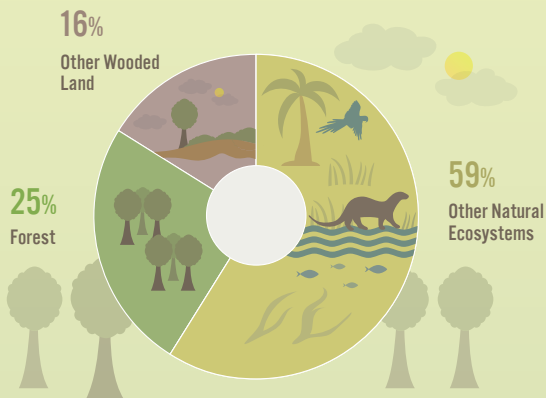
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KEY FINDINGS

- The Pantanal – one of the world's largest wetlands – is an area of exceptionally high biodiversity value and a critical carbon sink but is facing multiple threats, the most prominent being the intensification of cattle ranching and conversion of native vegetation to pasture.
- This research explores the role played by EU cattle supply chains in driving the conversion of native vegetation to pasture in the Pantanal biome, with a view to informing the European Commission's impact assessment of the expansion of the EU Regulation on deforestation-free products to include Other Wooded Land and Other Natural Ecosystems.
- While the pace of conversion of savanna (Other Wooded Land) and forest formations has slowed over the past 30 years, the rate of conversion of grassland and wetland (Other Natural Ecosystems) into pasture in the Pantanal is intensifying – the average annual rate of wetland conversion almost doubled in 2010-2021 compared to 1990-2000.
- The total area of pasture (for livestock) in the Pantanal biome also more than doubled (127.5% growth) between 1990 and 2021, to reach 2.54 million hectares.
- Based on available data, we identified 36 direct suppliers and 276 indirect suppliers of cattle products to the EU, located either fully or partially within the Pantanal (excluding indirect suppliers within Mato Grosso do Sul), accounting for approximately 5.5% of the total land area of the biome.
- The boundaries of these properties overlap with International Union for Conservation of Nature (IUCN) maximum potential habitat ranges for between 197 and 279 native mammals, amphibians and reptiles and are located within the maximum potential habitat ranges of between 11 and 21 threatened native mammals, amphibians and reptiles.
- During the period 2012-2021, a total of 40,246.9 hectares of native vegetation were converted to pasture on these 312 properties, including 25,237.6 hectares of wetland and grassland (Other Natural Ecosystems) and 11,124.4 hectares of savanna (Other Wooded Land), equating to the conversion of 9.2% of total Other Natural Ecosystems and Other Wooded Land cover within the property boundaries.
- In addition, we estimate that approximately 97 indirect suppliers of cattle to EU supply chains may be based in the Brazilian state of Mato Grosso do Sul. Once these suppliers are included, we estimate that 14,149.6 hectares of Other Wooded Land and 32,100.6 hectares of Other Natural Ecosystems – a combined area more than four times the size of Paris – were converted to pasture within Pantanal-based properties linked either directly or indirectly to the EU market, during the period 2012-2021. This translates to the average annual conversion of an area equivalent in size to 1,982 and 4,496 football pitches for Other Wooded Land and Other Natural Ecosystems vegetation categories, respectively.
- The rate of conversion intensified in 2020-2021 compared to 2019-2020, with conversion of Other Wooded Land to pasture across the Pantanal as a whole increasing by 64%. Conversion of Other Natural Ecosystems to pasture grew even more rapidly, rising by 83%.
- These figures however underestimate the extent of conversion of native vegetation in the Pantanal to pasture linked to EU supply chains. We were unable to account for second tier indirect suppliers (ranches that supply cattle to first tier indirect suppliers in the Pantanal) or the suppliers to those facilities and so on, due to a lack of full traceability in Brazil's cattle supply chains. The EU's deforestation footprint may therefore be significantly larger than the figures presented, as this research was not able to accurately examine the full extent of the ranching network that may supply cattle to the EU market.
- Losses of such non-forest vegetation would fall outside of the scope of the zero-deforestation requirements of the current EU Regulation (provided clearing was done in compliance with Brazilian regulations), despite being driven, at least in part, by EU consumption of cattle products, and posing a significant threat to the biodiversity and climate-regulation functions of the Pantanal as a whole. In terms of CO₂ emissions, this conversion of native vegetation to pasture equated to the estimated release of 4.6 million tonnes of CO₂ during the period 2012-21, equivalent to the consumption of 10.6 million barrels of crude oil.¹
- If the existing pace of native vegetation conversion into pasture continues, we estimate that EU supply chains could drive the conversion to pasture of 4,625.0 hectares or 6,478 football pitches of savanna, wetland and grassland ecosystems within the Pantanal annually, in the absence of an expanded EU Regulatory framework to cover Other Wooded Land and Other Natural Ecosystems.
- There is, however, a significant risk that deforestation in the Pantanal may intensify in the near future, as a result of the weakening of environmental legislation in the state of Mato Grosso and deforestation leakage due to stricter protections for the Amazon and Cerrado biomes.
- Assuming an increase in the rate of conversion, we further estimate that, between 2023 and 2050, EU supply chains could contribute to the conversion of 65,614.5 hectares of the Pantanal's savanna ecosystems and 153,022.6 hectares of wetland and grassland. This would equate to a combined area the size of 306,214 football pitches, or an area of native vegetation the size of 30 football pitches converted to pasture every day. Introducing measures to prevent the conversion of these areas to pasture and the associated CO₂ emissions could avoid the estimated release of 17.6 million tonnes of CO₂, equivalent to taking 3.9 million petrol-powered cars off the road for a year.²

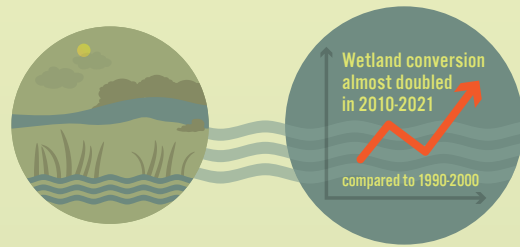
2021

Other Wooded Land and Other Natural Ecosystems account for 75% of the Pantanal's native vegetation



Rate of conversion* of grassland and wetland (Other Natural Ecosystems) is intensifying

*average annual rate



2021

Total pasture in the Pantanal reached 2.54 million hectares

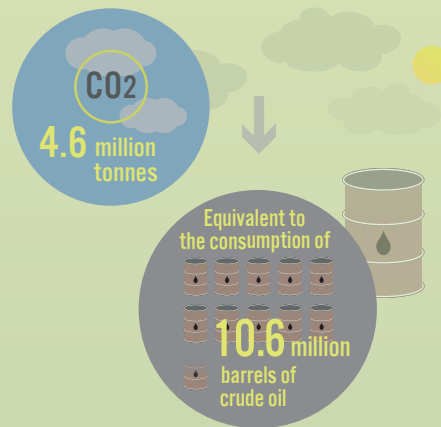


Over 400 suppliers of cattle products to the EU in the Pantanal*



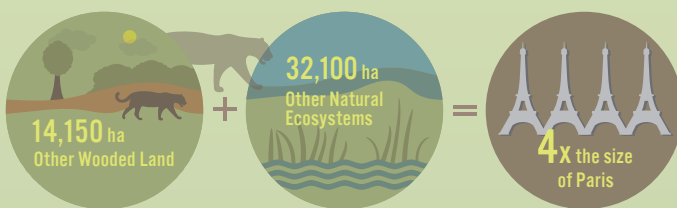
2012-2021

Estimated CO2 emissions from vegetation loss



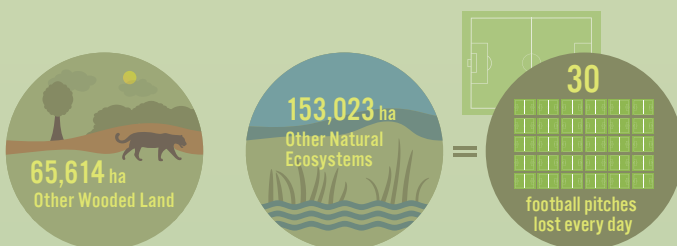
2012-2021

Area of native vegetation lost within EU-linked properties:



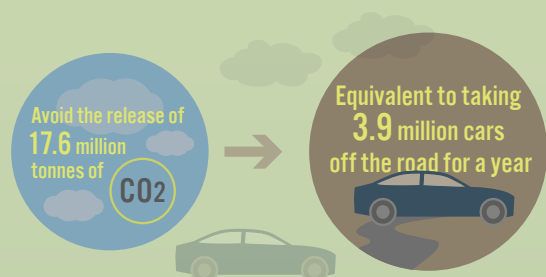
2023-2050

Forecast area of native vegetation loss within EU-linked properties:



2023-2050

Expanding the scope of the EU Deforestation Regulation could:



1. Introduction

The Pantanal – one of the world’s largest wetlands – extends across Brazil, Paraguay and Bolivia, covering a total area of approximately 16 million hectares.³ Comprising approximately 60% of the Upper Paraguay River Basin, the Pantanal biome is the epicentre of a complex and unique system of climatic and hydrological processes between the basin and surrounding highland areas.⁴ The wetland ecosystem acts as a sponge, absorbing water from the highland plateaus during rainy seasons – protecting downstream ecosystems and communities from floods – before slowly releasing this water during the dry season.⁵ The Pantanal provides a plethora of critical ecosystem services: approximately 8 million people that live within the wider river basin, including Indigenous peoples and local communities, rely heavily on the biome’s unique seasonal flood pulse for flood protection and water supply, as well as water purification.⁶ The Brazilian portion of the Pantanal, upon which this briefing will focus, is located entirely within the states of Mato Grosso (35%) and Mato Grosso do Sul (65%).⁷

The region’s unique landscape supports rich biodiversity, containing sizeable populations of a number of vulnerable and threatened species,⁸ including the giant otter (*Pteronura brasiliensis*), one of the most threatened mammals in South America and classified as endangered by the IUCN,⁹ as well as the giant anteater (*Myrmecophaga tridactyla*),¹⁰ giant armadillo (*Priodontes maximus*),¹¹ lowland tapir (*Tapirus terrestris*),¹² and the world’s largest parrot, the hyacinth macaw (*Anodorhynchus hyacinthinus*).¹³ The Pantanal is also host to the highest density of jaguars (*Panthera onca*) in the world.¹⁴ The jaguar – the largest feline in the Americas¹⁵ – has been assessed by the IUCN as near threatened, facing habitat destruction and fragmentation, having lost around 50% of its historic range.¹⁶ The Pantanal’s vegetation is particularly diverse owing to the varying soil classes and flood cycles, resulting in the greatest diversity of aquatic plants on the planet.¹⁷ In total, over 2,000 plant, 174 mammal, 580 bird, 271 fish, 131 reptile and 57 amphibian species – together with innumerable invertebrates and microorganisms – can be found within the Pantanal’s borders.¹⁸



Jaguar

The Pantanal is host to the highest density of jaguars in the world.



Giant Otter



Globally, wetlands are disappearing three times faster than forests.¹⁹



Over 38,000 square kilometres – an area larger than Belgium – burned in 2020, killing more than 17 million wild vertebrates and emitting 115.6 million tonnes of CO₂.

Despite its high ecological value, most of the Pantanal is unprotected and held as private lands comprising 93% of the land on the Brazilian side,²⁰ of which 80% is used for cattle ranching.²¹ Even though it forms part of the wider UNESCO Pantanal Biosphere Reserve²², with specific areas designated as Ramsar sites²³ – wetlands of international importance – the existing protected area network is far from adequate to protect the Pantanal’s representative ecosystems and their diverse wildlife. In contrast to the neighbouring Amazon and Cerrado biomes, the Pantanal lacks specific policies to address deforestation linked to soy production or cattle ranching, nor are any such policies currently under consideration. In 2015, the state of Mato Grosso do Sul passed a decree legalising cattle grazing within Permanent Protected Areas (PPAs).²⁴ Analysis from SOS Pantanal suggests that the enactment of this degree caused a rapid increase in native vegetation clearance in the portion of the Pantanal that falls within Mato Grosso do Sul, which increased from an average of 29,000 hectares per year between 2009 and 2015 to 54,000 hectares per year between 2016 and 2021.²⁵ In August 2022, the state of Mato Grosso approved a similar bill legalising the use of PPAs and Legal Reserves (LRs)²⁶ for cattle grazing in the Pantanal biome, as well as allowing an increase in clearing of native vegetation,²⁷ which is expected to lead to similarly increased rates of native vegetation clearance in the coming years.

The Pantanal is facing myriad threats, including the conversion of natural vegetation into pasture and agricultural crops, erosion and agrochemical run-off into waterways, hydroelectric power projects resulting in diversion and degradation of waterways, mining and the destruction of habitat through fire.²⁸ Between 2019 and 2022, an area the size of Barcelona was deforested in the Pantanal, with records showing the largest average area per deforestation alert of all Brazil’s biomes.²⁹

Illegal deforestation more than doubled in the first six months of 2020,³⁰ which was also a record-breaking year for fires. Approximately one third of the biome burned,³¹ killing more than 17 million wild vertebrates³² and emitting 115.6 million tonnes of carbon dioxide (CO₂),³³ more than Belgium’s CO₂ emissions in the same year.³⁴ Fuelled by drought and strong winds, the vast majority of these fires were started by cattle ranchers in order to clear further land for cattle grazing. Fires have impacted every Indigenous territory in the Pantanal: one of the worst hit has been the Guató tribe, who lost 90% of their land in the 2020 fires.³⁵

The ongoing intensification of cattle ranching is a leading threat to biodiversity within the biome.³⁶ Cattle ranching is now the primary economic activity in the Pantanal, with approximately 3,000 ranches on the Brazilian side and an unknown number in Bolivia and Paraguay.³⁷ The total cattle herd in the Brazilian Pantanal has been estimated at 3.8 million animals, producing approximately 1 million calves per year.³⁸ In addition, MapBiomas data shows that the total soybean planted area within the Pantanal grew by 81% between 2010 and 2021.³⁹

According to the IUCN Red List of Threatened Species, 177 species in the Brazilian states of Mato Grosso and Mato Grosso do Sul – within which the Brazilian Pantanal is fully contained – are directly threatened by the expansion of small-holder and agro-industry grazing, ranching and farming.⁴⁰ Over 12% of the Pantanal’s native vegetation has already disappeared due to the growth of ranching and agricultural activities.⁴¹ A decade ago, scientists predicted that if high rates of deforestation persist, the Pantanal as an ecosystem could effectively disappear by 2050.⁴²

If high rates of deforestation persist, the Pantanal as an ecosystem could effectively disappear by 2050.

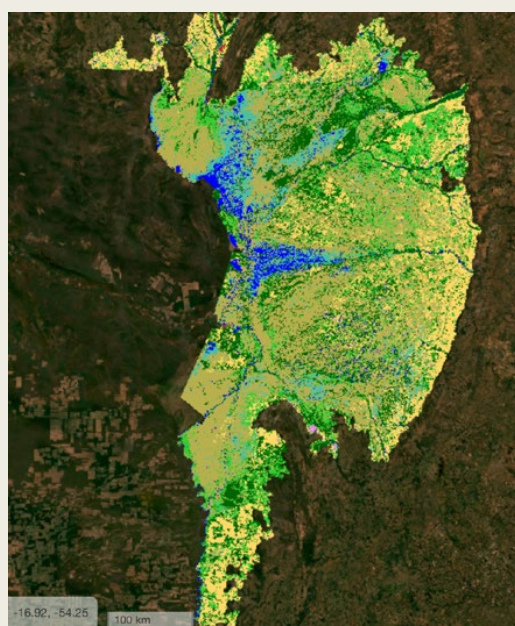
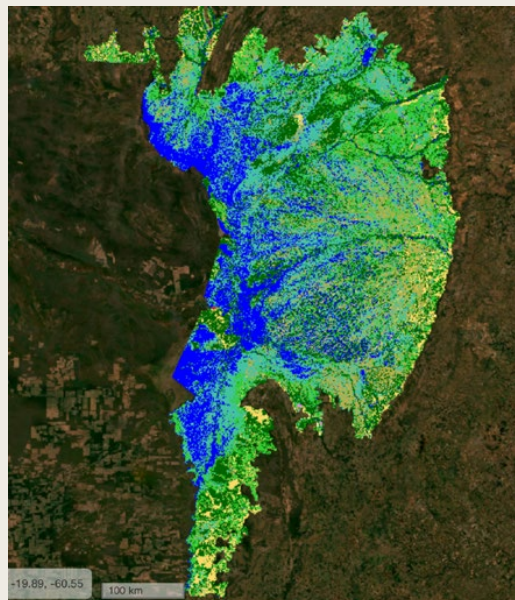
Land use change in the Pantanal 1985 - 2021

1985

- 1. Forest
- 2. Non-Forest Natural Training
- 3. Agricultural
- 4. Unvegetated area
- 5. Body Of Water
- 6. Not observed

2021

- 1. Forest
- 2. Non-Forest Natural Training
- 3. Agricultural
- 4. Unvegetated area
- 5. Body Of Water
- 6. Not observed



Source: MapBiomias platform.

2. Research objective

The objective of this research is to provide evidence in support of the expansion of the European Union (EU) Regulation on deforestation-free products⁴³ (the **Regulation**) to include ‘Other Wooded Land’ and ‘Other Natural Ecosystems’ as per the EU/FAO definitions outlined in **Table 1** below. Article 34 of the Regulation requires the Commission to evaluate and, if appropriate, present a legislative proposal on extending the scope of the Regulation to Other Wooded Land within one year of the Regulation’s entry into force and, for Other Natural Ecosystems (including other land with high carbon stocks and a high biodiversity value such as grasslands, peatlands and wetlands) within two years of the Regulation’s entry into force.

This briefing focuses on the impact of EU cattle supply chains on deforestation and native vegetation loss in the Pantanal biome in Brazil. As outlined in the **Introduction**, cattle ranching is the leading driver of forest and other native vegetation loss in the Pantanal. This briefing does not consider the issue of native vegetation conversion for soy plantations, which is an emerging threat within the biome that must also be carefully monitored.

3. Methodology

3.1. Connecting cattle ranches (fazendas) within the Pantanal to EU supply chains

We identified cattle ranches of interest using the Brazilian government’s Lista Aptas,⁴⁴ which includes all bovine holding facilities in Brazil that have been certified as compliant with EU health and sanitation requirements (**Figure 1 - Step A**).⁴⁵ Only farms that have been registered under the Brazilian System for Individual Identification of Bovines and Buffalos (SISBOV), which provides an official, but voluntary, system for the identification of individual animals destined for slaughter for beef, are eligible for inclusion in this list.⁴⁶ Administered by Brazil’s Ministry of Agriculture, Ranching and Provisions (MAPA), SISBOV requires annual inspections of cattle properties, along with additional requirements to ensure accuracy of data on individual animals and their movements.⁴⁷ Less than 1% of Brazil’s cattle ranches are certified under the SISBOV system.⁴⁸ The Lista Aptas is routinely updated in the EU’s online platform for sanitary and phytosanitary certification required for, among others, imports of animal products and food into the EU (TRACES).⁴⁹ There are no requirements related to the properties that SISBOV properties purchase cattle from, nor are there requirements about land use on licensed properties.



Cattle, JBS slaughterhouse outside Campo Grande, MS, Brazil.

In addition to properties on the Lista Aptas (TRACES list), we analysed Guide to Animal Transit (GTA) data – which tracks cattle movements between ranches and from ranch to slaughterhouse – to identify ranches within the Pantanal that have supplied cattle to TRACES properties (both within and outside the Pantanal) and may therefore be implicated in EU supply chains (hereafter referred to as indirect suppliers) (**Figure 1 – Step B**). To be eligible for export to the EU, cattle must spend at least 90 days at a ranch on the TRACES list prior to being transported to a Federally Inspected Slaughterhouse (SIF) for slaughter. Slaughterhouses must also be approved under EU health and sanitation legislation for export to the EU, with approved facilities listed according to product type in TRACES.⁵⁰

GTA records for the states of Mato Grosso and Mato Grosso do Sul, in which the Pantanal is located, are not made available to the public. This study therefore analysed historical data previously downloaded from Mato Grosso’s state sanitation agency for the period January 2017-May 2019. As GTA data for Mato Grosso do Sul was not available to this study, we extrapolated the findings for Mato Grosso to obtain an estimate of the number of Pantanal-based indirect suppliers in Mato Grosso do Sul (based on the average number of Pantanal-based indirect suppliers per TRACES property as calculated below).

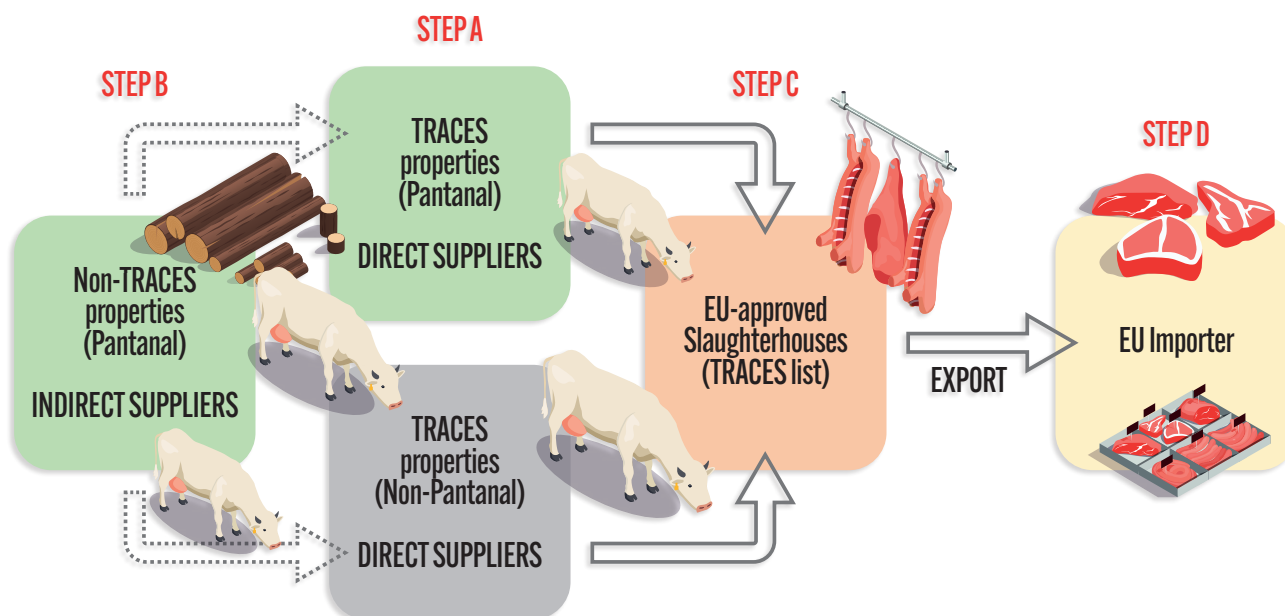
This figure was used to calculate the deforestation footprint of EU cattle supply chains in the Pantanal (described further under **Section 3.2** below).

$$\text{Total MS ISp} = (\text{Total MT ISp} / \text{MT TF pnp}) \times \text{Total MS TF pnp}$$

MS (*Mato Grosso do Sul*), MT (*Mato Grosso*), IS (*indirect supplier*), TF (*TRACES fazenda*), p (*Pantanal*), np (*non-Pantanal*)

To confirm the link between Pantanal-based ranches and EU supply chains, we conducted further verifications to connect ranches on the Lista Aptas (TRACES list) to shipments for export via EU-approved slaughterhouses (**Figure 1 – Steps C and D**). In Step C, we analysed records of cattle movements between Lista Aptas (TRACES) ranches and EU-approved slaughterhouses between January 2020 and June 2023, obtained via the traceability portal of one of the major beef suppliers to the EU, JBS.⁵¹ In Step D, we analysed shipment records in the Panjiva trade database for exports of meat products from these slaughterhouses to the EU that broadly aligned with the date of arrival of cattle at the respective facilities.⁵² For the purposes of this analysis, we considered trade reported under the custom codes set out in **Table 2**.

Figure 1: Schematic illustration of supply chain linkages between Pantanal-based ranches and the EU market



Notes:

- ¹ Green shading indicates ranches implicated in EU supply chains that may have a deforestation footprint within the Pantanal.
- ² Direct suppliers to EU-approved slaughterhouses were identified based on the SISBOV properties in the Lista Aptas maintained by the Brazilian government and uploaded to the EU’s TRACES system.
- ³ Indirect suppliers were identified based on GTA records.
- ⁴ Steps A to D are references to steps in the process for conducting this research.

3.2. Calculating the extent of native vegetation loss (deforestation footprint) and resultant CO₂ emissions within Pantanal-based ranches supplying the EU

Direct and indirect suppliers of cattle to EU supply chains within the Pantanal were geolocated using tools such as Registro Rural⁵³ and property boundaries downloaded from the Brazilian government's national environmental registry of rural properties, the Cadastro Ambiental Rural (CAR)⁵⁴, the INCRA and Terra Legal systems. We then used MapBiomias land cover data to analyse the extent of loss of forest, savanna, grassland and wetland, and the conversion of these vegetation types to pasture from 2012 to 2021. To account for inter-annual variability, we compared areas classified as native vegetation in both 2011 and 2012 with areas classified as pasture in both 2020 and 2021. Savanna broadly corresponds to the EU Deforestation Regulation category Other Wooded Land, while grassland and wetland broadly correspond to the category Other Natural Ecosystems.⁵⁵

Native vegetation conversion to pasture within areas protected under Brazil's Forest Code (LRs and PPAs)⁵⁶ was determined, for the target fazendas, using spatial analysis tools in QGIS. Individual layers for each LR and PPA obtained from the CAR database⁵⁷ were first merged into a combined vector layer. Land conversion was then calculated within that layer for each land cover class of interest over relevant time periods using standard raster calculation. Finally, a zonal histogram was produced to calculate the number of cells corresponding to native vegetation conversion to pasture within the LR and PPA in each fazenda.

To supplement the satellite data obtained from MapBiomias, in situ photographic and video evidence of deforestation and native vegetation loss was obtained for selected fazendas in the Pantanal with links to EU supply chains.

For Mato Grosso do Sul, due to the absence of available GTA records (see under **Section 3.1** above), we used the average fazenda size of indirect suppliers in Mato Grosso to calculate the total land area covered by the estimated number of Pantanal-based indirect suppliers. We then applied average vegetation loss and conversion figures for indirect suppliers based in Mato Grosso to estimate vegetation loss and conversion to pasture across the above vegetation categories in the Mato Grosso do Sul properties. These figures were added to vegetation loss and conversion figures for Pantanal-based TRACES ranches in Mato Grosso do Sul to obtain figures for the state.

To estimate CO₂ emissions resulting from native vegetation loss in the EU-linked properties (excluding indirect suppliers in Mato Grosso do Sul), we calculated average above and below ground biomass for each vegetation type within each property boundary and applied an emission factor of 0.85, which assumes that 85% of the carbon contained in

vegetation becomes committed greenhouse gas emissions.⁵⁸ We then transformed carbon into CO₂ using a factor of 3.67⁵⁹ and multiplied average CO₂ emitted by the hectares of each natural vegetation class that were converted to pasture between 2012 and 2021.

To obtain an estimate of CO₂ emissions for indirect suppliers in Mato Grosso do Sul, we calculated average CO₂ emission figures for each vegetation type per hectare for all known EU-linked suppliers in Mato Grosso and Mato Grosso do Sul, and then applied these averages to the estimated total area of the indirect supplier fazendas in Mato Grosso do Sul.

Finally, we analysed biodiversity indicators for the identified Pantanal-based direct and indirect suppliers (excluding indirect suppliers in Mato Grosso do Sul). We overlaid the property boundaries with IUCN maximum potential range data for native mammals, amphibians and reptiles, as well as priority areas for biodiversity conservation designated by Brazil's Ministry of Environment and Climate Change.⁶⁰

3.3. Data limitations

The identification of indirect suppliers of cattle to EU supply chains was limited by the lack of available GTA records for more recent years (post-2019) and for the state of Mato Grosso do Sul. This precluded a more accurate, complete assessment of the current deforestation footprint (and resulting CO₂ emissions) linked to EU supply chains within the Pantanal. Our estimate of native vegetation cover and conversion to pasture for indirect suppliers in Mato Grosso do Sul, extrapolated based on figures for Mato Grosso-based indirect suppliers, may further underestimate the EU's deforestation footprint, due to significantly higher levels of historical vegetation conversion in Mato Grosso do Sul when compared to the state of Mato Grosso: according to a recent analysis by MapBiomias, between 2019 and 2022, 91,528 hectares of vegetation in the Pantanal were deforested in Mato Grosso do Sul compared to 9,535 hectares in Mato Grosso.⁶¹ Estimated CO₂ emissions do not account for soil carbon as the amount of CO₂ that would be released on clearing is difficult to estimate with accuracy.⁶² Finally, due to a lack of full traceability within cattle supply chains in Brazil, we were unable to account for second tier indirect suppliers (non-TRACES properties that supply cattle to first tier indirect suppliers in the Pantanal) or the suppliers to those properties and so on. Widening the analysis to include these properties could result in a significantly increased deforestation and CO₂ emission footprint linked to EU supply chains, and could be the subject of further research.

Table 1: EU definitions of forest, other wooded land, and other natural ecosystems, with related FAO and MapBiomias vegetation categories

EU Deforestation Regulation term	Definition from the EU Deforestation Regulation	FAO categories ⁶³	MapBiomias categories
Forest	Land spanning more than 0.5 hectares with trees higher than 5m and a canopy cover of more than 10% (land-cover criteria), or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use (Art. 2(2)).	Primary evergreen forest (FEP)	Forest formation
		Primary semi-deciduous forest (FSP)	
		Primary deciduous forest (FDP)	
Other Wooded Land	Land not classified as 'forest' spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of 5 to 10%, or trees able to reach these thresholds in situ, or with a combined cover of shrubs, bushes and trees above 10 percent, excluding land that is predominantly under agricultural or urban land use (Art. 6b).	Shrubs (WS)	Savanna formation
		Wooded grassland (WG)	Grassland formation
Other Natural Ecosystems	To include other land with high carbon stocks and with a high biodiversity value such as grasslands, peatlands, and wetlands (Art. 32(2)).	Natural grassland (OG)	
		Marsh	Wetland formation

Table 2: Cattle-related products included within the EU Regulation on deforestation-free products

Commodity	Products ¹
Cattle	<ul style="list-style-type: none"> ● 0102 21, 0102 29 Live cattle ● ex 0201 Meat of cattle, fresh or chilled ● ex 0202 Meat of cattle, frozen ● ex 0206 10 Edible offal of cattle, fresh or chilled ● ex 0206 22 Edible cattle livers, frozen ● ex 0206 29 Edible cattle offal (excluding tongues and livers), frozen ● 160250 Other prepared or preserved meat, meat offal, blood of bovine animals ● ex 4101 Raw hides and skins of cattle (fresh, or salted, dried, limed, pickled or otherwise preserved, but not tanned, parchment-dressed or further prepared), whether or not dehaired or split ● ex 4104 Tanned or crust hides and skins of cattle, without hair on, whether or not split, but not further prepared ● ex 4107 Leather of cattle, further prepared after tanning or crusting, including parchment-dressed leather, without hair on, whether or not split, other than leather of heading 4114

¹ Annex I, Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1115>

4. Findings

4.1. Pantanal-level analysis and trends

In 2021, 19.7% of the Pantanal biome (24.8% of the biome's native vegetation cover) was categorised as forest, according to Mapbiomas data, and therefore within the scope of the zero-deforestation requirements of the EU Regulation on deforestation-free products.

Other Wooded Land accounted for 13.0% of the total, and Other Natural Ecosystems a further 46.8%, together representing 59.8% of the Pantanal's land area (75.2% of native vegetation cover) which is not currently subject to the zero-deforestation provisions of the Regulation⁶⁴ (**Table 3**). According to IUCN data, the Pantanal falls within the maximum potential range of 411 native species of mammal, amphibian and reptile, including 28 threatened species.⁶⁵

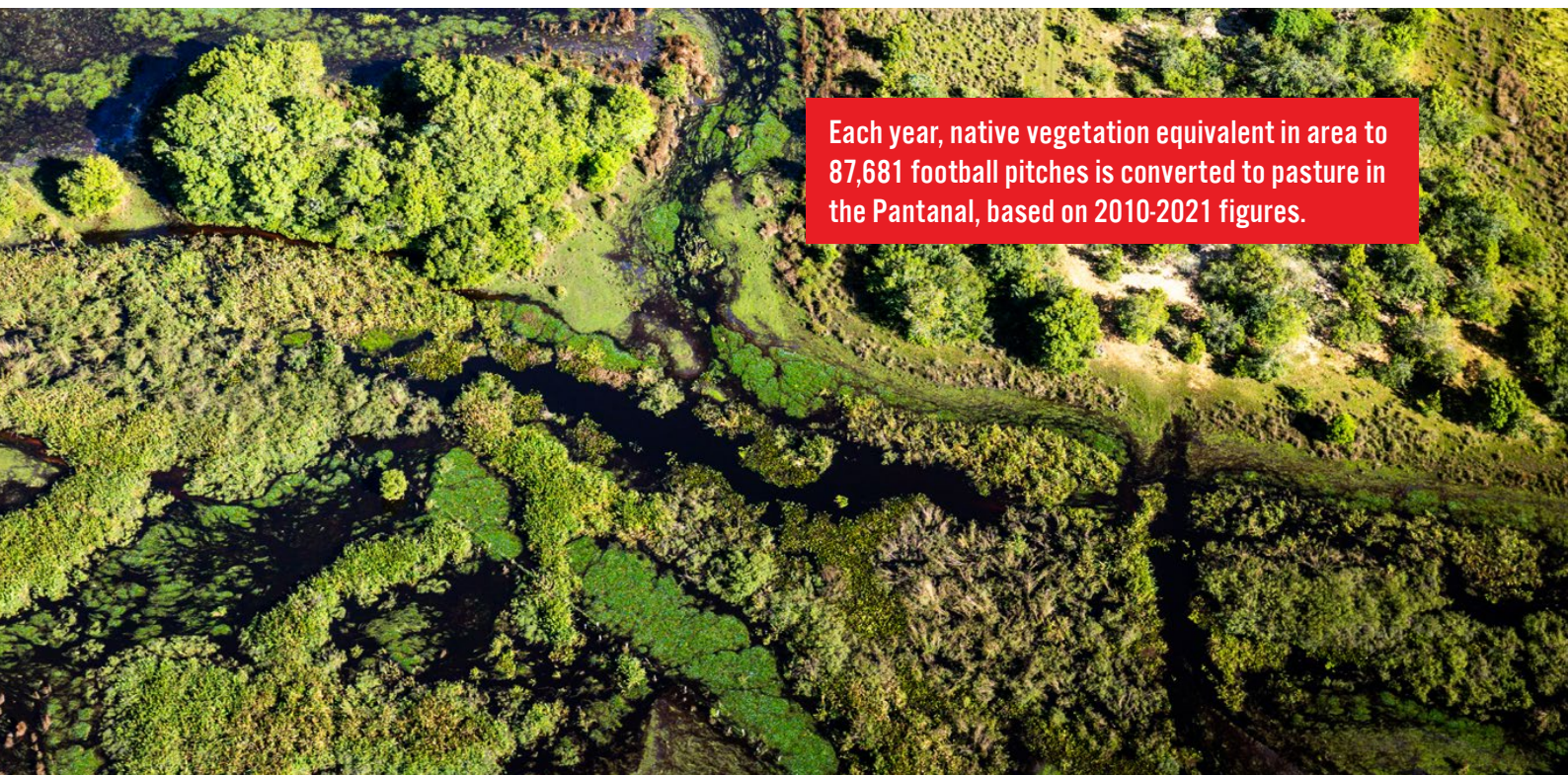
Table 3: Distribution of land cover types in the Pantanal (2021)

Land cover	Hectares	% of total land area	% of total native vegetation cover
Forest	2,980,715	19.7	24.8
Other Wooded Land	1,959,289	13.0	16.3
Other Natural Ecosystems	7,075,559	46.8	58.9
Pasture	2,544,377	16.8	N/A

Source: MapBiomas

A total of 751,249.6 hectares of forest, savanna, grassland and wetland formations within the Pantanal were converted into pasture between 2010 and 2021 (**Table 4 and Figure 2**), representing 6.3% of their combined 2010 total area of 12.0 million hectares. Each year, native vegetation equivalent in area to 87,681 football pitches is converted to pasture in the Pantanal, based on 2010-2021 figures.⁶⁶

While the pace of conversion of forest and savanna formations has slowed over the past 30 years, the rate of conversion from grassland and wetland into pasture has been intensifying – the average annual rate of wetland conversion almost doubled in 2010-2021 compared to 1990-2000 (**Table 4**). The total area of pasture (for livestock) in the Pantanal biome also more than doubled (127.5% growth) between 1990 and 2021, to reach 2.54 million hectares.



Each year, native vegetation equivalent in area to 87,681 football pitches is converted to pasture in the Pantanal, based on 2010-2021 figures.

Table 4: Native vegetation converted to pasture in Pantanal biome (total area and rate of conversion)

	Area converted to pasture (2010-2021)	As % of 2010 total area	Average annual rate of conversion 1990-2000 (%)	Average annual rate of conversion 2000-2010 (%)	Average annual rate of conversion 2010-2021 (%)
Forest	99,960.6	3.3	0.8	0.6	0.3
Savanna	138,698.7	7.1	1.1	1.1	0.7
Grassland	394,421.1	9.6	0.7	0.8	0.9
Wetland	118,169.2	4.0	0.2	0.3	0.4

Source: MapBiomias

Conversion of native vegetation to pasture has been concentrated along the edges of the Pantanal towards its northern and eastern borders, spreading inwards along the major waterways (Figure 2). This may be indicative of displacement of cattle ranching from the neighbouring Amazon and Cerrado, and highlights a risk of deforestation leakage into the Pantanal should protections of those biomes be further enhanced relative to the Pantanal. Indeed, a 2021

study demonstrated how stricter protections in the Amazon have led to deforestation leakage to the neighbouring Cerrado linked to cattle ranching.⁶⁷ The study found an increase in deforestation in the Cerrado within 200km of the Amazon-Cerrado border following the Zero-Deforestation Cattle Agreements which mandated that slaughterhouses refrain from buying cattle from properties in the Amazon with deforestation after 2009.⁶⁸

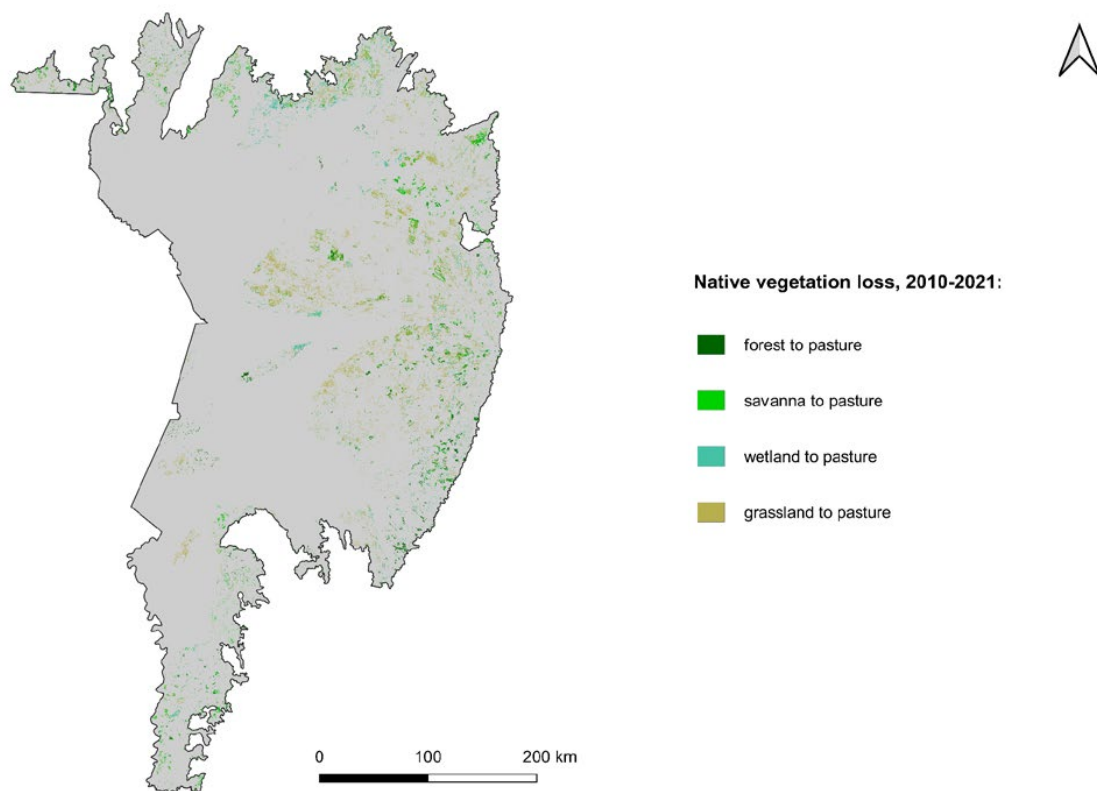


Figure 2: Conversion of native vegetation to pasture (2010-2021) (Source: MapBiomias)

4.2. Deforestation and native vegetation loss and associated CO2 emissions linked to EU supply chains

A total of 36 direct suppliers (TRACES properties) and 276 indirect suppliers (non-TRACES properties) of cattle products to the EU were identified for the purposes of this analysis (see **Figure 1**). These properties, all located either fully or partially within the Pantanal, have a combined area of 828,766.6 hectares, representing approximately 5.5% of the total land area of the biome. These figures do not include indirect suppliers based in Mato Grosso do Sul (for the reasons set out in **Section 3** above), which are considered separately below.

All 312 properties overlapped with IUCN maximum potential habitat ranges for between 197 and 279 native mammals, amphibians and reptiles, including between 11 and 21 threatened species. 58% of these properties are located at least partially in priority areas for biodiversity conservation, as designated by Brazil's Ministry of Environment and Climate Change.⁶⁹

According to Mapbiomas data, a total of 40,246.9 hectares of native vegetation (forest, Other Wooded Land and Other Natural Ecosystems) were converted to pasture on the above 312 EU-linked properties during the period 2012-2021 (**Table 5**). Converted area was highest for Other Natural Ecosystems, with 25,237.6 hectares of wetland and grassland converted to pasture between 2012 and 2021, equating to 2,523.8 hectares each year. Other Wooded Land also underwent significant conversion, with 11,124.4 hectares of savanna converted to pasture over the 10-year period, equating to 1,112.4 hectares lost annually. Overall, this equated to the conversion of 9.2% of Other Wooded Land and Other Natural Ecosystems within these property boundaries. Case studies of properties with comparatively high levels of native vegetation loss are provided in **Box 1** on page 18.

Table 5: Extent of conversion of native vegetation cover to pasture within EU-linked properties in the Pantanal (excluding indirect suppliers in Mato Grosso do Sul)

	Area of vegetation category converted to pasture 2012-2021 (hectares)	% of vegetation category converted (within EU supplier properties)
Forest	3,884.8	2.3
Other Wooded Land (Savanna)	11,124.4	6.4
Other Natural Ecosystems (Wetland and Grassland)	25,237.6	11.5

Source: MapBiomas

We estimate that, in addition, approximately 97 indirect suppliers of cattle to EU supply chains may be based in Mato Grosso do Sul, with an estimated combined area of 225,372.5 hectares. Based on figures for vegetation cover and vegetation

loss for Mato Grosso-based indirect suppliers, we estimate that 10,944.6 hectares of native vegetation were converted to pasture within the Mato Grosso do Sul properties between 2012 and 2021, broken down by vegetation category in **Table 6**.

The total area of pasture (for livestock) in the Pantanal biome more than doubled (127.5% growth) between 1990 and 2021, to reach 2.54 million hectares.



Table 6: Estimated extent of conversion of native vegetation cover to pasture within indirect supplier properties in Mato Grosso do Sul

	Area of vegetation category converted to pasture 2012-2021 (hectares)	% of vegetation category converted (within EU supplier properties)
Forest	1,056.4	2.3
Other Wooded Land (Savanna)	3,025.2	6.4
Other Natural Ecosystems (Wetland and Grassland)	6,863.0	11.5

Overall, during the period 2012-2021, this equates to the conversion to pasture of an estimated 14,149.6 hectares of Other Wooded Land and 32,100.6 hectares of Other Natural Ecosystems – a combined area four times larger than Paris – within Pantanal-based properties linked either directly or indirectly to the EU market (Table 7). This translates to the conversion to pasture of 1,415.0 hectares of Other Wooded Land and 3,210.1 hectares of Other Natural Ecosystems on average annually – an area equivalent to 1,982 and 4,496 football pitches, respectively. Across the Pantanal as a whole, the rate of conversion intensified in 2020-2021 compared to 2019-2020, with conversion of Other Wooded Land to pasture increasing by

64%, and conversion of Other Natural Ecosystems to pasture growing even more rapidly, by 83%. These native vegetation losses would fall outside of the scope of the current EU Regulation on deforestation-free products,⁷⁰ despite being driven, at least in part, by EU consumption of cattle products, and posing a significant threat to the biodiversity and climate-regulation functions of the Pantanal as a whole.

In terms of CO₂ emissions, this conversion of native vegetation into pasture resulted in the estimated release of 4.6 million tonnes of CO₂ during the period 2012-21, equivalent to the consumption of 10.6 million barrels of crude oil.⁷¹

Table 7: Estimated total extent of conversion of native vegetation cover to pasture within EU-linked properties in the Pantanal (direct and indirect suppliers, Mato Grosso and Mato Grosso do Sul)

	Area of vegetation category converted to pasture 2012-2021 (hectares)	% of vegetation category converted (within EU supplier properties)	Estimated CO ₂ emissions (metric tonnes CO ₂)
Forest	4,941.3	2.3	835,083.9
Other Wooded Land (Savanna)	14,149.6	6.4	1,794,877.4
Other Natural Ecosystems (Wetland and Grassland)	32,100.6	11.5	1,943,882.4

If the existing pace of native vegetation conversion into pasture continues, we estimate that EU supply chains could contribute to the conversion of 4,625.0 hectares of savanna, wetland and grassland ecosystems to pasture within the Pantanal annually. An expanded EU Regulatory framework to cover Other Wooded Land and Other Natural Ecosystems could play an important role in deterring such conversion in the future.


However, rates of vegetation conversion may well intensify going forward should stricter protections in the neighbouring Amazon and Cerrado biomes cause deforestation leakage into unprotected ecosystems within the Pantanal. In addition, the weakening of environmental legislation in the Pantanal – most recently with the bill approved by the state of Mato Grosso in August 2022, which legalises the use of PPAs and LRs for cattle grazing in the Pantanal biome, and allows an increase in clearing of native vegetation⁷² – is expected to lead to increased rates of deforestation in the coming years.⁷³

As a result, we further estimate that **EU supply chains could contribute to the conversion to pasture of 65,614.5 hectares of the Pantanal's savanna ecosystems, and 153,022.6 hectares of wetland and grassland between 2023 and 2050, equating to a combined area the size of 306,214 football pitches, or 30 football pitches lost every day.** An expanded EU Regulatory framework could greatly increase the pressure on land users to conserve these areas instead. These figures assume an increase in the rate of conversion of Other Wooded Land and Other Natural Ecosystems compared to 2012-2021 rates, to take into account *inter alia* the likely impact of expected deforestation leakage from neighbouring biomes and the recent dismantling of environmental protections in the state of Mato Grosso.⁷⁴ **Preventing the conversion of these areas to pasture and the associated CO₂ emissions could avoid the estimated release of 17.6 million tonnes of CO₂, equivalent to taking 3.9 million petrol-powered cars off the road for a year.**⁷⁵

The current EU Regulation on deforestation-free products already requires compliance with relevant local regulations. In the Pantanal, while state-level legislation adopted in Mato Grosso in 2022 and in Mato Grosso do Sul in 2015 has allowed for cattle grazing to take place within PPAs in

both states, cattle grazing is only permitted within LRs in Mato Grosso. This research has identified a risk of illegal deforestation linked to EU supply chains – this includes apparent deforestation within fazendas on the Lista Aptas in Mato Grosso do Sul that appeared to take place within the boundaries of the properties' LRs (see **Box 1** for examples). This deforestation may render these properties ineligible to supply the EU under the current provisions of the Regulation, and the examples we identified may be indicative of a much wider issue: according to MapBiomias,⁷⁶ during the period 2019-2022, 5,142 hectares of deforested areas in the Pantanal overlapped with land designated as LR.

Of further concern is the prevalence of human rights abuses within the Brazilian cattle ranching industry, including ranches in the Pantanal. Since 2017, around 100 workers have been rescued from conditions analogous to slavery in Pantanal-based properties, including properties that supply cattle to EU-approved slaughterhouses. Our research indicates a high risk of EU supply chains being tainted with human rights abuses, and demonstrates how these issues intersect with environmental degradation. For further details, see **Box 2**.



EU supply chains could contribute to the conversion of 65,614 hectares of the Pantanal's savanna ecosystems, and 153,023 hectares of wetland and grassland between 2023 and 2050, equating to a combined area the size of 306,214 football pitches, or 30 football pitches lost every day.

BOX 1: Case studies of native vegetation conversion to pasture in TRACES properties within the Pantanal and links to the EU market

Fazenda Olhos D'Água

Fazenda Olhos D'Água is located in Aquidauana, Mato Grosso do Sul. Between 2012 and 2021, 99.3 hectares of Other Wooded Land and 21.8 hectares of Other Natural Ecosystems within the property's boundaries were converted into pasture – a total of 121.1 hectares.

In recent years, JBS's two slaughterhouses in Campo Grande – which are both approved for export to the EU – have received regular deliveries from Fazenda Olhos D'Água, often several times per month. Using published data, we were able to link a number of these deliveries to the subsequent export of bovine products to the EU: on 2 February 2023, for example, JBS Campo Grande Unit 1 received a delivery of cattle from Fazenda Olhos D'Água, the timing of which aligned with exports from the slaughterhouse to Italy, Sweden and Poland. JBS Campo Grande (Units 1 and 2 combined) was responsible for the highest volume of bovine product exports to the EU during the period 2018-2021, according to trade data in Panjiva.

Figure 3: Aerial image of land cleared for cattle pasture at Fazenda Olhos D'Água (23 March 2023)



Fazenda Yndiana

Fazenda Yndiana, located in Porto Murtinho, Mato Grosso do Sul, has seen high levels of deforestation and conversion of native vegetation into pasture in recent years. Mapbiomas data shows that between 2012 and 2021, a total of 817.7 hectares of Other Wooded Land and 7.1 hectares of Other Natural Ecosystems within the property's borders was converted into pasture, equivalent to 11.1% of the property's total land area. Deforestation may further have taken place within the boundaries of areas protected under Brazil's Forest Code: this includes the conversion to pasture of 14.1 hectares of savanna within the property's Legal Reserve during the period 2010-2021.

This fazenda has regularly delivered cattle to JBS's two slaughterhouses in Campo Grande and one in Naviraí, with Campo Grande Unit 1 and Naviraí receiving deliveries as recently as 2022. On 15 March 2022, JBS Campo Grande Unit 1 received a shipment of cattle from Fazenda Yndiana, which aligned with a JBS export of bovine products to Spain.

Figure 4: Aerial image of land cleared for cattle pasture at Fazenda Yndiana (property to the far right of the image) (2 May 2023)



Fazenda Primavera

Fazenda Primavera, located in Aquidauana, Mato Grosso do Sul, has a history of infringements of Brazilian environmental law. In 2018, the property was added to the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) list of environmental infractions after an area of 107.53 hectares was “*destroyed without environmental authorization for suppression of native vegetation*”, with this area subsequently embargoed. According to MapBiomas data, deforestation appears to have taken place within areas protected under Brazil’s Forest Code and local legislation between 2010 and 2021, including the conversion to pasture of 15.9 hectares of savanna, wetland and grassland within the boundaries of the property’s Legal Reserve. MapBiomas data further shows that 83.1 hectares of Other Wooded Land and 620.9 hectares of Other Natural Ecosystems were converted to pasture between 2012 and 2021.

JBS Campo Grande Unit 2 received shipments of cattle from this property between 2020 and 2021: this included a shipment received on 4 May 2021, the timing of which aligned with the subsequent export of bovine products to Spain.

Fazenda Seis Palmas

Fazenda Seis Palmas is located in Porto Murtinho, Mato Grosso do Sul. Between 2012 and 2021, 32.1 hectares of Other Wooded Land and 61.7 hectares of Other Natural Ecosystems were converted into pasture in this fazenda, according to MapBiomas data.

JBS’s Campo Grande Unit 2 slaughterhouse receives deliveries from the property every few months, including in 2023. On 6 May 2022, the slaughterhouse received three deliveries from Fazenda Seis Palmas, which aligned with JBS exports to Belgium, France, Italy, the Netherlands, Poland and Sweden.

BOX 2: Human rights abuses in the Brazilian cattle ranching industry

In Brazil, cattle ranching was the sector from which most workers were rescued from conditions analogous to slavery between 1995 and 2020, at 17,253 individuals (31% of the total).⁷⁷ Between 2017 and 2023, 122 workers were rescued from such conditions on cattle ranches in the states of Mato Grosso and Mato Grosso do Sul – within which the Pantanal biome is entirely contained – according to official figures from the Brazilian Ministry of Work and Employment.⁷⁸ Cases related to cattle ranching represented 23% of all rescues of people found to be working in conditions analogous to slavery in Mato Grosso and Mato Grosso do Sul over this period.

Since 2017, 17 cattle ranches located within the Pantanal biome have featured on the Brazilian government's register of employers that have subjected workers to conditions analogous to slavery – also known as the 'Dirty List'.⁷⁹ A total of 96 workers were rescued from these ranches between 2017 and 2023. While none of these 17 farms are EU-approved (SISBOV), there is a high risk of EU supply chains being contaminated with human rights abuses given the frequency of cattle trading between SISBOV and non-SISBOV properties within the biome (see **Section 4.2** above).

One of these 17 properties – Fazenda Marabá, located in the municipality of Porto Murtinho – appeared to have a continued, direct relationship with a major EU beef supplier, JBS, after it was placed on the Dirty List in October 2022. 17 workers were rescued by authorities from Fazenda Marabá in 2020 after being subjected to degrading working conditions including a lack of protective equipment, proper accommodation, drinking water, access to toilets/bathrooms, and an area to prepare or store food.⁸⁰ After the date of the inspection (15th December 2020),⁸¹ the fazenda made at least 26 deliveries of cattle to JBS's Campo Grande Unit 2 slaughterhouse.⁸² 13 of these deliveries took place after the property was added to the Dirty List on the 5th October 2022, with the last recorded delivery to JBS's Campo Grande Unit 2 slaughterhouse taking place on the 23rd March 2023.⁸³ Records thus suggest that JBS continued the trading relationship for over two years after conditions of slavery were first recorded.

Fazenda Canadá, an EU-approved (SISBOV) cattle ranch located just 1.4km outside the Pantanal border, is evidence that EU trade with the Brazilian cattle ranching sector has direct links to human rights abuses. A 2021 inspection by the Brazilian Ministry of Labour and Employment found five fazenda workers were subjected to degrading working conditions, including a lack of access to shelter, water, sanitation, and food storage and preparation areas.⁸⁴ The inspection of working conditions within Fazenda Canadá by the Brazilian authorities began on the 5th September 2021. However, up until mid-2022, this property continued to deliver cattle to JBS's EU export-approved Campo Grande Unit 1 and Naviraí slaughterhouses. At least eight deliveries took place during this period, though deliveries ceased once the property was added to the Dirty List in October 2022.⁸⁵ An analysis of native vegetation conversion highlights the intersect between environmental damage and human rights abuses linked to EU supply chains: between 2010 and 2021, 335.5 hectares of Other Wooded Land and 60.8 hectares of Other Natural Ecosystems were converted into pasture within the boundaries of Fazenda Canadá – a total of 396.3 hectares, or 5.3% of its total area. See property to the left of the image in **Figure 4**.

The number of slavery cases and rescued workers across Brazil fell significantly between 2010 and 2020 compared to the previous decade. This was a direct result of a drop in the number of labour inspections, widely considered to be a result of reduced budgets and the policy stance of the federal government during this period.⁸⁶

Our research indicates a high risk of EU supply chains being tainted with human rights abuses, and demonstrates how these issues intersect with environmental degradation.

5. Conclusion and recommendations

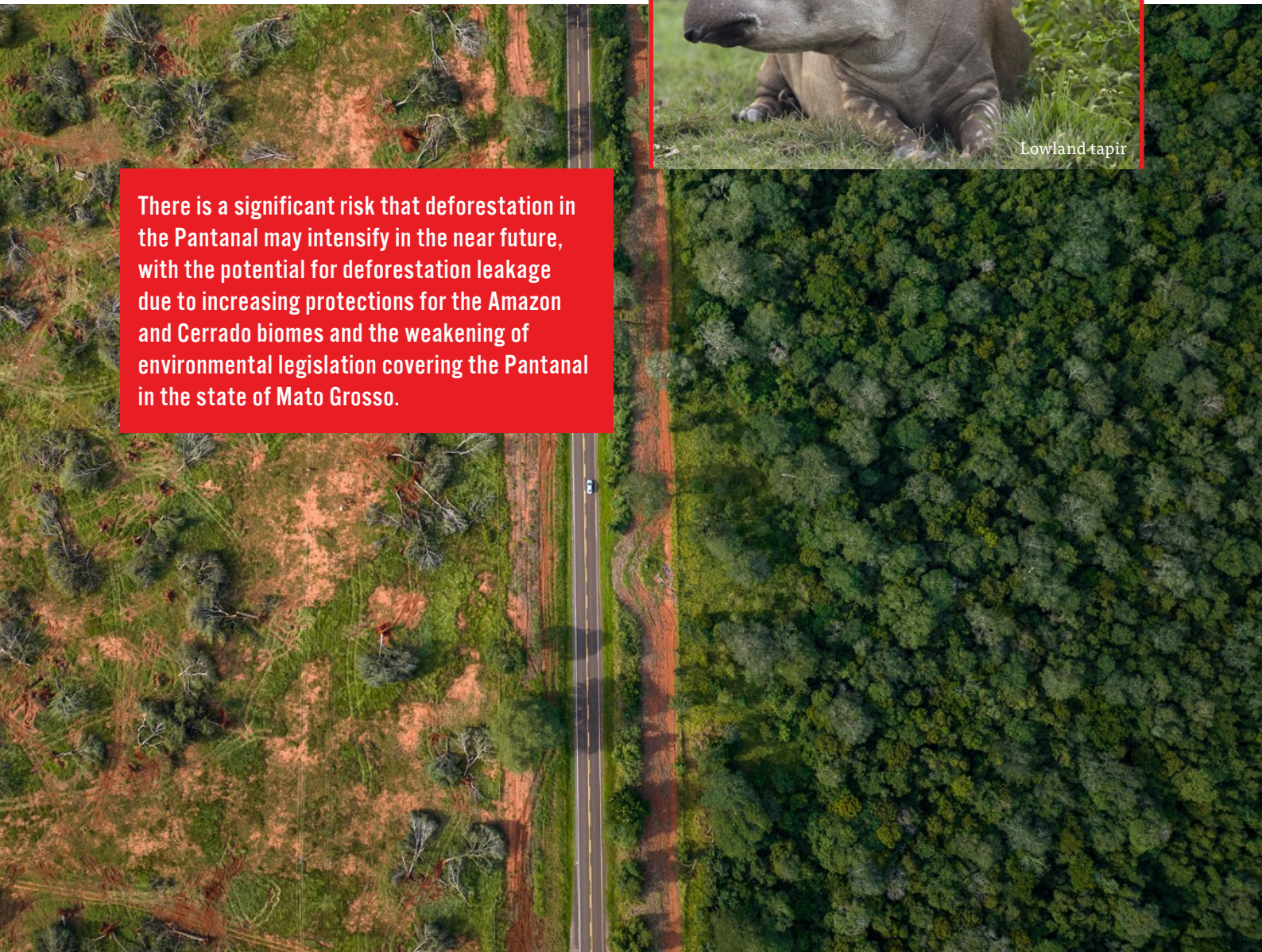
This research has demonstrated unequivocally the role played by properties in EU cattle supply chains in driving the loss of native vegetation, and its conversion to pasture, in the Pantanal biome. Losses are particularly extensive for savanna, grassland and wetland ecosystems – which account for around 60% of the Pantanal's land area (or 75% of its native vegetation) and which do not currently fall within the scope of the zero-deforestation requirements of the EU Regulation on deforestation-free products. There is a significant risk that deforestation in the Pantanal may intensify in the near future, with the potential for deforestation leakage due to increasing protections for the Amazon and Cerrado biomes and the weakening of environmental legislation covering the Pantanal in the state of Mato Grosso. In the absence of increased protection, we have estimated the potential conversion of hundreds of thousands of hectares of native vegetation to pasture – in the Pantanal alone – over the coming decades, linked to EU consumption of cattle products and the associated emission of almost 18 million tonnes of CO₂.

The EU's deforestation footprint may, in fact, be significantly larger, as this research was not able to examine the full extent of the ranching network that may supply cattle to the EU market.

We therefore recommend that the EU expands the protections afforded by the EU Regulation on deforestation-free products to Other Wooded Land and Other Natural Ecosystems, thereby preventing deforestation leakage and ensuring that EU supply chains do not contribute to the destruction of ecosystems of global significance to biodiversity and climate regulation, such as the Pantanal.



There is a significant risk that deforestation in the Pantanal may intensify in the near future, with the potential for deforestation leakage due to increasing protections for the Amazon and Cerrado biomes and the weakening of environmental legislation covering the Pantanal in the state of Mato Grosso.



Appendices

Appendix I: Pantanal land cover by native vegetation category and year (hectares)

Year	Forest	Savanna	Wetland	Grassland
2021	2,980,715.0	1,959,289.4	1,086,907.8	5,988,650.7
2020	2,970,604.9	1,971,726.9	993,547.2	6,150,249.2
2019	2,979,766.9	1,974,991.3	2,099,400.4	4,954,364.1
2018	2,989,246.6	1,979,067.7	4,226,673.5	2,715,912.3
2017	2,996,491.2	1,985,372.1	2,501,962.5	4,526,463.6
2016	3,005,753.5	1,988,484.8	2,559,292.6	4,474,699.9
2015	3,010,664.5	1,993,396.3	2,548,091.9	4,470,180.8
2014	3,010,806.1	1,985,186.9	2,934,742.5	3,870,478.2
2013	3,013,212.7	1,980,704.5	1,701,161.3	5,422,936.8
2010	3,014,245.5	1,965,772.2	2,926,626.3	4,096,840.8
2000	3,161,914.3	2,067,707.3	2,824,419.0	4,114,208.7
1990	3,356,535.5	2,196,436.6	3,260,024.4	3,536,970.9

Source: MapBiomias

Appendix II: Pantanal land cover conversion to pasture by native vegetation category and time period (hectares)

	Forest	Savanna	Wetland	Grassland
1990-2000	248,205.7	234,074.5	71,287.5	248,799.9
2000-2010	190,812.3	213,252.2	86,285.9	308,092.7
2010-2021	99,960.6	138,698.7	118,169.2	394,421.1
2017-2021	52,135.5	79,340.1	116,325.1	284,343.0

Source: MapBiomass data and EJF analysis

Appendix III: Short profiles of the 36 cattle ranches located entirely or partially within the Pantanal biome that are approved for export to the European Union^{87,88,89}

1. Estância Ferreira I

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-D2E34B6C432847B1AEC5BA1A9180B719
Size	137.09 ha
Trading partners	JBS Araputanga (2021)
Delivery mapped to EU export?	Yes - general delivery from Estância Ferreira as a whole to JBS Araputanga on 13/04/21 can be mapped to JBS exports to France, the Netherlands and Italy.

2. Estância Ferreira II

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-8D5E24BFDEE34FA1A58ACBD289239E4F
Size	278.77 ha
Trading partners	JBS Araputanga (2021)
Delivery mapped to EU export?	Yes - general delivery from Estância Ferreira as a whole to JBS Araputanga on 13/04/21 can be mapped to JBS exports to France, the Netherlands and Italy.

3. Fazenda Olhos d'Água

Location	Aquidauana, Mato Grosso do Sul (-19.637032639883007, -55.35536189841953)
CAR number	MS-5001102-83F96B944DA946709A71D4213D6B0381
Size	10,327.848 ha
Trading partners	Both JBS Campo Grande 1 and JBS Campo Grande 2 receive regular deliveries of cattle from this fazenda, according to JBS Friboi data. Cattle are delivered several times per month.
Delivery mapped to EU export?	Yes - deliveries to JBS Campo Grande Unit 1 on 02/02/23 can be mapped to JBS exports to Italy, Sweden and Poland.

4. Fazenda São Francisco do Pau Arcado

Location	Corumbá, Mato Grosso do Sul (-19.969358, -57.226842)
CAR number	MS-5003207-D4E54EAE79A842C68ACF996F2A1E355B
Size	6,310.309 ha
Trading partners	JBS Campo Grande Unit 2 has received regular deliveries from this fazenda since the beginning of 2020.
Delivery mapped to EU export?	Yes - two deliveries to JBS Campo Grande Unit 2 on 21/12/2022 and 22/12/2022 can be mapped with JBS exports from Campo Grande to Italy, Netherlands, Germany and Poland.

5. Fazenda Seis Palmas

Location	Porto Murtinho, Mato Grosso do Sul (-21.084365326117556, -57.77766472255151)
CAR number	MS-5006903-C2095CoCA87E49BD8CBFE8F52C9C1D74
Size	8,964.299 ha
Trading partners	JBS Campo Grande Unit 2 (2020-present) and JBS Naviraí (2021 only). JBS Campo Grande Unit 2 receives deliveries every few months, including one in January 2023.
Delivery mapped to EU export?	Yes - three deliveries from this fazenda to JBS Campo Grande Unit 1 on 06/05/22 can be mapped to JBS exports to Sweden, France, Belgium, Netherlands, Italy, and Poland.

6. Fazenda Primavera

Location	Aquidauana, Mato Grosso do Sul (-19.5033451511056, -55.908161921905474)
CAR number	MS-5001102-73A867A80D1B4E4A86312742221B1B39
Size	30,987.034 ha
Trading partners	JBS Campo Grande 2 (2020-2021). There have been no deliveries of cattle from this fazenda to JBS since May 2021.
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Campo Grande Unit 2 on 04/05/21 can be mapped to a JBS export to Spain.

7. Fazenda Peixe de Couro

Location	Santo Antônio do Leverger, Mato Grosso (-16.932960850776535, -55.15517925862496)
CAR number	MT-5107800-70997A191038432997249073A1BB3E94
Size	10,485.126 ha
Trading partners	JBS Pedra Preta (2020-2022) and JBS Barra do Garças (2021 only). No deliveries in 2023. Last delivery was to JBS Pedra Preta in June 2022.
Delivery mapped to EU export?	Yes - delivery from this fazenda to JBS Pedra Preta on 05/05/21 can be mapped to JBS exports to Spain and the Netherlands.

8. Fazenda Nova Espanha

Location	Aquidauana, Mato Grosso do Sul (-20.11882397351499, -55.660791474121176)
CAR number	MS-5001102-A4C6D26EC1974D3C8A10741B165989DF
Size	4,725.456 ha
Trading partners	JBS Campo Grande 1 (2020-present), JBS Campo Grande 2 (2022-present), JBS Naviraí (2022 only). Deliveries to JBS normally monthly.
Delivery mapped to EU export?	Yes - two deliveries to JBS Campo Grande Unit 1 on 07/03/23 can be mapped to JBS exports to Sweden and Italy.

9. Fazenda Baía dos Jacarés

Location	Aquidauana, Mato Grosso do Sul (-20.3209938502786, -55.86910450027306)
CAR number	MS-5001102-A07877AC292D4E87AB410D3FABBB60FD
Size	610.208 ha
Trading partners	JBS Campo Grande 2 (2020-2021), JBS Campo Grande 1 (2021). No deliveries from this fazenda to JBS since October 2021.
Delivery mapped to EU export?	Yes - three deliveries from this fazenda to JBS Campo Grande Unit 2 on 29/10/2021 can be mapped to a JBS export to Italy.

10. Fazenda Amonguijá

Location	Porto Murtinho, Mato Grosso do Sul (-21.691151330141967, -57.474106384264005)
CAR number	MS-5006903-oCFB1712AD7A4C2384ECD3F7E9525E21
Size	7,248.852 ha
Trading partners	JBS Naviraí (2020-present).
Delivery mapped to EU export?	Yes - two deliveries from this fazenda to JBS Naviraí on 18/01/22 can be mapped to JBS exports to Italy and the Netherlands.

11. Fazenda Montana

Location	Porto Murtinho, Mato Grosso do Sul (-21.80433149278152, -57.66198519779972)
CAR number	MS-5006903-oCBDDDC947DA4931AE4493083C512F18
Size	686.478 ha
Trading partners	JBS Campo Grande 1 (2020-2022) JBS Naviraí (2021) JBS Campo Grande 2 (2020)
Delivery mapped to EU export?	Yes - delivery to JBS Campo Grande Unit 1 on 10/06/22 can be mapped to JBS export to Italy.

12. Fazenda Milena II

Location	Sonora, Mato Grosso do Sul (-17.931408899772954, -54.82354824936287)
CAR number	MS-5007935-46C4373E28BB46FFB16F637CAA01D279
Size	1,775.778 ha
Trading partners	JBS Campo Grande 1 (2020-2022) JBS Campo Grande 2 (2020-present)
Delivery mapped to EU export?	Yes - delivery from this fazenda to JBS Campo Grande Unit 2 on 21/04/22 can be mapped to JBS exports to Italy and Poland.

13. Fazenda Várzea Funda

Location	Cáceres, Mato Grosso (-16.583290703082547, -57.72683598149419)
CAR number	MT-5102504-9D66BF7AE2104440A7DFE4C9B517FF19
Size	8,748.568 ha
Trading partners	JBS Diamantino (2021-present)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Diamantino on 01/03/23 can be mapped to JBS exports to Germany, Italy and Spain.

14. Fazenda Santo Antônio das Lendas

Location	Cáceres, Mato Grosso (-16.6411, -57.8165)
CAR number	MT-5102504-8FB9A0146255496A8B5A86B1BB8E6520
Size	7,501.853 ha
Trading partners	JBS Araputanga (2020-2022). Marfrig Várzea Grande received a delivery of cattle from this fazenda on 10/01/2023.
Delivery mapped to EU export?	Yes - two deliveries from this fazenda to JBS Araputanga on 04/11/22 can be mapped to JBS exports to Spain, Italy and the Netherlands.

15. Fazenda Matão

Location	Cáceres, Mato Grosso (-16.596474545427444, -58.19311290633433)
CAR number	MT-5102504-4A5A0BAAA26745B5972033A13135252D
Size	1,074.676 ha
Trading partners	JBS Araputanga (2020-2022)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 31/05/22 can be mapped to JBS exports to Spain, Italy, the Netherlands, Germany and Greece.

16. Fazenda Morro Verde

Location	Porto Esperidião, Mato Grosso (-16.125685797358255, -59.000365398040145)
CAR number	MT-5106828-0780150992874CE593E61577C62D8361
Size	2,447.731 ha
Trading partners	JBS Araputanga (2020-present)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 09/03/23 can be mapped to JBS exports to Spain, Italy and Germany.

17. Fazenda Vitória

Location	Porto Esperidião, Mato Grosso (-15.928712783358352, -58.44174605914562)
CAR number	MT-5102504-832E928C6F454B8AB65396FA624CDEB2
Size	235.894 ha
Trading partners	JBS Araputanga (2020-2022)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 13/10/23 can be mapped to JBS exports to Spain, Italy, Germany and the Netherlands.

18. Fazenda Yndiana

Location	Porto Murtinho, Mato Grosso do Sul (-21.778334,-57.495834)
CAR number	MS-5006903-6253467D1DE5458DB8914Bo6C9467392
Size	7,433.818 ha
Trading partners	JBS Campo Grande 1 (2020-2022) JBS Campo Grande 2 (2020) JBS Naviraí (2022)
Delivery mapped to EU export?	Yes - two deliveries from this fazenda to JBS Campo Grande Unit 1 on 15/03/22 can be mapped to a JBS export to Spain.

19. Fazenda Soteco

Location	Cáceres, Mato Grosso (-16.098098460326263, -58.43860170113443)
CAR number	MT-5102504-EA848274FBCC446A9FFB4FE08599A8Do
Size	3,329.599 ha
Trading partners	Unknown (no relationship with JBS since at least 2020)
Delivery mapped to EU export?	No

20. Fazenda Novo Horizonte

Location	Miranda, Mato Grosso do Sul (-20.009320059026805, -56.33319422068026)
CAR number	MS-5005608-6Fo6FFD0936949799721F445B8287D67
Size	33,278.848 ha
Trading partners	JBS Campo Grande 1 (2020-present) JBS Campo Grande 2 (2021-present)
Delivery mapped to EU export?	Yes - two deliveries to JBS Campo Grande Unit 1 on 04/03/22 can be mapped to JBS exports to Spain and Poland.

21. Fazenda Santa Delfina

Location	Miranda, Mato Grosso do Sul (-20.03754873181072, -56.31705287593505)
CAR number	MS-5005608-1DDEE3BD57EF4BE4BFD95A7DDC978B79
Size	11,749.32 ha
Trading partners	JBS Campo Grande 2 (2020-2022) JBS Campo Grande 1 (2021)
Delivery mapped to EU export?	Yes - delivery from this fazenda to JBS Campo Grande Unit 2 on 29/09/22 can be mapped to JBS exports to Sweden and Italy.

22. Sítio Rincão II e Sítio Rancho Alegre

Location	Cáceres, Mato Grosso (-15.976151493800474, -57.86917568968147)
CAR number	MT-5102504-3Fo74D357EC34B999E90E919187E64E1
Size	134.039 ha
Trading partners	JBS Araputanga (2020-2022) JBS Pontes e Lacerda (2021) JBS Diamantino (2020-present)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 16/11/22 can be mapped to JBS exports to Germany, Netherlands, Spain and Italy.

23. Fazenda Santo Antônio (a)

Location	Cáceres, Mato Grosso (-16.059258349914636, -58.3301067352295)
CAR number	MT-5102504-546FF3A9AD0943578270E1687D99044D
Size	840.06 ha
Trading partners	Unclear owing to commonly used name, but likely ongoing links to JBS.
Delivery mapped to EU export?	No

24. Fazenda 13 de Ouro

Location	Cáceres, Mato Grosso (-16.07624875999693, -58.397397994995124)
CAR number	MT-5102504-3A688B52797A42A39F53BD55B4F9094E
Size	3,350.68 ha
Trading partners	JBS Araputanga (2020-2022) JBS Diamantino (2021)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 11/11/22 can be mapped to JBS exports to the Netherlands, Italy and Spain.

25. Fazenda Baía Grande

Location	Porto Esperidião/Cáceres, Mato Grosso
CAR number	MT-5102504-880360DD8CD84FB69EBo60A8EFAC55BB
Size	3,238.255 ha
Trading partners	JBS Araputanga (2020)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 24/04/20 can be mapped to JBS exports to Germany, Spain, Italy, the Netherlands and Portugal.

26. Fazenda Lagoa da Serra

Location	Sonora, Mato Grosso do Sul
CAR number	MS-5007935-0A778AD2A7024986ADB7CA67B310767C
Size	2,911.71 ha
Trading partners	JBS Campo Grande 2 (2020-present) JBS Campo Grande 1 (2020-2021)
Delivery mapped to EU export?	Yes - delivery from this fazenda to JBS Campo Grande Unit 2 on 23/09/22 can be mapped to JBS exports to Sweden and Italy.

27. Fazenda Santo Expedito

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-385455B80765439D8E03E9346CA0707E
Size	1,053.98 ha
Trading partners	JBS Araputanga (2020)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 18/12/20 can be mapped to JBS exports to Italy and the Netherlands.

28. Fazenda Lagoa Bonita

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-01CBDE32B4694F33AFF17182707D8D4B
Size	3,711.68 ha
Trading partners	JBS Araputanga (2020-present)
Delivery mapped to EU export?	Yes - three deliveries from this fazenda to JBS Araputanga on 10/03/23 can be mapped to JBS exports to Spain, Italy and Germany.

29. Fazenda Barra das Piraputangas

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-761052060EED443DA0450A5077B725B8
Size	2,789.25 ha
Trading partners	JBS Araputanga (2020-2022)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 03/12/22 can be mapped to JBS exports to Italy and Greece.

30. Fazenda (São) Clemente

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-67E788837E094310802E3802DB67FE44
Size	336.45 ha
Trading partners	JBS Diamantino (2020-2022) JBS Araputanga (2020-2021)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 18/07/22 can be mapped to JBS exports to Spain, Greece and Italy.
Additional Notes	Five employees were found to be working in conditions analogous to slavery on Fazenda São Clemente in 2011. As a result, the owner of the property appeared on the government's 'Dirty List' of employers that had subjected employees to conditions analogous to slavery for that year.

31. Fazenda Santa Cruz

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-2E6FC7EC47904FA6B312FE943CCE76E0
Size	560.47 ha
Trading partners	JBS Araputanga (2020-2022) JBS Diamantino (2020)
Delivery mapped to EU export?	Yes - two deliveries from this fazenda to JBS Araputanga on 05/12/22 can be mapped to JBS exports to Spain, Italy and Greece.

32. Fazenda Panambi (I/II/III)

Location	Cáceres, Mato Grosso
CAR numbers	MT-5102504-2AF81057586D4FDEB892E19C9A51679A, MT-5102504-947D268C3FE04A10BFD40579DF5D052A, MT-5102504-E0B20F6CA82F443DB77163AAC6914C05
Size	2,058.71 ha
Trading partners	JBS Araputanga (2020-present) JBS Diamantino (2021) Marfrig Várzea Grande received a delivery of cattle from this fazenda on 10/01/2023.
Delivery mapped to EU export?	Yes - delivery from this fazenda to JBS Araputanga on 10/01/23 can be mapped to JBS exports to Italy, the Netherlands, and Spain.

33. Fazenda Santo Antônio (b)

Location	Cáceres, Mato Grosso
CAR number	MT-5102504-515EE3D02DDE4CF9BB636BEA6FBBCBBF
Size	2,811.92 ha
Trading partners	Unclear owing to commonly used name, but likely ongoing links to JBS.
Delivery mapped to EU export?	No

34. Fazenda Riacho Doce

Location	Porto Esperidião, Mato Grosso
CAR number	MT-5106828-AB30CF7CoAF74FB1A1153026D6B22816
Size	3,892.41 ha
Trading partners	JBS Araputanga (2020-2022) JBS Pontes e Lacerda (2021)
Delivery mapped to EU export?	Yes - delivery from this fazenda to JBS Araputanga on 23/06/22 can be mapped to JBS exports to Spain, Italy and the Netherlands.

35. Fazenda Mocinha

Location	Porto Esperidião, Mato Grosso
CAR number	MT-5106828-8321DFEABD3E454E9EC104C33CE06091
Size	943.47 ha
Trading partners	JBS Araputanga (2021) JBS Pontes e Lacerda (2021)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 06/04/21 can be mapped to JBS exports to Italy, Spain and the Netherlands.

36. Fazenda Alexandre

Location	Porto Esperidião, Mato Grosso
CAR number	MT-5106828-D37FE3020D2943EC90814BAB6841CE4F
Size	443.84 ha
Trading partners	JBS Araputanga (2020-2022)
Delivery mapped to EU export?	Yes - a delivery from this fazenda to JBS Araputanga on 09/11/22 can be mapped to JBS exports to Italy and Spain.

Appendix IV: Estimated carbon emissions resulting from native vegetation conversion on identified EU-linked cattle ranches

Property ID*	Forest to pasture CO2 (Mg CO2)	Savanna to pasture CO2 (Mg CO2)	Wetland to pasture CO2 (Mg CO2)	Grassland to pasture CO2 (Mg CO2)	Total natural vegetation to pasture CO2 (Mg CO2)
Supplier 1	280.7	272.2	228.6	112.0	893.6
Supplier 2	8,188.1	2,278.5	172.9	79.3	10,718.9
Supplier 3	0.0	0.0	0.0	1.5	1.5
Supplier 4	0.0	40.1	0.0	269.2	309.3
Supplier 5	0.0	0.0	719.4	198.5	917.9
Supplier 6	150.8	35.4	0.0	0.0	186.1
Supplier 7	29.2	222.9	2,462.5	4,343.0	7,057.6
Supplier 8	2,789.5	456.7	739.5	1,522.5	5,508.1
Supplier 9	63.1	2,109.4	2,221.9	4,002.8	8,397.1
Supplier 10	10,050.2	97,859.8	3,625.6	336,874.6	448,410.3
Supplier 11	420.6	16.3	0.0	0.0	436.9
Supplier 12	47.4	55.4	2,961.6	328.9	3,393.3
Supplier 13	2.7	0.0	16.6	84.3	103.6
Supplier 14	0.0	0.0	21.9	0.0	21.9
Supplier 15	13,767.4	10,875.1	609.1	1,386.3	26,637.9
Supplier 16	0.0	0.0	0.0	0.0	0.0
Supplier 17	69.1	614.9	2,950.5	3,812.5	7,447.0
Supplier 18	206.8	130.8	66.2	278.2	682.0
Supplier 19	0.0	1,271.5	174.9	469.8	1,916.2
Supplier 20	60,158.4	310,272.4	16,603.9	149,365.4	536,400.1
Supplier 21	1,085.7	3,978.9	385.2	1,163.6	6,613.4
Supplier 22	36.9	480.0	1,210.3	6,780.8	8,508.0
Supplier 23	4,077.0	9,512.0	205.7	2,052.8	15,847.5
Supplier 24	157.2	0.0	61.9	1,545.7	1,764.7
Supplier 25	158.7	126.5	35.6	93.7	414.5
Supplier 26	0.0	0.0	0.0	0.0	0.0
Supplier 27	0.0	0.0	0.0	0.0	0.0
Supplier 28	160.2	319.7	71.5	55.0	606.3
Supplier 29	2,100.3	216.1	0.0	0.0	2,316.4
Supplier 30	10.5	30.0	69.9	13.9	124.3
Supplier 31	230.7	81.9	30.2	98.0	440.9

Supplier 32	1,003.1	275.6	0.0	361.5	1,640.2
Supplier 33	214.8	0.0	0.0	0.0	214.8
Supplier 34	783.2	19,944.6	0.0	855.7	21,583.5
Supplier 35	0.0	0.0	8.6	33.1	41.7
Supplier 36	395.4	9,487.4	73.8	635.1	10,591.7
Supplier 37	73.5	5,454.4	43.0	3,431.0	9,001.9
Supplier 38	54.7	0.0	22.6	40.6	117.9
Supplier 39	0.0	0.0	0.0	0.0	0.0
Supplier 40	6.6	5.6	0.0	3.5	15.7
Supplier 41	115.8	23.8	106.1	61.8	307.6
Supplier 42	0.0	32.7	57.4	14.0	104.1
Supplier 43	41.2	236.2	95.2	1,675.7	2,048.3
Supplier 44	4,296.5	1,352.5	0.0	16.9	5,665.9
Supplier 45	116.5	68.6	442.7	96.8	724.6
Supplier 46	392.6	122.6	0.0	0.0	515.2
Supplier 47	1,927.8	758.7	64.0	895.7	3,646.2
Supplier 48	4,292.6	36,889.6	337.2	93,793.5	135,312.9
Supplier 49	849.1	23.8	0.0	0.0	872.9
Supplier 50	3,130.2	825.8	0.0	0.0	3,956.0
Supplier 51	0.0	0.0	0.0	0.0	0.0
Supplier 52	131.3	206.3	695.9	46.9	1,080.4
Supplier 53	617.9	52,649.7	14,620.3	30,208.4	98,096.3
Supplier 54	0.0	0.0	0.0	0.0	0.0
Supplier 55	0.0	0.0	0.0	0.0	0.0
Supplier 56	10,890.2	8,141.9	158.9	6,477.0	25,668.0
Supplier 57	2,013.3	26,644.2	2,300.9	10,150.9	41,109.2
Supplier 58	368.1	16,112.0	0.6	7,676.7	24,157.4
Supplier 59	10.0	0.0	0.0	0.0	10.0
Supplier 60	1.7	0.0	0.0	0.0	1.7
Supplier 61	0.0	8.0	4.0	0.0	12.0
Supplier 62	40.1	52.7	2.5	13.8	109.1
Supplier 63	0.0	0.0	0.0	0.0	0.0
Supplier 64	7.0	0.0	0.0	0.0	7.0
Supplier 65	490.9	5.7	23.3	35.6	555.4
Supplier 66	15.7	101.9	0.0	0.0	117.6
Supplier 67	0.0	3,988.2	0.0	0.0	3,988.2

Supplier 68	934.2	1,418.2	868.3	301.9	3,522.6
Supplier 69	0.0	159.1	0.0	130.4	289.5
Supplier 70	42.7	404.8	16.6	411.1	875.2
Supplier 71	1,500.7	27.1	0.0	0.0	1,527.8
Supplier 72	23.0	195.3	30.8	5.4	254.6
Supplier 73	0.0	0.0	0.0	0.0	0.0
Supplier 74	5,567.2	172.0	0.0	0.0	5,739.2
Supplier 75	1.6	0.0	0.0	3.3	4.9
Supplier 76	2,083.3	411.6	0.0	0.0	2,494.9
Supplier 77	0.0	4.2	0.0	62.7	66.9
Supplier 78	0.0	0.0	0.0	0.0	0.0
Supplier 79	0.0	0.0	0.0	0.0	0.0
Supplier 80	148.1	0.0	37.0	74.9	260.0
Supplier 81	0.0	0.0	0.0	0.0	0.0
Supplier 82	443.1	2,687.9	0.0	1,787.4	4,918.3
Supplier 83	57.4	78.0	139.2	14.8	289.4
Supplier 84	8.9	227.8	7.3	0.0	244.0
Supplier 85	1,072.8	2,967.0	0.0	65.4	4,105.2
Supplier 86	635.7	190.0	14.1	19.6	859.4
Supplier 87	81.9	383.5	0.0	28.2	493.7
Supplier 88	294.8	0.0	0.0	0.0	294.8
Supplier 89	82,895.2	209,757.9	0.0	21,869.7	314,522.8
Supplier 90	45.9	0.0	0.0	0.0	45.9
Supplier 91	3,317.3	864.2	0.0	114.9	4,296.3
Supplier 92	154.4	3,537.4	1.6	9,045.2	12,738.6
Supplier 93	0.0	0.0	0.0	0.0	0.0
Supplier 94	35.5	2,056.7	1,481.8	2,170.9	5,744.9
Supplier 95	19.0	304.0	48.9	624.4	996.3
Supplier 96	222.8	45.9	11.8	12.6	293.1
Supplier 97	638.6	890.3	50.1	990.9	2,569.8
Supplier 98	0.0	0.0	0.0	0.0	0.0
Supplier 99	226.9	113.6	62.2	79.3	482.0
Supplier 100	6,166.8	2,422.4	341.6	1,003.2	9,934.1
Supplier 101	14,659.1	1,889.7	350.5	3,089.7	19,989.1
Supplier 102	0.0	7.0	0.0	388.5	395.5
Supplier 103	6,589.1	1,632.4	1,749.9	252.9	10,224.3

Supplier 104	68,610.9	40,124.9	187.9	282.7	109,206.5
Supplier 105	0.0	0.0	4.0	3.6	7.6
Supplier 106	0.0	3,794.9	441.1	2,412.3	6,648.3
Supplier 107	0.0	0.0	0.0	0.0	0.0
Supplier 108	2.0	0.0	0.0	0.0	2.0
Supplier 109	352.2	1,105.2	0.0	350.0	1,807.4
Supplier 110	3,408.0	3,424.1	0.0	1,798.4	8,630.4
Supplier 111	0.0	0.0	0.0	0.0	0.0
Supplier 112	109.5	0.0	88.3	553.4	751.2
Supplier 113	0.0	0.0	0.0	0.0	0.0
Supplier 114	692.5	4,383.9	4,630.3	7,941.1	17,647.8
Supplier 115	51.1	0.0	0.0	0.0	51.1
Supplier 116	324.1	1,684.9	923.7	5,158.4	8,091.2
Supplier 117	0.0	1,957.2	0.0	0.0	1,957.2
Supplier 118	9,517.4	1,155.9	519.2	1,735.6	12,928.1
Supplier 119	0.0	0.0	0.0	0.0	0.0
Supplier 120	2,616.9	0.5	0.0	0.0	2,617.3
Supplier 121	222.8	2,964.9	281.7	5,668.9	9,138.4
Supplier 122	0.0	0.1	0.0	10.9	11.1
Supplier 123	0.0	0.0	0.0	0.0	0.0
Supplier 124	0.0	0.0	0.0	14.7	14.7
Supplier 125	1,508.0	2,333.7	0.0	928.6	4,770.3
Supplier 126	0.0	0.0	0.0	0.0	0.0
Supplier 127	0.0	0.0	0.0	0.0	0.0
Supplier 128	163.0	1,267.8	2,055.8	1,563.0	5,049.6
Supplier 129	1,917.2	2,608.0	2,059.5	9,263.3	15,848.0
Supplier 130	109.2	0.0	26.0	0.0	135.2
Supplier 131	435.7	8.3	5.8	0.0	449.7
Supplier 132	229.9	9.9	11.0	0.0	250.7
Supplier 133	71.2	0.0	0.0	0.0	71.2
Supplier 134	11.7	1.3	24.9	0.0	38.0
Supplier 135	362.4	0.0	0.0	3.0	365.3
Supplier 136	0.0	38.8	143.7	298.1	480.6
Supplier 137	107.2	5.3	0.0	0.0	112.5
Supplier 138	2,894.7	2,671.3	165.0	53.5	5,784.5
Supplier 139	117.6	77.4	267.9	2,279.9	2,742.7
Supplier 140	76.9	196.7	2.1	473.5	749.3

Supplier 141	3,054.4	98,813.2	2,373.1	69,575.1	173,815.8
Supplier 142	1,364.9	0.0	0.0	0.0	1,364.9
Supplier 143	645.6	0.0	0.0	0.0	645.6
Supplier 144	0.0	0.0	0.0	0.0	0.0
Supplier 145	39.6	1.7	7.0	31.9	80.2
Supplier 146	5.1	5.6	94.5	289.8	395.0
Supplier 147	1,379.5	2,627.2	81.5	635.6	4,723.7
Supplier 148	0.0	0.0	0.0	0.0	0.0
Supplier 149	11,754.8	8,502.0	55.4	4,980.3	25,292.4
Supplier 150	1,040.6	2,728.3	32.8	461.8	4,263.5
Supplier 151	450.5	9.8	0.0	0.0	460.4
Supplier 152	131.9	0.0	0.0	0.0	131.9
Supplier 153	1,620.0	4,356.3	958.2	661.5	7,596.0
Supplier 154	669.6	562.7	48.0	989.3	2,269.5
Supplier 155	4.3	424.6	9.2	384.0	822.1
Supplier 156	3,916.2	16,956.9	1,704.6	8,170.3	30,748.0
Supplier 157	410.8	144.4	0.0	31.5	586.7
Supplier 158	571.8	1,169.2	1,779.6	5,842.8	9,363.4
Supplier 159	0.0	0.0	5.3	41.2	46.4
Supplier 160	1,418.4	6,900.4	1,739.9	4,404.2	14,462.9
Supplier 161	0.0	0.0	9.6	17.3	26.9
Supplier 162	100.9	5,224.6	311.0	621.7	6,258.2
Supplier 163	0.0	0.0	0.0	0.0	0.0
Supplier 164	0.0	9.4	49.1	7.5	66.0
Supplier 165	10.7	0.0	0.0	0.0	10.7
Supplier 166	29.2	123.3	15.3	1,744.2	1,911.9
Supplier 167	57.7	0.0	0.0	0.0	57.7
Supplier 168	607.0	0.0	18.5	45.4	671.0
Supplier 169	50.6	132.5	615.3	555.5	1,354.0
Supplier 170	314.8	546.1	348.8	1,285.0	2,494.7
Supplier 171	634.8	31.2	23.4	5.9	695.2
Supplier 172	0.0	0.0	0.1	0.0	0.1
Supplier 173	2,696.2	924.4	1,029.2	4,016.3	8,666.0
Supplier 174	0.0	0.0	0.0	0.0	0.0
Supplier 175	9,037.2	80,643.2	17,357.8	244,832.7	351,870.9
Supplier 176	52.0	0.0	0.0	0.0	52.0
Supplier 177	100.9	13.8	24.0	50.8	189.5

Supplier 178	138.4	0.0	7.3	454.8	600.6
Supplier 179	0.0	212.3	1,833.1	5,643.8	7,689.3
Supplier 180	0.0	0.0	0.0	0.0	0.0
Supplier 181	76.3	5,329.0	2,068.0	7,255.7	14,729.1
Supplier 182	116.8	650.0	217.1	217.5	1,201.4
Supplier 183	194.6	52.3	346.2	820.7	1,413.8
Supplier 184	0.0	17.1	13.2	0.0	30.3
Supplier 185	305.4	530.7	686.7	852.8	2,375.6
Supplier 186	7.9	0.0	6.6	18.4	32.8
Supplier 187	0.0	0.0	0.0	12.2	12.2
Supplier 188	0.0	0.0	0.0	27.3	27.3
Supplier 189	9,002.0	5,413.9	9,328.6	6,889.1	30,633.5
Supplier 190	144.6	2,244.9	145.7	1,251.2	3,786.4
Supplier 191	19.2	278.3	205.6	1,664.2	2,167.3
Supplier 192	868.2	1,720.0	778.4	3,737.5	7,104.1
Supplier 193	2,091.3	10,902.6	0.0	539.8	13,533.7
Supplier 194	1,950.0	6,361.4	918.5	918.9	10,148.8
Supplier 195	99.4	197.1	96.7	11.7	404.9
Supplier 196	603.2	602.1	62.1	103.8	1,371.2
Supplier 197	1,101.2	72.2	156.7	12.0	1,342.1
Supplier 198	0.0	0.0	0.0	0.0	0.0
Supplier 199	28,963.0	15,189.7	288.6	4,524.4	48,965.7
Supplier 200	0.0	0.0	11.5	0.0	11.5
Supplier 201	0.0	0.0	0.0	0.0	0.0
Supplier 202	1,396.6	0.0	0.0	0.0	1,396.6
Supplier 203	3,495.3	10,909.3	1,007.6	7,301.9	22,714.1
Supplier 204	28.5	31.7	229.4	548.0	837.6
Supplier 205	63.2	37.3	6.0	1.9	108.4
Supplier 206	32.0	440.9	125.9	55.5	654.2
Supplier 207	93.0	82.5	28.1	62.3	265.8
Supplier 208	4.9	0.0	8.6	0.0	13.4
Supplier 209	8,456.8	6,797.6	1,521.6	7,697.2	24,473.2
Supplier 210	7.2	42.3	6.9	8.3	64.7
Supplier 211	0.0	0.0	1.6	14.5	16.1
Supplier 212	0.0	0.0	0.0	0.0	0.0
Supplier 213	37.3	220.6	0.7	0.0	258.6
Supplier 214	502.8	10,722.3	340.8	681.8	12,247.7

Supplier 215	9.5	1.7	0.0	0.0	11.1
Supplier 216	724.8	1,426.2	0.0	45.0	2,196.0
Supplier 217	0.0	0.0	0.0	0.0	0.0
Supplier 218	105.2	4.3	326.1	501.5	937.1
Supplier 219	515.0	119.6	32.4	64.8	731.8
Supplier 220	226.5	1,675.7	38.8	73.7	2,014.6
Supplier 221	284.1	458.0	2.7	64.5	809.3
Supplier 222	164.8	581.9	5.5	65.5	817.7
Supplier 223	1,840.0	0.0	23.2	0.0	1,863.2
Supplier 224	1,093.6	1,648.2	0.0	815.4	3,557.2
Supplier 225	445.3	13,065.3	0.0	297.9	13,808.5
Supplier 226	75,871.5	116,847.1	1,536.4	20,600.1	214,855.1
Supplier 227	0.0	3.1	38.6	10.8	52.5
Supplier 228	0.0	457.4	45.9	489.3	992.6
Supplier 229	1,249.9	447.9	128.6	766.0	2,592.4
Supplier 230	0.0	0.0	0.0	0.0	0.0
Supplier 231	0.0	141.4	196.0	876.5	1,213.9
Supplier 232	164.6	87.9	12.3	150.0	414.7
Supplier 233	249.4	3,166.5	0.0	0.0	3,415.9
Supplier 234	54.5	0.0	5.1	7.2	66.8
Supplier 235	685.9	209.1	150.0	34.4	1,079.4
Supplier 236	19.8	123.0	30.0	35.2	208.1
Supplier 237	25.4	333.0	226.5	7,053.9	7,638.8
Supplier 238	431.9	8,187.2	268.3	184,627.9	193,515.3
Supplier 239	1,714.2	1,778.2	602.5	17,581.5	21,676.4
Supplier 240	1,100.2	5,858.1	5,473.8	57,989.2	70,421.3
Supplier 241	805.3	54.8	0.0	72.0	932.1
Supplier 242	2,934.6	55.4	1,370.4	616.3	4,976.7
Supplier 243	1,620.8	592.3	45.6	628.0	2,886.7
Supplier 244	34,724.1	13,101.8	0.0	1,276.7	49,102.5
Supplier 245	181.3	1.1	105.3	65.8	353.5
Supplier 246	94.9	601.0	7.3	0.0	703.2
Supplier 247	0.0	0.0	0.0	0.0	0.0
Supplier 248	410.6	641.1	168.1	289.3	1,509.1
Supplier 249	5.1	964.4	908.8	4,528.7	6,407.1
Supplier 250	0.0	0.0	0.0	0.0	0.0
Supplier 251	0.0	905.7	540.6	1,434.0	2,880.3

Supplier 252	1,727.7	1,857.0	388.9	2,598.3	6,571.9
Supplier 253	467.8	3,130.3	395.3	405.7	4,399.1
Supplier 254	185.5	79.1	0.0	0.0	264.6
Supplier 255	1,275.8	745.9	149.6	815.4	2,986.7
Supplier 256	0.0	462.8	93.8	812.9	1,369.4
Supplier 257	3,795.5	3,232.8	99.5	1,556.4	8,684.2
Supplier 258	0.0	184.7	179.6	5,373.7	5,738.0
Supplier 259	0.0	0.0	4.7	4.1	8.8
Supplier 260	111.4	314.9	29.1	1,053.7	1,509.0
Supplier 261	0.0	46.3	7.9	0.0	54.2
Supplier 262	0.0	115.3	1,139.5	2,668.8	3,923.6
Supplier 263	26.2	1,658.6	27,167.9	32,400.6	61,253.4
Supplier 264	1,364.0	63.8	507.5	178.6	2,113.8
Supplier 265	0.0	1,394.5	371.7	199.1	1,965.4
Supplier 266	128.9	102.3	654.3	5,670.8	6,556.4
Supplier 267	613.8	0.0	87.9	0.0	701.6
Supplier 268	1,658.6	2,118.5	1,368.8	0.0	5,145.9
Supplier 269	340.8	0.0	39.0	74.3	454.1
Supplier 270	229.8	642.5	0.0	93.7	965.9
Supplier 271	0.0	0.0	0.0	0.0	0.0
Supplier 272	338.3	16.5	12.6	35.9	403.3
Supplier 273	1,950.0	719.6	25.2	433.6	3,128.4
Supplier 274	611.6	7.3	4.1	0.0	622.9
Supplier 275	74.1	148.1	0.0	0.0	222.2
Supplier 276	673.1	58.9	121.6	0.0	853.7
Fazenda Primavera	17,927.9	13,146.2	2,421.2	46,328.1	79,823.3
Fazenda Olhos D'Água	68,536.3	20,998.8	47.6	2,131.2	91,713.9
Fazenda Baía dos Jacarés	733.9	6.7	325.3	5.5	1,071.5
Fazenda Nova Espanha	22,218.1	332.9	11,533.3	5,342.1	39,426.3
Fazenda S. Francisco do Pau Arcado	6,057.7	8,600.6	12.6	319.2	14,990.1
Fazenda Santa Delfina	2,501.9	4,996.8	1,502.9	3,778.9	12,780.5
Fazenda Novo Horizonte	4,998.1	1,478.3	1,089.1	1,452.0	9,017.5
Fazenda Montana	0.0	195.9	0.0	0.0	196.0
Fazenda Amonguijá	1,026.9	2,789.6	136.0	1,542.1	5,494.6
Fazenda Yndiana	13,275.5	153,896.1	0.0	739.2	167,910.8
Fazenda Seis Palmas	942.3	670.6	916.1	184.5	2,713.4
Fazenda Lagoa da Serra	1,014.9	237.9	11.9	0.0	1,264.7

Fazenda Milena II	65.7	361.8	0.0	0.0	427.5
Fazenda Lagoa Bonita	1,487.5	334.1	325.9	1,113.7	3,261.2
Fazenda Panambi I	553.5	480.3	46.1	1,085.7	2,165.6
Fazenda Santa Cruz	107.1	27.5	88.6	12.9	236.0
Fazenda Santo Expedito	1,546.6	151.2	1.7	0.0	1,699.5
Fazenda 13 de Ouro	903.9	541.6	952.4	467.6	2,865.4
Sítio Rincão II e Sítio Rancho Alegre	20.3	0.0	0.0	0.0	20.3
Fazenda Matão	10,200.4	2,001.7	132.2	264.5	12,598.8
Fazenda Santo Antônio (b)	6,162.6	4,496.8	19.4	1,405.2	12,084.1
Fazenda Santo Antônio (a)	2,287.5	1,619.9	19.2	223.6	4,150.3
Fazenda (São) Clemente	0.0	31.7	0.0	0.0	31.7
Fazenda Barra das Piraputangas	1,884.8	2,284.2	0.0	1,047.4	5,216.4
Fazenda Vitória	835.2	1,918.0	39.6	883.2	3,676.0
Fazenda Baía Grande	677.5	2,488.0	127.2	391.0	3,683.8
Estância Ferreira II	448.3	5.4	1.3	43.4	498.5
Fazenda Santo Antônio das Lendas	179.8	327.5	2,008.0	415.5	2,930.9
Fazenda Panambi II	48.8	100.4	82.9	391.8	623.9
Fazenda Várzea Funda	524.5	400.1	3.1	0.0	927.7
Estância Ferreira I	52.9	0.0	30.6	14.0	97.6
Fazenda Panambi III	286.2	173.9	99.8	1,023.5	1,583.4
Fazenda Soteco	191.7	365.9	64.1	59.2	680.9
Fazenda Morro Verde	201.2	198.3	4.8	44.6	448.9
Fazenda Mocinha	231.7	1,019.1	71.7	76.4	1,398.9
Fazenda Riacho Doce	453.0	1,644.2	159.5	1,859.1	4,115.8
Fazenda Alexandrei	8.8	198.8	17.4	48.8	273.8
Fazenda Peixe de Couro	217.9	3,761.5	368.2	25,359.1	29,706.6
Total	772,405.8	1,660,161.0	188,687.4	1,609,294.8	4,230,549.0
Total after 0.85x conversion factor	656,544.9	1,411,136.8	160,384.3	1,367,900.6	3,595,966.6

Notes:

*Includes Mato Grosso and Mato Grosso do Sul SISBOV properties (direct suppliers) within the Pantanal and Mato Grosso indirect suppliers but excludes Mato Grosso do Sul indirect suppliers. The identities of the Mato Grosso indirect suppliers, which were obtained based on GTA data, are anonymised at the data provider's request.

Appendix V: Exports to EU member states from JBS slaughterhouses that have received deliveries from SISBOV cattle ranches within the Pantanal biome (January 2020 - May 2023)

Country	Number of shipments*	Percentage share of shipments destined for the EU
Italy	971	35.53%
Netherlands	719	26.31%
Spain	593	21.70%
Germany	344	12.59%
Portugal	34	1.24%
Greece	25	0.91%
Belgium	19	0.70%
Sweden	13	0.48%
France	6	0.22%
Denmark	6	0.22%
Poland	1	0.04%
Romania	1	0.04%
Lithuania	1	0.04%

Notes:

* Slaughterhouses included in figures: JBS Araputanga, JBS Barra do Garças, JBS Campo Grande (Units 1 and 2), JBS Diamantino, JBS Naviraí, JBS Pedra Preta, JBS Pontes e Lacerda.

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