This report presents the state of the art for illegal deforestation on soy farms in the State of Mato Grosso, the largest producer, and exporter of soy in Brazil. We conclude the report by presenting some guidelines for an expanded crop monitoring protocol in Mato Grosso thereby contributing to more effective strategies to combat deforestation related to soy and associated grain crops.

**MAIN FINDINGS**

- One-fifth of all deforestation in Mato Grosso between August 2008 and July 2019 took place on soy farms (511 thousand hectares);

- 92% of land deforested in these properties was not authorized by environmental agencies and was thus illegal;

- One-third of all land illegally deforested in soy farms in Mato Grosso was planted in soy in 2019.

- Fewer than 200 properties accounted for 50% of all land deforested linked to soy farms in the period;

- The Cerrado remains the biome most threatened by soy expansion, having concentrated 66% of illegally deforested lands in soy farms in the period;

- Only 30% of soy farms that illegally deforested have been embargoed;

- Expanding deforestation monitoring protocols to cover soy farms in the Cerrado biome, monitoring the entirety of soy farms – rather than deforested polygons – and developing a platform to increase transparency are crucial for controlling illegal deforestation in the soy supply chain in Mato Grosso.

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INTRODUCTION

Over the last decade, the area planted with soy in Brazil nearly tripled, growing from 13.4 to 34.2 million hectares. In Mato Grosso (Figura 1), the largest Brazilian soy producer, soy crops in 2020 surpassed 10 million hectares\(^2\) reaching 35.1 million tons\(^3\). In 2019, 19,936 rural properties in the state had more than 25 hectares of soy. Almost one-fifth of such properties were larger than 1,500 hectares\(^4\).

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2. https://mapbiomas.org/
3. https://sidra.ibge.gov.br/tabela/1612#resultado
4. All rural properties in the SIMCAR, SICAR and SIGEF databases were included in the analysis. For more details refer to the technical note describing the methodology.
From October 2020 through October 2021, Mato Grosso exported US$ 253.2 million (or 657.8 thousand tons) from its soy complex. By 2021, more than 80% of soy was exported, and the remaining 20% was purchased by the domestic market. The main destination for soy exported was the Chinese market (42.1% or 12.5 million tons), followed by the European Union market that purchased 20% of Mato Grosso soy (or 5.6 million tons). In 2018, the GDP of agriculture totaled R$ 25.7 million, and more than half of that (R$ 13.6 million) came from the 20 municipalities that concentrated more than half of the areas planted in soy in the state.

Despite its relevance for the economy, the soy supply chain faces various challenges, particularly regarding the direct and indirect pressure of crop expansion over native vegetation. Over the last two decades, the direct expansion of soy crops into natural environments was responsible for almost 5% of all losses of native vegetation in South America: 3.4 million hectares directly converted. From this amount of native vegetation directly converted into soy, 1.5 million hectares (or 44%) were detected in the Cerrado biome and 0.7 million in the Amazon. However, in both biomes, for each hectare of pasture converted into soy, at least one hectare of native vegetation is converted into pasture, suggesting that soy is an important driver of indirect conversion of native vegetation.

Currently, the Amazon and Cerrado, where 14.6 and 55.1% of all soy cultivated in Brazil are respectively found, represent the biomes most threatened by the expansion of this crop. The pressure on the Cerrado is nonetheless much higher. Estimates are that from 2021 through 2050, an additional 12.4 million hectares of land will be converted into soy – 10.8 million in the Cerrado. Meanwhile, only 13% of this biome is protected either as Conservation Units or Indigenous Lands. Additionally, according to the Forest Code, the percentage of native vegetation to be preserved in the Cerrado is smaller, ranging from 20 to 35% of each property. Finally, the Soy Moratorium, the voluntary agreement of the soy industry to block any soy from lands deforested after July 2008 applies only to rural properties located in the Amazon biome.

Understanding the land-use and land-cover dynamics on soy farms and the legal compliance of these properties regarding deforestation is crucial for improving mechanisms to monitor and control deforestation in the soy supply chain. In this report, we build on various datasets to show how illegal deforestation expanded on soy farms in

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6. Cálculo feito com base nos dados Comex (MDIC) de exportação total e dados de produção total de soja do IBGE (Tabela 1618).
Mato Grosso from August 2008 to July 2019. Based on that, we have established recommendations to build strategies that could be more effective in eliminating the illegal deforestation linked to the soy supply chain.

THE ILLEGALITY OF DEFORESTATION

From August 2008 through July 2019, 2.5 million hectares of native vegetation were cleared in Mato Grosso. Almost entirely (95%) not authorized by the State Environmental Secretariat in Mato Grosso (Sema/MT), this deforestation was illegal. Throughout the 11-year time series, deforestation in the state increased four-fold, going from 71.9 to 271.1 thousand hectares. More than half (66% or 1.65 million hectares) of it was detected on rural properties, with 92.8% of that being illegal (1.53 million hectares). Although the proportion of illegal deforestation decreased over time – from 98.3% in 2009 to 84% in 2019 – figures are still considerably high, contradicting commitments and goals set by the government and private sectors to zero deforestation in the supply chain (Figure 2).

SOY AND ILLEGAL DEFORESTATION

Of all the deforestation detected on rural properties, 31% (511 hectares) were mapped on the 3,516 soy farms in 2019. These properties represented less than 20% of all farms growing soy in that year. We have also found that only 176 soy farms concentrated 50% of all illegal deforestation, highlighting the high concentration of illegal deforestation on a few properties that were mostly (85%) large soy farms larger than 1,500 hectares.

To identify rural properties growing soy in 2019, we overlapped soy crops mapped by Mapbiomas (Collection 5), the rural properties databases of SIMCAR, SICAR, and SIGEF. We used the PRODES deforested polygons and deforestation permits issued by the State Environmental Secretariat in Mato Grosso (Sema/MT) to estimate illegal deforestation on these properties between August 2008 and July 2019. We crossed these data for illegal deforestation on individual properties with the area cultivated in soy to estimate illegal deforestation that overlapped soy crops and that did not overlap but was inside soy farms. As a final step, we estimated the amount of land under embargo on soy farms. More details here.

Following the same trend of illegality, more than 90% of all deforestation detected on soy farms (468.1 thousand hectares) was illegal. Therefore, for every hectare of forest legally cleared, another 11 hectares were illegal. Overall, 158.8 thousand hectares illegally deforested in Mato Grosso were cultivated with soy in 2019. A further 309.1 thousand hectares also illegally deforested were detected on soy farms outside soy crop areas.

Following the dynamics of soy expansion and deforestation, the direct conversion of forests into soy crops is rarely observed. Often, deforested lands are initially used for other purposes such as for pastures, and only later are converted into soy crops. In this context, most soy crops mapped in 2019 overlapped deforested polygons that had been detected in previous years.

14. To create the rural property database for this study rural properties we used data from the following public databases: o National Rural Environmental Registry System (SICAR), the Mato Grosso Rural Environmental Registry System (SIMCAR) and the Land Title Management System (SIGEF). Records from those bases totaled 112,741 rural properties and 60.7 million hectares.
For instance, of all land deforested in 2009 on soy farms (9.4 mil hectares), 62% were cultivated in 2019. However, in 2018, of all land deforested this same year (34.2 thousand hectares) only 7% overlapped soy crops.

More than 50% of all land illegally deforested on soy farms was concentrated in only 15 municipalities accounting for 261.8 thousand hectares. Of these municipalities, eight are in the Amazon biome, and the remaining are in the Cerrado (Figure 3).

**EMBARGOES AND ILLEGAL DEFORESTATION PER BIOME**

Only 30% of soy farms illegally deforested had embargoes in their boundaries issued either by the federal environmental agency (Ibama) and/or by the State Agency (Sema/MT). In almost 80% of embargoed soy farms (or 838 properties) partially or fully overlapped deforested polygons. Nonetheless, only 22 soy farms have adhered to the Mato Grosso State Environmental Regularization Program (PRA) and are in the process of environmental regularization.

Though the amount of deforestation in the two main biomes of Mato Grosso is very similar – approximately 1.2 million hectares in each biome – most land illegally deforested in soy farms was concentrated in the Cerrado, totaling 307.6 thousand hectares. This amount of land deforested was double the amount cleared in the Amazon where 159.6 thousand hectares of forest were detected (Figure 4).

Despite the concentration of deforestation in the Cerrado, the number of embargoed soy farms in this biome was lower in comparison to the Amazon. While in the Amazon 804 rural properties had embargoes issued either by Ibama and/or Sema, the number of soy farms under embargo in the Cerrado was three times lower, totaling only 253 properties.

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**FIGURE 3.** DISTRIBUTION OF ILLEGAL DEFORESTATION (IN HECTARES) FROM AUGUST 2008 THROUGH JULY 2019 ON RURAL PROPERTIES WITH MORE THAN 25 HECTARES OF SOY IN 2019 PER MUNICIPALITY

**FIGURE 4.** DISTRIBUTION OF ILLEGAL DEFORESTATION ON SOY FARMS IN THE TWO MATO GROSSO BIOMES OF CERRADO AND AMAZON
This trend is also seen when it comes to the number of properties having embargoes overlapping deforested lands: these amounted to 654 in the Amazon and only 184 in the Cerrado. This demonstrates how threatened the Cerrado biome is because of illegal deforestation linked to soy farms.

**AGREEMENTS TO COMBAT DEFORESTATION IN THE SOY SUPPLY CHAIN**

Today, the main sector agreement initiative in place to combat deforestation in the soy supply chain is the Soy Moratorium. Declared in 2006, the Soy Moratorium was conceived as a strategy to guarantee that soy coming from suppliers in the Amazon biome is deforestation-free.

Every year, the Soy Moratorium monitoring protocol identifies soy suppliers growing soy in polygons deforested after 2008. A restricted access list is created to inform the industry regarding the suppliers to be blocked in the supply chain. However, deforested polygons that do not overlap soy crops are outside the scope of the agreement. Therefore, suppliers who have deforested polygons that are overlapped by soy crops inside the boundaries of their properties are not blocked. In other words, the environmental compliance of soy farms as a whole is not monitored.

In the Amazon biome portion of Mato Grosso alone, 193 thousand hectares were deforested on soy farms. For 2019, we mapped 75 thousand hectares of deforestation overlapped with soy crops and 118 thousand hectares of deforestation that although did not overlap soy crops, were inside soy farms.

Considering only the soy that was produced in the Amazon biome, almost one million hectares of soy were cultivated on soy farms linked to illegal deforestation. This represents roughly 10% of all land cultivated with soy in the State of Mato Grosso. According to the Soy Moratorium, on the other hand, 85 thousand hectares of soy were in non-conformity in the 2019/2020 crop season. This indicates that, despite the efforts to implement this sectorial agreement, there is still a considerable amount of soy linked to illegal deforestation17. Urgent and ambitious measures are therefore needed to combat deforestation in the soy supply chain, which must consider the environmental compliance of properties as a whole rather than only the area currently cultivated with soy18,19.

According to the Brazilian Forest Code, suppression of native vegetation must be authorized by State Environmental Agencies. This procedure is crucial for the sustainable use of the land and also to restrain deforestation and reduce its impacts. Non-compliance with this procedure contaminates the supply chain with illegal deforestation and jeopardizes the sustainability of the trading companies’ operations.

Although over the last decade, the Amazon biome has seen a more rapid expansion of soy crops, the impacts over the Cerrado biome have been much more severe. Not only is illegal deforestation higher in the Cerrado but the overall area cleared on soy farms that have not yet been cultivated with soy is also larger in this biome.

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18. Another criterion in the Soy Moratorium that may lead to low values for non-compliance in the municipalities that concentrate half of the deforestation in Mato Grosso during the studied period aggregating deforested polygons, given that small deforested polygons are only monitored when they are adjacent to others and total more than 25 hectares.
Despite that, the industry has moved slowly towards more stringent mechanisms for controlling deforestation linked to crop expansion in this biome.

**IMPLEMENTING A MORE STRINGENT AND EFFECTIVE PROTOCOL IN MATO GROSSO: CRITERIA AND RECOMMENDATIONS**

This report aims at supporting governments, buyers, and other stakeholders dealing with production, trading, and financing in setting more stringent and effective strategies for halting deforestation in the soy supply chain. In that regard, implementing a more comprehensive protocol in the state of Mato Grosso that, for instance, included all crops as seen in the Green Protocol developed for Pará would be a major step forward. Moreover, as additional criteria to be considered we highlight:

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<th>Criterion</th>
<th>Main features</th>
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| **Scope**                     | ▪ Expanding the agreement throughout the three Mato Grosso biomes.  
                                ▪ Including direct and indirect transactions of all companies, whether involved in trading or processing, who participate in the supply chain. |
| **Blocking**                  | ▪ Blocking of all crops cultivated on all deforested rural properties, regardless of whether they overlap deforested lands.  
                                ▪ Identifying and blocking any suppliers who may use auxiliary non-compliant properties for trade. |
| **Deforestation**             | ▪ Monitoring deforested polygons as small as 6.25 hectares inside the boundaries of rural properties cultivating grain crops. |
| **Indigenous Lands and Conservation Units** | ▪ Defining criteria for monitoring and blocking crops from Indigenous Lands and Conservation Units\(^2\) that violated what is defined by the Brazilian legal framework. |
| **Rural registering (CAR)**   | ▪ Requesting all suppliers to be registered in the rural registry system (CAR), including contiguous properties belonging to a single farmer\(^2\). |
| **Productivity**              | ▪ Defining and adopting maximum standards of productivity as a function of the crop area to avoid soy laundering from deforested lands.  
                                ▪ Creating a database of purchasing operations for companies to identify suppliers that have reached their maximum trading volumes according to their maximum standards of productivity. |

\(^21\). Except for Environmental Protection Areas.  
\(^22\). Journalistic investigations have called attention to the use of fragmented records for rural properties in CAR in Mato Grosso to get around company sourcing criteria. More details at: https://revistagloborural.globo.com/Noticias/Sustentabilidade/noticia/2021/03/pecuaristas-usariam-car-para-driblar-politica-de-compras-de-frigorificos-e-supermercados-diz-relatorio.html
## Criterion | Main features
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**Embargoes** | - Consulting the embargo data available from both federal and state environmental agencies.

**Slave Labor List** | - Blocking any suppliers listed in the Slave Labor List.

**Blocking mechanism** | - Using spatial analysis tools to cross spatial information in addition to consultations in the public databases.
- Publicizing the list of non-compliant suppliers to increase the transparency of this protocol.

**Governance** | - Establishing governance mechanisms that are inclusive to all sectors of interest as a means to provide legitimacy, increase empowerment and improve the flow of information.
- Include civil society in the structure of governance recognizing the public interest in these agreements and allowing social participation.

**Reinsertion of suppliers in non-compliance** | - Defining procedures in agreement with the Brazilian legal framework to allow suppliers in non-compliance to trade again thus strengthening implementation of the Forest Code.

**Audits** | - Establishing independent, transparent, standardized, and frequent audit procedures covering all volumes traded by companies;
- Allowing a larger group of institutions to follow up and validate audit procedures and processes.
- Increasing transparency of monitoring and auditing results.

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