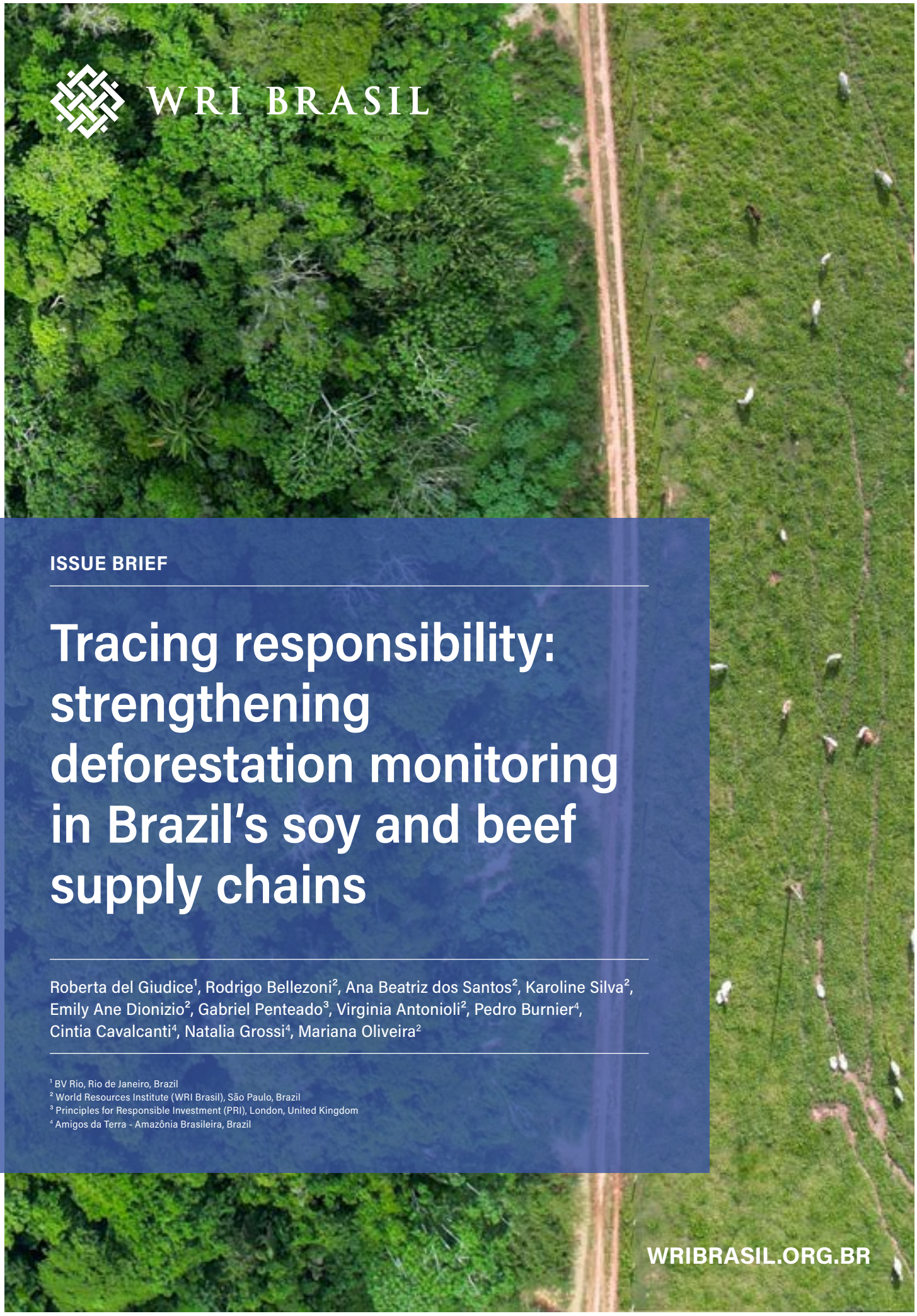

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ISSUE BRIEF

Tracing responsibility: strengthening deforestation monitoring in Brazil's soy and beef supply chains

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HIGHLIGHTS

- Agricultural deforestation and conversion in Brazil are not just a domestic issue but a critical global concern. Soy and beef, as top export commodities, are major drivers with worldwide impacts on emissions and food security.
- These risks underscore the importance of credible monitoring and traceability initiatives that verify whether soy and beef are associated with legal or illegal deforestation, supporting more transparent and accountable supply chains aligned with Brazilian environmental and social regulations.
- Our analysis shows that Brazil's current set of initiatives is fragmented, with inconsistencies across key monitoring aspects—such as differing cut-off dates, uneven enforcement, and limited coverage of indirect suppliers—undermining effective compliance across supply chains.
- In response, this study outlines a core set of socio-environmental requirements and recommendations that together form a reference framework, designed to guide commercial partners in achieving compliance with Brazilian environmental legislation.
- This framework also includes an additional set of requirements aimed at achieving sustainable soy and beef[1] outcomes, supporting more transparent, credible supply-chains.
- By strengthening alignment around clear and credible standards, this proposed reference framework for monitoring and verifying legality and sustainability reinforces partnerships with strategic countries for Brazil—such as China—supporting joint efforts to eliminate deforestation and conversion linked to soy and beef exports.

Executive summary

Context

Brazil is a global leader in agricultural exports, particularly soy and beef, which together accounted for over 60% of the country's agribusiness export value in 2024 (MAPA 2024). These sectors remain the primary drivers of deforestation and conversion, especially in the Amazon and Cerrado biomes (Lapola et al. 2014, Dias et al. 2016). This tension has led to the implementation of a range of protocols and tools—aligned with national interests and in response to international scrutiny and market pressure—to promote sustainable soy and beef supply chains (Fripp et al. 2023). In this context, this study makes a distinctive contribution by proposing a unified set of legality-based and sustainable soy and beef requirements along with recommendations for a future protocol for Brazil's soy and beef supply chains, derived from monitoring approaches already in place in Brazil. The resulting framework offers international markets a consistent reference, aligned with Brazilian law and more ambitious deforestation- and conversion-free goals, supporting public and private supply-chain actors seeking stronger sustainability commitments, including major importers such as China.

Methodology

This brief is based on a structured review and comparison of 21 initiatives—10 focused on soy and 11 on beef—designed to support the monitoring and verification of sustainable supply chains in Brazil's Amazon and Cerrado biomes. The analysis was conducted in five steps: (i) Identification: selection of initiatives based on relevance, scope and influence, through a review of public documents and platforms; (ii) Systematization: assessment of initiatives against six standardized environmental and social criteria (monitoring and traceability, deforestation controls, environmental embargoes, overlaps with protected areas, legal compliance, and labor conditions analogous to slavery), derived from Brazilian law and international frameworks such as the Accountability Framework initiative (AFi) and the EU Deforestation Regulation (EUDR); (iii) Binary assessment: identification of coverage gaps across the six criteria; (iv) Comparative analysis: examination of how initiatives address the criteria in practice, comparing depth, rigor and coverage, and highlighting opportunities for harmonization and improvement; (v) Recommendations: development of preliminary recommendations to guide the drafting of a unified protocol that reinforces legal compliance and supports sustainable soy and beef supply chains aligned with international expectations.

Results and recommendations

The results highlight stronger practices in three initiatives. In the beef sector, the Monitoring Protocol for Amazon Cattle Suppliers (PMFGA) demonstrates broad biome-level coverage and incorporates key compliance elements, including the authorization for native vegetation suppression (ASV), an important mechanism to assess whether vegetation removal was legally authorized. In the soy sector, the Green Grain Protocol of Pará (PVG) also incorporates ASV verification, expanding the scope of compliance checks across the state's soy supply chain. Across both the beef and soy sectors, the SeloVerde (Green Label) platforms—analyzed here for the states of Pará, Minas Gerais and Maranhão—show significant potential by addressing a wide range of key criteria, including the integration of invoice data and relevant legal information such as Environmental Regularization Programs (PRA) and records of environmental infractions.

Building on these strengths and on other key requirements necessary to achieve legal and sustainable soy and beef supply chains, we put forward recommendations to guide implementation pathways, including property-level monitoring and blocking, the use of official data sources, verification of legal and labor compliance, traceability of indirect suppliers, transparency mechanisms, and clear remediation procedures.

Together, these elements provide a consistent reference framework for monitoring and verifying legality and sustainability in soy and beef supply chains aligned with Brazilian law and more ambitious deforestation- and conversion free goals, supporting sustainable engagement with international markets and strategic partners, including Brazil–China supply-chain cooperation.

Introduction

Setting the scene: deforestation monitoring in Brazil's soy and beef supply chains

Brazil's soy and beef supply chains are at the center of global deforestation debates, drawing increasing scrutiny from international markets and reshaping how these commodities are monitored. The link between agricultural production and land-use change is well established, particularly in the Amazon and Cerrado—two biomes that have experienced extensive landscape transformation. In the Cerrado, 38.2 million hectares of native vegetation were lost between 1985 and 2023—an area roughly the size of Japan—, and agriculture now occupies around 50% of the biome (MapBiomas, 2023). In the Amazon, nearly 90% of deforested areas over the past four decades have been converted into pasture, making cattle ranching the main driver of land-use change (MapBiomas, 2023). These dynamics have intensified concerns among Brazil's trade partners, who increasingly seek to decouple commodities from deforestation.

As the world's leading exporter of soy and beef—primarily to China, the European Union (EU) and the Middle East (FAOSTAT, 2025)—, Brazil consolidated its agricultural model through successive waves of expansion, from sector modernization in the 1970s and 1980s to large-scale frontier expansion into the Cerrado and Amazon in the 1990s and 2000s (Dias et al. 2016; Escolhas 2025). International attention intensified after Greenpeace reports exposed links between soy and beef production and deforestation (Greenpeace, 2006; 2009), triggering landmark responses in the Amazon. In the beef sector, this pressure led to the adoption of the Beef TACs (Termos de Ajustamento de Conduta—Terms of Conduct Adjustment), legally binding agreements coordinated by the Federal Prosecutor's Office that require slaughterhouses not to purchase cattle originating from areas with illegal deforestation. In soy, it resulted in the Amazon Soy Moratorium (ASM), a voluntary agreement launched in 2006 in which traders committed not to purchase soy grown on land deforested after 2008.

Recent international frameworks have advanced the concept of deforestation – and conversion-free (DCF) supply chains. DCF refers to the absence of deforestation and conversion after defined cut-off dates. In line with AFi (2025), "deforestation" refers to the loss of natural forests due to conversion to agriculture or other land uses, while "conversion" encompasses the transformation of any natural ecosystem (i.e., not only forests) into other land uses or significant changes in its composition, structure, or function. Within this landscape, the ASM and Beef TACs represent cornerstone efforts to promote legal compliance in Brazil's agricultural supply chains. Numerous other initiatives—such as agreements, public platforms, certification schemes and recommendations from multi-stakeholder forums—have also emerged in Brazil and globally, with the specific goal of identifying non-compliant suppliers and supporting the enforcement of DCF commitments (Donofrio et al. 2017; Proforest, 2016; Fripp et al. 2023). This proliferation creates challenges for international partners, who often seek alignment with Brazilian environmental laws and established national initiatives, but may lack clarity about the full scope of legal obligations and whether existing initiatives effectively cover them.

External regulations are further reshaping monitoring requirements. The EU Deforestation Regulation (EUDR) requires operators to demonstrate that seven key agricultural commodities—cattle, cocoa, coffee, palm oil, rubber, soy and wood—and their derived products, including beef, furniture, leather and chocolate, placed on the EU market are not linked to deforestation, forest degradation or illegal conversion after 31 December 2020, based on geolocation, traceability, legal compliance and due diligence (European Union 2023). Other major markets are also advancing. In China, corporate and sectoral initiatives include COFCO International's shipment of deforestation- and conversion-free soy in 2024 (Toledo 2024) and the China Meat Association (CMA)'s Green Trade specifications aligned with Accountability Framework initiative (AFi) principles (AFi 2025).

China remains Brazil's main trade partner. In 2023, 74% of Brazilian soy exports—worth US$38.6 billion—were destined for China, while beef exports reached 1.33 million tonnes in 2024 (Brasil MDIC 2025). Together, soy and beef exports to China generated approximately US$44.6 billion in 2023–2024. In this context, the set of requirements proposed in this study supports bilateral trade while advancing sustainability outcomes.

To strengthen dialogue with international buyers and improve sustainable soy and beef supply chains implementation, this study proposes a unified list of socio-environmental requirements aligned with Brazilian law and more ambitious sustainability goals adopted by

some existing initiatives. Through a comparative analysis of key soy and beef initiatives, the study identifies gaps, overlaps and best practices, resulting in two consolidated lists—one for each sector - covering legal and sustainable soy and beef, along with ten priority recommendations. Together, these outputs provide a shared technical reference to support trade discussions and improvements in monitoring frameworks.

Methodology

This study adopts a qualitative analysis to map and review initiatives in Brazil that aim to promote legal and sustainable soy and beef supply chains, focusing on the Amazon and Cerrado biomes. The analysis was conducted in five phases.

In the first phase, initiatives were identified through a structured review of publicly available sources, including official websites, institutional platforms, and relevant literature. The initiatives were selected based on their geographic commercial scope and their institutional influence, as assessed through WRI's expert judgment and accumulated sectoral knowledge. Geographic and commercial relevance was interpreted qualitatively, considering the territorial coverage of each initiative, its visibility and relevance in strategic markets such as the European Union and China, and its engagement with key sector actors. On the institutional side, we prioritized initiatives with participation, recognition, or alignment with public bodies. We sought to include at least one example from each of the four categories of initiatives, as defined in Table A-1 (see in Appendix A). The objective was to ensure representativeness by prioritizing initiatives that are widely adopted or publicly referenced and supported by government agencies and major industry actors.

In the second phase, the selected initiatives were systematized and assessed based on a common set of environmental and social criteria, with emphasis on legal and sustainable supply chain requirements and alignment with Brazilian legislation. For the comparative analysis, six core categories of criteria were applied across both soy and beef chains. These categories were not arbitrarily chosen but rather consolidated from requirements found within the initiatives and aligned with Brazilian legislation and international frameworks—including, but not limited to, the AFi and the EUDR. These frameworks informed the selection of elements such as Monitoring, Reporting and Verification (MRV), human rights due diligence, and legal compliance.

These six selected categories capture the most critical elements for achieving both legal compliance in Brazil and alignment with international frameworks for sustainable soy and beef supply chains. The criteria were consolidated from recurring requirements observed across the reviewed initiatives and refined to ensure their direct relevance to our target sectors. Together, they reflect the minimum set of socio-environmental requirements needed to prevent deforestation and conversion, uphold labor rights, and ensure robust monitoring and enforcement mechanisms. By focusing on these six categories, the analysis aims to balance national legal requirements with internationally recognized standards, while keeping the framework practical and applicable. The six categories of environmental and social criteria are defined bellow:

i. **Scope of Monitoring, Reporting and Verification (MRV)**: covers geographic and operational scope, including biomes, states, monitoring units (e.g., property or plot), and traceability tools. Reflects the effectiveness of socio-environmental controls.

ii. **Deforestation and Conversion:** assesses whether the initiative defines a cut-off date, monitoring unit, detection thresholds, blocking criteria and conditions for reintegration. Supports sustainable soy and beef supply chains goals and prevents illegal clearing.

iii. **Environmental embargoes:** verifies whether initiatives block suppliers linked to embargoed areas due to environmental violations, helping with legal compliance.

iv. **Overlaps with protected areas**: checks whether properties overlap with Indigenous Lands, Quilombola Territories[2], Protected Areas, Agrarian Settlements[3], or Undesignated Public Forests (FPND), to prevent illegal use.

v. **Environmental compliance:** assesses the Brazilian Rural Environmental Registry (Cadastro Ambiental Rural – CAR) status, boundaries, overlaps, legal reserves, licenses, and violations. Also examines practices known in Brazil as "triangulation", where products from non-compliant farms are routed through compliant ones.

vi. **Occurrence of labor conditions analogous to slavery:** evaluates whether suppliers on official forced labor lists are excluded, promoting labor rights and social responsibility.

In the third phase, a preliminary assessment of each initiative verified the presence or absence of these criteria using a binary (yes/no) approach, summarized in two tables produced for this analysis, both for soybean (Table B-1) and for beef (Table C-1). This exercise reveals areas of strong coverage, as well as significant gaps that limit the effectiveness of sustainable soy and beef commitments.

The fourth phase involved a qualitative assessment of how each initiative operationalizes the criteria in practice, examining the mechanisms, legal instruments, and data sources used to verify and monitor compliance, and identifying opportunities for harmonization and improvement. In this step, the verification requirements were organized into three categories: (i) Legality-based compliance under Brazil's Forest Code[4] — the national law that governs the protection and sustainable use of forests and other types of native vegetation — along with nationwide, market-adopted sectoral agreements, (ii) Complementary criteria for socio-environmental compliance under Brazil's broader policy framework, and (iii) Additional sustainable soy and beef supply chains requirements that go beyond national regulation. Finally, the fifth phase consolidated the findings through preliminary recommendations designed to guide the drafting of a unified protocol that reinforces legal compliance and supports sustainable soy and beef supply chains aligned with international expectations.

Results

Results of the qualitative analysis of key soy supply chain initiatives in Brazil

Ten soy supply chain initiatives were selected, comprising three commercial agreements—the Amazon Soy Moratorium (ASM), the Green Grain Protocol of Pará (PVG), and the Control of Authorized Suppression of the Cerrado (CSA); one private platform—the Soft Commodities Forum (SCF); four governmental platforms—SeloVerde PA, SeloVerde MG, the Maranhão Agribusiness Inspection and Monitoring System (SIFMA)/SeloVerde MA, and Agro Brasil + Sustentável Platform (ABSP); and two certification standards—the Round Table on Responsible Soy (RTRS) and ProTerra (Table 1). A detailed description of the initiatives related to the six categories of environmental and social criteria — a. Scope of MRV; b. Deforestation; c. Environmental embargoes; d. Overlaps with protected areas; e. Environmental compliance; f. Occurrence of labor conditions analogous to slavery — which support this work can be found in Appendix B.

Soy initiatives differ in scope, enforcement mechanisms, and geographic coverage across biomes and states (see Appendix B-1), with direct implications for international markets—particularly the European Union under the EUDR and major buyers such as China. While EUDR compliance requires monitoring land-use change against the cut-off date of December 31, 2020, most initiatives assessed remain anchored to the Forest Code cut-off date of July 2008, which ensures legal compliance in Brazil but does not fully meet post-2020 deforestation and conversion free requirements. Only SCF and CSA have adopted more recent cut-off dates— December 31, 2020 for SCF and August 1, 2020 for CSA; however, both operate at the farm plot level (i.e., cultivated plot) rather than the property level required under the Brazilian Forest Code, underscoring persistent differences in scale and compliance logic across systems.

For China and other volume-driven markets, scale and risk mitigation may take priority over full post-2020 DCF compliance. Large initiatives such as ASM are attractive because they employ robust, satellite-based monitoring and are scalable, but they do not guarantee full traceability. In addition, for both China and the EUDR, legality—meaning compliance with domestic legislation—is a central element. Most private initiatives (ASM, CSA, SCF) exclude irregular overlaps with Indigenous Lands, Quilombola Territories, or Conservation Units from their monitoring scope. As a result, these areas may not be systematically captured, which can allow irregular clearing and land conflicts to go undetected and increase the risk of "laundering" soy through triangulation or diversion of production from non-compliant farms into less demanding markets.

The PVG (Pará) is the only soy agreement that explicitly evaluates CAR overlaps with Indigenous Lands and Conservation Units. This criterion is also incorporated into the public SeloVerde platforms in Pará (PA), Minas Gerais (MG), and Maranhão (MA). Notably, SeloVerde PA further integrates data layers on agrarian settlements[5] and FPND. These platforms also evaluate additional compliance indicators such as environmental licensing, infraction records, and CAR inconsistencies—adding critical dimensions to risk analysis. Additionally, only PVG and SeloVerde formally require the CAR registry to show "active"[6] or "pending"[7] status, while others use it informally or not at all.

Table 1. **Scope of Monitoring and Coverage of Initiatives in the Soy Supply Chain**

INITIATIVE	CATEGORY	BIOME	COVERAGE	DESCRIPTION
Amazon Soy Moratorium (ASM)	Agreement	Amazon	States of Acre, Amazonas, Rondônia, Roraima, Pará, Amapá, Tocantins, Mato Grosso and part of Maranhão (Legal Amazon)	A voluntary agreement by members of the National Association of Cereal Exporters (ANEC) and the Brazilian Association of Vegetable Oil Industries (ABIOVE) to exclude soy sourced from areas deforested in the Amazon after July 22, 2008, coordinated by the Soy Working Group (GTS).
Green Grain Protocol of Pará (PVG)	Agreement	Amazon	State of Pará	A voluntary agreement among the Federal Prosecutor's Office (MPF), the Ministry of Environment and Climate Change (MMA), the Government of Pará, and grain companies to ensure socio-environmental compliance in Pará's soy supply chain.
Control of Authorized Suppression of the Cerrado (CSA)	Agreement	Cerrado	States of Bahia, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Paraná, Piauí, Rondônia, São Paulo, Tocantins and the Distrito Federal	ABIOVE and ANEC commitment to exclude soy from areas in the Cerrado cleared without an Authorization for native vegetation suppression (ASV) after August 1, 2020.
Soft Commodities Forum (SCF)	Private collaborative platform	Cerrado	States of Bahia, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Paraná, Piauí, Rondônia, São Paulo, Tocantins and the Distrito Federal	Platform of six global traders, hosted by the World Business Council for Sustainable Development (WBCSD)[a], focused on improving traceability and eliminating conversion of native vegetation in the Cerrado.
SeloVerde PA	Governmental monitoring platform	Amazon and Cerrado	State of Pará	Transparency platform by Pará's government (developed by the CIT and the CSR/UFMG), with daily updates to monitor property-level compliance and illegal deforestation.
SeloVerde MG	Governmental monitoring platform	Cerrado and Atlantic Forest	State of Minas Gerais	Similar platform implemented by Minas Gerais's State Forestry Institute (IEF) and Secretariat of Agriculture, Livestock, and Supply (SEAPA), integrating CAR-based data to support compliance and policy monitoring.
SIFMA/SeloVerde MA	Governmental monitoring platform	Amazon, Cerrado and Caatinga	State of Maranhão	Maranhão's system integrates environmental and invoice data to monitor agricultural production, native vegetation, and indirect soy suppliers, and is currently used internally.
Agro Brasil+ Sustentável Platform (ABSP)	Governmental monitoring platform	All biomes	National Territory	Federal digital platform integrating governmental databases[b] to provide traceable information on sustainable agricultural production.
Roundtable on Responsible Soy (RTRS)	Certification standard	All biomes	National Territory	International multi-stakeholder certification covering environmental, social, and economic criteria for responsible soy.
ProTerra	Certification standard	All biomes	National Territory	Non-GMO certification standard based on the Basel Criteria[c] for responsible soy, applicable to sustainable agricultural supply chains.

Notes and Sources: WRI authors, [a] World Business Council for Sustainable Development, [b] All databases are described on Portaria SDI/MAPA nº 721, January 2, 2025 (Brasil MAPA SDI 2025), [c] The Basel Criteria for Responsible Soy Production (Proforest 2005).

Public platforms also offer increasing levels of transparency and standardization. SeloVerde PA is the most advanced, integrating CAR data, deforestation alerts (PRODES[8] and DETER[9]), embargo lists, and analyses of CAR overlaps with protected or undesignated areas to assess property-level compliance. SeloVerde MG and SIFMA/SeloVerde MA follow similar principles, though they are in earlier stages of implementation. At the federal level, the ABSP platform aims to unify databases related to sustainable agricultural production nationwide, with potential integration of state-level systems. However, it remains under development and is subject to ongoing updates, including plans for a DCF module aligned with the EUDR. The SeloVerde platforms also issue official compliance declarations, which can be used as evidence of compliance with Article 3 (b) of the EUDR.
In addition, while SeloVerde systems cover 100% of farms within their respective states, the ABSP platform relies on voluntary, individual farmer enrollment, which limits coverage and increases the risk of traceability blind spots.

The multiplicity of standards creates complexity, making it difficult for producers and international buyers to navigate requirements. Some initiatives (such as ASM, CSA and SCF) monitor only soybean fields rather than the entire rural property registered in the CAR. This approach conflicts with the Forest Code, which establishes that environmental compliance must be assessed at the property level, not just on planted areas. This means that private actors relying on these standards cannot guarantee full legal compliance, creating uncertainty in relation to both domestic and international requirements. By contrast, PVG, public platforms and certification systems assess entire properties, offering a broader accountability lens. SeloVerde MG, for example, can detect deforestation events as small as 1 hectare, supporting granular, property-level assessments that are critical for supply chain screening. A notable example is SIFMA/SeloVerde (MA), which uniquely integrates fiscal data (invoices) with production monitoring, enabling lot-level traceability and the detection of volume mixing from non-compliant areas.

Enforcement of embargoes is mandatory under ASM and PVG, with PVG allowing conditional sourcing if verified outside embargoed areas. Public platforms like SeloVerde PA enable dynamic cross-checks between CAR records, deforestation alerts, and embargoes. Other initiatives, including SCF and CSA, typically provide embargo data for reference but do not enforce blocking measures. Labor compliance receives less emphasis across initiatives. ASM, PVG, and public platforms consult the Ministry of Labor and Employment's (MTE) "Dirty List"[10] for slave-like labor conditions, but this is not a blocking criterion on the SeloVerde platforms due to their consultative nature. In contrast, RTRS and ProTerra require social audits[11] and grievance mechanisms, offering more robust protection.

In summary, international demand—driven both by regulations such as the EUDR and by large markets like China—will require the soy sector to balance the need for scale (addressed by ASM and SCF, relevant for less regulated markets) with the demand for traceability and rigor (post-2020 DCF). The key to improvement lies in integrating and harmonizing the more robust standards, such as those advanced by PVG and the SeloVerde platforms in Pará and Maranhão, to enable property-level compliance, and support access to both high-volume markets such as China and more restrictive markets such as the EU.

Results of the qualitative analysis of key beef supply chain initiatives in Brazil

A total of eleven initiatives were mapped for the beef supply chain. These include two socio-environmental commitments—the Terms of Conduct Adjustment (Beef TAC) and the Public Livestock Commitment (CPP); three monitoring protocols - Monitoring Protocol for Amazon Cattle Suppliers (PMFGA), Voluntary Monitoring Protocol for Cattle Suppliers in the Cerrado (PMVFG), and Individual Traceability and Indirect Monitoring Program (PRIMI); two multi-stakeholder recommendations - Good Practices of the Indirect Suppliers Working Group (GTFI) and Guide to Sustainable Livestock Indicators (GIPS); and four public platforms - SeloVerde PA, SeloVerde MG, SIFMA/SeloVerde MA, and Agro Brasil + Sustentável Platform (ABSP). Table 2 summarizes each initiative by category, biome scope, regional coverage, and a brief description. A detailed description of the initiatives related to the six categories of environmental and social criteria — a. Scope of MRV; b. Deforestation; c. Environmental embargoes; d. Overlaps with protected areas; e. Environmental compliance; f. Occurrence of labor conditions analogous to slavery — which support this work, and the discussion presented above, can be found in Appendix C.

Table 2. **Scope of monitoring and coverage of initiatives in the beef supply chain**

INITIATIVE	CATEGORY	BIOME	COVERAGE	DESCRIPTION
Terms of Conduct Adjustment (Beef TAC)	Commitment	Amazon	States of Acre, Amazonas, Mato Grosso, Pará, Rondônia, and Tocantins	Legally binding agreement between the Federal Prosecutor's Office (MPF) and slaughterhouses in the Amazon, requiring exclusion of suppliers with socio-environmental irregularities to reduce illegal deforestation.
Public Livestock Commitment (CPP)	Commitment	Amazon	States of Acre, Amapá, Goiás, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins	Voluntary private agreement initiated by Greenpeace, setting sourcing criteria to avoid cattle linked to deforestation and violations in the Amazon.
Monitoring Protocol for Amazon Cattle Suppliers (PMFGA)	Monitoring protocol	Amazon	All states of the Legal Amazon	Implementation protocol for zero-deforestation commitments in the Amazon, covering TAC and CPP compliance.
Voluntary Monitoring Protocol for Cattle Suppliers in the Cerrado (PMVFGC)	Monitoring protocol / Commitment	Cerrado	States of Bahia, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraná, Rondônia, São Paulo, Tocantins.	Voluntary private protocol for sourcing cattle in the Cerrado, designed to prevent socio-environmental risks in supply chains.
Individual Traceability and Indirect Monitoring Program (PRIMI)	Monitoring protocol / Certification	Amazon, Cerrado, Atlantic Forest	All states that include these biomes	Voluntary private protocol linking Brazil's official individual traceability system to socio-environmental screening at each transaction, including animal origin classification.
Good Practices of the Indirect Suppliers Working Group (GTFI)	Recommendations from multi-stakeholder forums	Amazon	All states of the Legal Amazon	Recommendations developed by the Indirect Suppliers Working Group, based on TAC and other commitments, focused on feasible, property-level monitoring of indirect suppliers.
Guide to Sustainable Livestock Indicators (GIPS)	Recommendations from multi-stakeholder forums	All biomes	National Territory	Free digital tool offering self-declared sustainability indicators for livestock operations, based on Brazilian law, best practices, and global principles.
SeloVerde PA	Government monitoring platform	Amazon and Cerrado	State of Pará	Platform from Pará's state government providing daily data on property-level production and environmental compliance.
SeloVerde MG	Government monitoring platform	Cerrado and Atlantic Forest	State of Minas Gerais	Similar tool for Minas Gerais, integrating CAR data to support environmental oversight and policy.
SIFMA/SeloVerde	Government monitoring platform	Amazon, Cerrado and Caatinga	State of Maranhão	Maranhão's platform for production tracking, socio-environmental data cross-checking, and native vegetation monitoring.
Agro Brasil+ Sustentável platform (ABSP)	Government monitoring platform	All Biomes	National Territory	Federal digital platform integrating governmental databases[a] to provide traceable information on sustainable agricultural production, with coverage limited to farmers who voluntarily enroll in the system.

Notes and Sources: WRI authors, [a] All databases are described on Portaria SDI/MAPA nº 721, January 2, 2025 (Brasil MAPA SDI 2025).

As in the soy sector, Brazilian beef initiatives differ in how they align with market demands, with stricter DCF and individual traceability requirements driven by the EU and more volume-based approaches in other major markets. The EUDR is a key driver of stricter due diligence, particularly through its post-2020 DCF requirement, which highlights major differences among initiatives. While Beef TAC ensures legal compliance using the 2008 Forest Code cut-off date, it does not meet EUDR standards. By contrast, CPP and PMFGA—implemented under the Boi na Linha (Beef on Track) initiative—and more recent initiatives such as PVMFGC, PRIMI, and the SeloVerde platforms

in Minas Gerais and Pará, adopt post-2020 cut-off dates, with PRIMI and SeloVerde MG applying finer detection thresholds and more comprehensive monitoring.

Public platforms such as SeloVerde Pará, Minas Gerais, and Maranhão, along with the federal ABSP, provide more standardized, transparent and scalable systems. These platforms combine CAR data with deforestation alerts (from PRODES, DETER, and GLAD[12]), embargo lists, land tenure information, Animal Transit Records (Guias de Trânsito Animal - GTAs), and official infraction records. SeloVerde Maranhão, while more recent and still under development, follows a similar architecture to Pará's, with state-specific adjustments to incorporate local land tenure and enforcement challenges. The federal ABSP is designed to unify federal—and potentially state—databases nationwide, but as of now remains under implementation and has limited integration with private sector monitoring efforts.

These public platforms and monitoring protocols (PMFGA and PMVFGC) enable property-level assessments and detection of triangulated cattle flows between compliant and non-compliant farms. They do so by cross-referencing GTA origins and destinations, applying productivity thresholds based on CAR registry data (a maximum of three Animal Units per hectare per year), and identifying links between properties registered under the same CPF/CNPJ[13] within a 100 km radius. However, their uptake by companies remains limited. While many initiatives screen for embargoed properties by checking CPF/CNPJ against the embargo list issued by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), few verify whether animals were raised in embargoed polygons, making room for circumvention. SeloVerde Pará offers this capability via historical analysis of GTAs[14] and CAR polygons.

Most initiatives apply filters for overlaps with legally protected zones —including IL, PA, and QT. Going further, the SeloVerde platforms use consistent spatial filters to flag such overlaps and go even further by including overlaps with agrarian settlements and Undesignated Public Forests. The platforms also assess broader compliance indicators such as licensing status, infraction history, and CAR consistency, providing a more complete risk profile per property.

All mapped initiatives monitor labor conditions analogous to slavery by checking the CPF/CNPJ of owners, tenants, or partners against the MTE "Dirty List". If a match is identified at purchase, all associated properties are blocked and remain so until the name is removed from the list; unblocking is not allowed under this criterion. The GIPS, as Brazil's main multi-stakeholder platform for sustainable cattle, has developed guidelines and indicators for responsible production, but it does not enforce compliance and has no verification system of its own, thus limiting its direct operational impact.

The main gap in beef supply chain monitoring is the exclusion of indirect suppliers, a key source of deforestation leakage identified in recent assessments (Levy et al. 2023). Existing audits under the TAC and CPP focus on direct suppliers, leaving earlier production stages exposed to deforestation risks. Addressing this gap requires stronger demand-side pressure, with tools such as the GTFI guidelines supporting initial monitoring and initiatives like PMFGA expected to progressively incorporate indirect suppliers. While individual traceability systems such as PRIMI offer a potential solution, their large-scale adoption remains constrained by cost and technical complexity. In the Cerrado, PMVFGC addresses indirect supplier risks by applying productivity thresholds to flag potential cattle laundering, while encouraging the gradual integration of sectoral monitoring tools as data availability improves.

The findings show that public platforms such as SeloVerde Pará, SeloVerde Minas Gerais, and SIFMA Maranhão provide transparent, government-generated data and can serve as effective auxiliary tools for supply-chain monitoring. When combined with more robust initiatives—such as PMFGA and PMVFGC—, these public platforms can meet international requirements by translating voluntary commitments into operational monitoring procedures. Planned updates under the Amazon Cattle Suppliers Monitoring Protocol 3.0 (expected in 2026), for example, will strengthen this framework by expanding coverage to indirect suppliers and improving legal grounding and data integration. More broadly, the development of scalable digital tools, including Application Programming Interfaces (APIs) and automated query systems, could further enhance the operational use of these platforms and improve their suitability for large, demanding markets such as China.

List of strategic requirements for sustainable soy and beef supply chains

Based on the comparative analysis of key initiatives in Brazil's soy and beef sectors (see Tables B-1 and C-1 presented in the Appendix section), two lists of key socio-environmental requirements were developed

(Tables 3 and 4), covering both legality and sustainable soy and beef aspects. These requirements are drawn from the most robust initiatives—PMFGA, Beef TAC, the PVG, and the platforms SeloVerde Pará and SIFMA/SeloVerde Maranhão—and are aligned with international frameworks such as the Accountability Framework initiative (AFi), and convergent requirements identified by institutions including Imaflora, TNC, WRI Brasil and WWF-Brazil (WWF-Brasil *et al.* 2025).

The proposed list consolidates existing Brazilian socio-environmental requirements into a single reference framework to support buyers, traders, and other supply-chain actors in monitoring, verifying, and demonstrating compliance with legal and sustainability requirements. It combines elements from multiple initiatives to improve transparency and implementation, providing international buyers with clear, actionable guidance aligned with Brazilian legal standards and global expectations, while addressing remaining gaps through supplementary, voluntary sustainable soy and beef criteria. The list is organized into two modules: module 1 focused on compliance with Brazilian environmental legislation and existing agreements, and module 2 dedicated to enhanced sustainable soy and beef requirements. Verification requirements for soy and beef supply chains are summarized in Tables 3 and 4, respectively.

Together, these lists of legal and sustainable soy and beef requirements provide a unified reference framework that can be used by international buyers and governments to strengthen monitoring across these two supply chains. By consolidating existing safeguards and aligning them with international frameworks such as the AFi, the proposed criteria offer practical guidance for ensuring compliance with Brazilian legislation while advancing commitments toward more sustainable soy and beef supply chains. In practice, buyers and traders can use these criteria to inform due diligence and sourcing decisions; verification initiatives can integrate them into monitoring protocols and risk assessment systems; and government agencies can use them to align public monitoring tools and strengthen enforcement. This alignment would help address key traceability and enforcement gaps identified in Sections 3 and 4, creating greater clarity for international markets and supporting the expansion of trade in soy and beef that is both legally compliant and aligned with stronger sustainability safeguards.

Advancing towards transparent, legal and sustainable supply chains

The list of requirements presented here demonstrates how to verify both legal compliance under Brazilian environmental regulations and sustainable soy and beef supply chains. Although international buyers are not the direct implementers of these criteria within producing regions, they need clarity on them to hold their suppliers accountable and drive change along the chain (Lambin et al. 2018). While governments are responsible for creating policies that shape corporate practices, well-informed buyers can foster engagement between the private sector and public authorities — which is essential to achieving transparent, traceable, and sustainable soy and beef supply chains.

Building on the minimum set of socio-environmental requirements presented earlier, and drawing on the initiatives analyzed in this study, we briefly outline ten priority recommendations to promote seller adherence to a standardized protocol for sustainable soy and beef trade, consistent with Brazilian environmental legislation and international DCF frameworks. These recommendations aim to align requirements and harmonize expectations across the sector, thereby reducing uncertainty. Implementation of these measures, however, ultimately lies with upstream actors and first aggregators, who are responsible for managing compliance on the ground.

I - Rural property as the monitoring and blocking unit

Adopting the rural property, as defined by the CAR, as the standard monitoring and blocking unit ensures that socio-environmental criteria apply to the entire property and enables cross-referencing with systems such as PRODES and embargo lists. However, the self-declaratory nature of the CAR introduces uncertainties, as producers are allowed to register polygons, Permanent Preservation Areas[15] (APPs - Áreas de Preservação Permanente, in Portuguese), and Legal Reserves[16] (RLs - Reservas Legais, in Portuguese) without immediate technical validation. In addition, the CAR is not a land tenure regularization instrument and does not confer ownership or tenure rights; rather, it is an environmental registry that may only indirectly support land tenure verification processes. For this reason, complementing CAR information with land tenure databases such as the National Land Management

Table 3. **Soy supply chain: compliance with Brazilian legislation and additional criteria for for more sustainable soy supply chains**

MODULE 1	
Legality-Based Criteria for Socio-Environmental Compliance Under Brazil's Policy Framework [a], including the Forest Code, and Nationwide Market-Adopted Soy Agreements [b]	
Verification requirements	**Description**
CAR presentation and status	Verifies CAR status (Active or Pending) in federal and/or state databases.
Environmental Embargo List	Checks for environmental embargoes on CPF/CNPJ using official IBAMA, Chico Mendes Institute for Biodiversity Conservation (ICMBio), and state-level lists.
Labor Analogous to Slavery	Cross-checks for labor analogous to slavery by consulting the Ministry of Labor's Dirty List using CPF/CNPJ of landholders, tenants, or partners.
Illegal Deforestation: No Overlap with PRODES Deforestation Polygons	Detects illegal deforestation through overlap between CAR and PRODES polygons (≥6.25 ha) and considering cases with no Authorization for Native Vegetation Suppression (ASV) presented; cut-off date: july 22, 2008 (Brazil Forest Code)
Presentation of Authorization for Native Vegetation Suppression (ASV)	Checks for legal deforestation authorization, issued by the State Environmental Secretariat (SEMA) or IBAMA.
Native Vegetation Balance - surplus and deficit of Legal Reserve (RL) and Permanent Preservation Area (APP) [c]	Assesses the environmental balance of RL and APP in accordance with Brazil's Forest Code.
No Overlap with Protected Areas (Indigenous Lands, Conservation Units and Quilombola Territories [d])	Checks for overlaps between CAR and protected areas, including Indigenous Lands, Conservation Units and Quilombola Territories[e].
No Overlap with Environmental Embargoed Polygons	Verifies overlap with embargoed polygons due to deforestation based on IBAMA and state data.
No Overlap with Undesignated Public Forests (FPNDs) [d]	Checks for overlaps with Undesignated Public Forests to identify risk of illegal land occupation.
Unified Environmental License (LAU) or application protocol [d]	Confirms presence of valid environmental license, such as LAU or equivalent, or evidence of submitted licensing protocol.
Environmental Infraction Notices and Inspections	Verifies environmental infractions registered by federal or state agencies.
MODULE 2	
Sustainable Soy: Beyond-Legal Compliance	
Zero Deforestation and Conversion of Native Ecosystems	Detects legal deforestation and conversion of native vegetation using PRODES, DETER, MapBiomas Alerta, and other official sources; polygons ≥1 ha; cut-off date: august 1, 2020.
Changes to CAR boundaries [d]	Monitors CAR boundary changes over time to detect potential concealment of deforestation.
No Overlap with Rural Settlements [d]	Checks overlap with agrarian settlements, relevant for identifying risks of land grabbing or social conflict.
No Overlap with Other CAR Registrations [f]	Detects overlapping CAR registrations for the same area, indicating potential fraud or irregular land claims.
Proportionality Between Productive Area and Commercialized Soy Volume	Validates declared productivity (e.g., via invoices) against registered productive area under CAR; soy productivity capped at 70 sacks/hag — an important criterion for detecting potential 'soy laundering'.
Soy Sales Invoice	Verifies issuance of soy invoices ideally linked to CAR data to support supply chain traceability.

Notes and sources:

[a] Referring to the Amazon Soy Moratorium (ASM) and the Green Grain Protocol (PGV).

[b] Beyond Brazil's Forest Code, this mainly includes: Law No. 9.605/1998 (Environmental Crimes Law); Law No. 6.938/1981 (National Environmental Policy); Complementary Law No. 140/2011; and other applicable labor, occupational safety, and environmental regulations.

[c] It is recommended to check the environmental balance at the rural property level where such data is available.

[d] Requirement not met by the Green Grain Protocol of Pará (PVG) but met by SIFMA/SeloVerde.

[e] Properties overlapping Indigenous Lands are not eligible for unblocking. For Conservation Units and Quilombola Territories, unblocking is only allowed in legally permitted cases (e.g., authorized land use, proven expropriation, or cartographic error).

[f] This requirement is not explicitly included in the initiatives analyzed in this study. However, because the identification and resolution of CAR overlaps represent an important advancement in strengthening CAR validation under the Brazilian Forest Code, we included this requirement in the sustainable module of the list.

[g] Requirement met by the Green Grain Protocol of Pará (PVG).

Table 4. **Beef supply chain: compliance with Brazilian legislation and additional criteria for more sustainable beef supply chains**

MODULE 1	
Legality-Based Criteria for Socio-Environmental Compliance Under Brazil's Policy Framework[a], including the Forest Code, and Nationwide Market-Adopted Beef Agreements[b]	
Verification criterion	**Description**
CAR presentation and Status	Verifies CAR status (Active or Pending) in federal and/or state databases.
Environmental Embargo List	Checks for environmental embargoes on CPF/CNPJ using official IBAMA, ICMBio, and state-level lists.
Labor Analogous to Slavery	Cross-checks for labor analogous to slavery by consulting the Ministry of Labor's Dirty List using CPF/CNPJ of landholders, tenants, or partners.
Presentation of Animal Transit Records (GTA)	Verifies GTA records to track animal movements from supplying properties.
Illegal Deforestation: No Overlap with PRODES Deforestation Polygons	Detects illegal deforestation through overlap between CAR and PRODES polygons (≥6.25 ha) and considering cases with no Authorization for Native Vegetation Suppression (ASV) presented; cut-off date: july 22, 2008 (Brazil's Forest Code)
Presentation of Authorization for Native Vegetation Suppression (ASV)	Checks for legal deforestation authorization, issued by the State Environmental Secretariat (SEMA) or IBAMA.
Native Vegetation Balance (surplus and deficit of RL and APP) [c]	Assesses environmental balance of RL and APP in accordance with the Brazil's Forest Code.
No Overlap with Protected Areas (Indigenous Lands, Quilombola Territories and Conservation Units)	Checks overlap between CAR and protected areas, including Indigenous Lands, Conservation Units, and Quilombola Territories [e].
No Overlap with Environmental Embargoed Polygons	Verifies overlap with embargoed polygons due to deforestation based on IBAMA and state-level data.
Rural Environmental Licensing (LAR)	Confirms presence of valid environmental license, such as LAR or equivalent, or evidence of submitted licensing protocol.
Changes to CAR Map Boundaries	Monitors CAR boundary changes over time to detect potential concealment of deforestation.
No Overlap with Undesignated Public Forests (FPNDs) [d]	Checks for overlaps with Undesignated Public Forests to identify risk of illegal land occupation.
Environmental Infraction Notices and Inspections [d]	Verifies environmental infractions registered by federal or state agencies.
Property Enrollment in the Environmental Regularization Program (PRA) [d]	Checks enrollment in the PRA via federal and state CAR platforms.
MODULE 2	
Sustainable Beef: Beyond-Legal Compliance	
Zero Deforestation and Conversion of Native Ecosystems	Detects legal deforestation and conversion of native vegetation using PRODES, DETER, MapBiomas Alerta, and other official sources; polygons ≥1 ha; cut-off: august 1, 2020.
No Overlap with Rural Settlements [d]	Checks overlap with agrarian settlements, relevant for identifying risks of land grabbing or social conflict.
No Overlap with other CAR Registrations [f]	Detects overlapping CAR registrations for the same area, indicating potential fraud or irregular land claims.
Auxiliary Properties	Identifies multiple CARs linked to the same CPF/CNPJ within the same geographic region to detect irregular ownership patterns.
Individual Animal Identification	Confirms the use of individual animal identification or commitment to national and subnational traceability systems.
Productivity	Validates maximum productivity of up to 3 heads of cattle per hectare per year per supplying property.

Notes and sources:

[a] Referring to the Cattle Supplier Monitoring Protocol in the Amazon (Beef TAC and Beef on Track).

[b] Beyond Brazil's Forest Code, this mainly includes: Law No. 9.605/1998 (Environmental Crimes Law); Law No. 6.938/1981 (National Environmental Policy); Complementary Law No. 140/2011; and other applicable labor, occupational safety, and environmental regulations.

[c] It is recommended to check the environmental balance at the rural property level where such data is available.

[d] Requirement not met by the Cattle Supplier Monitoring Protocol in the Amazon but met by SeloVerde PA.

[e] Properties overlapping Indigenous Lands are not eligible for unblocking. For Conservation Units and Quilombola Territories, unblocking is only allowed in legally permitted cases (e.g., authorized land use, proven expropriation, or cartographic error).

[f] This requirement is not explicitly included in the initiatives analyzed in this study. However, because the identification and resolution of CAR overlaps represent an important advancement in strengthening CAR validation under the Brazilian Forest Code, we included this requirement in the sustainable module of the list.

System (SIGEF) may strengthen control, although SIGEF coverage remains partial and operational bottlenecks currently limit its applicability as a universal reference.

Despite its limitations, the CAR already enables property-level verification for a substantial share of Brazil's soy and beef supply chains, with approximately 8 million properties registered in the National System of Rural Environmental Registry (SICAR). Of this total, around 2 million (about 25%) have undergone some level of environmental analysis, and roughly 470,000 (about 6%) have completed the full validation process. Adopting a property-level blocking approach can help prevent production fragmentation and laundering from non-compliant areas as, from a risk-management perspective, applying this measure at the level of the entire rural property discourages the reallocation of production to unmonitored plots and reduces the risk of indirect non-compliance (AFi 2020; WWF-Brasil *et al.* 2025). Although this approach goes beyond the minimum scope of the EUDR, it can strengthen due diligence and reduce the risk of indirect non-compliance in supply chains.

II - Use of official and scientifically validated data sources

Monitoring and compliance verification should prioritize federal and state databases that ensure legal certainty, standardization, and auditability, including systems such as PRODES and DETER, as well as public databases such as the CAR, GTA, embargoed areas lists, ASV, Indigenous Lands, Quilombola Territories, Protected Areas, Undesignated Public Forests or areas designated for agrarian reform, and the registry of employers linked to labor conditions analogous to slavery, which are essential for comprehensive traceability and effective risk control.

At the same time, scientifically validated private monitoring tools—such as MapBiomas Alerta and Global Forest Watch—can complement public sources by providing timely and high-resolution data, strengthening continuity and resilience in monitoring efforts; given their differing scopes and detection capacities, particularly for forest conversion, these tools should be applied in a complementary manner. Commercial protocols and monitoring systems should rely on data sources, whether public or private, that are recognized by competent authorities and validated through robust scientific methodologies, incorporating mechanisms for periodic review, cross-validation, and transparency to ensure reliable and comprehensive analyses across regions and contexts.

III - Ensuring legal compliance and absence of labor conditions analogous to slavery

Ensure legal compliance based on three pillars: environmental, land tenure, and labor. On the environmental front, compliance with Brazil's main legal frameworks is required, including the Forest Code (Law No. 12.651/2012), the National Environmental Policy (Law No. 6.938/1981, which regulates environmental licensing and oversight of polluting activities), the Protected Areas Law (Law No. 9.985/2000, which sets rules for the use and management of Conservation Units), and the Environmental Crimes Law (Law No. 9.605/1998, which defines environmental offenses and associated criminal and administrative penalties). In practice, this includes verification of illegal deforestation, compliance with minimum APP and RL areas, and checks for the presence of environmental sanctions.

With respect to land tenure, properties must not overlap with Indigenous Lands, Quilombola Territories, Protected Areas, FPND, or areas designated for agrarian reform, as these are legally protected under Brazilian law and the Federal Constitution. Unauthorized private occupation of such areas constitutes illegal land grabbing, prohibited under the Public Forest Management Law (Law No. 11.284/2006). In the labor dimension, properties linked to CPF/CNPJ holders included in the official "Dirty List" for slave-like labor, as defined in Article 149 of the Penal Code, must be blocked, in line with national legislation and international human rights principles, including those established by AFi and the Universal Declaration of Human Rights.

IV - Transparency and verification mechanisms

Socio-environmental commitments gain credibility through third-party verification based on clear and impartial methodologies, and monitoring systems should therefore be subject to independent audits conducted by entities selected for their technical expertise and absence of conflicts of interest (Imaflora 2022). At the same time, studies highlight concerns regarding costs and legitimacy, noting that, in the absence of robust regulatory frameworks, third-party certification may be vulnerable to greenwashing practices (Zhao et al. 2020). To strengthen credibility, verification procedures should follow defined audit schedules and reporting timelines, ensuring regular and timely assessments.

Moreover, it is recommended to publicly disclose verification reports (or summaries), including their scope, criteria, and results. This level of transparency is intended to build trust among markets players, civil society, and investors (AFi 2020). Public disclosure should be complemented by mechanisms that enable critical analysis and corrective action, thereby supporting the continuous improvement of monitoring and compliance practices.

V - Broad territorial coverage

Ensure broad territorial coverage in monitoring protocols and initiatives, with a focus on scale and effective impact on landscapes and environmental governance. To address deforestation and other irregularities systemically, commitments must extend to biomes under significant pressure. Currently, this largely means the Amazon and Cerrado, given their role in agricultural expansion. However, other Brazilian biomes may also require priority attention depending on evolving pressures, such as the Pantanal—particularly in the context of fire and land-use change—and the Atlantic Forest, where conversion risks persist despite high levels of historical fragmentation. The protocol should be applicable on a large scale and foster coordinated action among companies, governments, and other stakeholders across sectoral, jurisdictional, and landscape levels.

VI - Sustainable soy and beef production in all Brazilian biomes from July 22, 2008 onward

Ensure supply chains are free of illegal deforestation in all Brazilian biomes from July 22, 2008, as established by Brazil's Forest Code (Law No. 12.651/2012). Adopting this legal milestone as a minimum criterion guarantees compliance with Brazilian environmental legislation and reinforces the protection of critical ecosystems on rural properties, especially in the Amazon and Cerrado.

VII - Free of deforestation and conversion in all Brazilian biomes, with a date to be established by a voluntary protocol

Adopt voluntary commitments to achieve zero deforestation and zero conversion across all Brazilian biomes, with cut-off dates defined by sectoral or corporate protocols. These commitments are primarily directed at international buyers—including traders, processors, and retailers—who can implement and enforce socio-environmental criteria across their supply chains. Governments play a complementary role by fostering alignment with Brazil's Nationally Determined Contribution (NDC), which commits to achieving zero deforestation in the Brazilian Amazon by 2030. As reflected in the Brazilian Climate Plan (MMA 2025), this target is operationalized as net-zero deforestation, combining the elimination of illegal deforestation with the compensation of any remaining legal deforestation through the restoration of an equivalent area of native vegetation. They also resonate with market requirements such as the EU Deforestation Regulation (EUDR, Regulation (EU) 2023/1115), which establishes a fixed cut-off date of December 31, 2020. This measure should cover all native vegetation, promoting not only the elimination of new deforestation but also conservation, restoration, and/or compensation actions for impacts already caused.

Except for the Amazon biome, where companies should comply with the Brazilian Forest Code and nationally adopted agreements (such as ASM and the Public Livestock Commitment), as well as the Minimum Monitoring Criteria for DCF Products – for Commodities Originating from Brazil, which set the zero deforestation and conversion cut-off date at July 2008, companies may establish their own cut-off dates for other ecosystems. However, it is strongly recommended to adopt internationally recognized and market-aligned dates, as reflected in the AFi, the EUDR, the Minimum Monitoring Criteria for DCF Products, and the Science Based Targets Initiative (SBTi) FLAG Guidance. In practice, this means setting the zero deforestation and conversion cut-off date no later than August 2020 for all other natural ecosystems, reflecting widely adopted market expectations and facilitating comparability and compliance across supply chains.

VIII - Traceability of indirect suppliers in soy and beef supply chains

Eliminating socio-environmental irregularities in soy and beef supply chains requires full traceability of all suppliers, including indirect ones, which remains challenging due to supply chain complexity and financial, logistical, and technological barriers. International buyers should lead this effort by requiring full traceability from suppliers and progressively expanding coverage, while governments play

a key role by establishing clear regulations and providing enabling infrastructure, such as national databases, digital transit systems, and CAR-linked monitoring platforms.

In the beef sector, individual animal traceability[17] is still under development at federal and state levels, but companies should begin implementing traceability mechanisms immediately, using existing tools. A phased approach is recommended, starting with animal transit reports (GTA) and indirect supplier monitoring protocols (e.g., GTFI), and progressively advancing toward individual animal identification as national and subnational systems mature. While programs such as Pará's Individual Cattle Traceability Program target full identification by 2030 and the national PNIB establishes a voluntary transition until mandatory adoption by 2032, reliance on individual traceability alone risks delaying the use of widely available GTA-based systems.

Although individual identification adds granularity, GTA-based traceability is already sufficient to identify deforestation-related risks in beef supply chains, and should be applied without delay.

As for soy, buyers should ensure traceability back to the farm of origin by actively engaging intermediary suppliers (such as traders and cooperatives) to obtain critical information on raw material origins. SeloVerde MA illustrates how invoice-based records support traceability across production and commercialization stages. This coverage should then be progressively expanded to encompass the entire supply chain. In this context, expanding transparency and knowledge about soy storage and processing facilities can play an important enabling role for traceability, drawing on lessons from other commodities such as palm oil, where facility-level disclosure has supported monitoring and reporting. A phased implementation strategy allows companies to address technical and financial constraints while laying the groundwork for robust and reliable traceability systems.

IX – Blocking system and mechanisms for remediating and reintegrating non-compliant suppliers

Companies should implement blocking systems to exclude suppliers that fail to meet socio-environmental criteria; however, exclusion alone can incentivize parallel or informal supply chains if not paired with broader transformation measures (Yang et al. 2025). Clear remediation and reintegration procedures are therefore essential, allowing suppliers to re-enter supply chains once verifiable corrective actions are implemented. These include isolating post–cut-off deforested or converted areas under monitored restoration or regeneration plans, contractual commitments to zero further native vegetation clearing, and financial or technical support to promote expansion on already degraded lands. While technically feasible, large-scale adoption depends on consistent oversight, standardized contracts, and economic incentives that favor restoration and sustainable intensification. Applied consistently across soy and beef supply chains, these measures support restoration, deter further deforestation, and enable the reintegration of suppliers into traceable and verifiable systems.

X - Supervisory group with civil society participation

This recommendation is directed at the entities responsible for designing and governing the protocol, including companies, industry associations and government agencies, which should establish a supervisory group with civil society participation to oversee its implementation. These actors would also be responsible for granting controlled access to the necessary information to group members, ensuring that data sharing complies with legal requirements and protects sensitive personal and commercial information.

Expected impact and limitations

A unified set of requirements for sustainable soy and beef supply chains has the potential to significantly enhance transparency, consistency, and stakeholder communication in international trade. As observed in dialogues with Chinese stakeholders during closed meetings and conferences, this lack of harmonization complicates communication and reduces clarity for foreign companies, government actors, and buyers across the supply chain. A unified list of requirements would establish a common technical reference, enabling clearer coordination between Brazilian suppliers and international buyers. By aligning expectations and terminology, this list would reduce confusion, support risk assessments, and build institutional trust. For international buyers in particular, who often face challenges identifying credible data sources and regulatory benchmarks, the unified set of requirements offers a structured and reliable entry point into Brazil's complex governance framework. As highlighted by Trase and Proforest (2023), tools such as risk benchmarking help focus monitoring efforts on high-risk regions and

streamline due diligence in lower-risk areas, underscoring the value of a harmonized reference system for international buyers.

Beyond defining requirements, this study also presents key recommendations to support the development of a unified protocol. Its effective adoption and implementation, however, depend on a range of enabling conditions, including market incentives, alignment with existing sourcing strategies, access to reliable data, and institutional capacity (Gollnow et al. 2022; Meijer 2015). Even so, a unified protocol offers a pragmatic opportunity to improve traceability, reduce reputational risks, and align national systems with international expectations, including those under the EU Deforestation Regulation. Overall, it represents a strategic pathway to align actors, strengthen supply chain credibility, and support the operationalization of bilateral sustainability commitments. The protocol's role, therefore, is not to replace existing initiatives, but to consolidate and harmonize their requirements into a single, phased implementation framework, providing a transparent and adaptable benchmark that can be scaled or tailored to different levels of ambition. Companies, governments and other actors should continue using existing standards and tools—such as public agreements and the SeloVerde platforms—while a common benchmark helps align sectoral requirements and provides governments and international buyers with a clearer basis for eligibility criteria and structured engagement.

Special: Why a unified protocol for sustainable soy and beef in Brazil-China trade relations?

China plays a central role in Brazil's soy and beef supply chains, importing over 70% of Brazilian soy exports and around half of its beef exports (AEB, 2024). This dynamic creates a significant opportunity to advance sustainability through bilateral cooperation. Given the scale of trade flows, strengthened legal and sustainable trade frameworks between Brazil and its trading partners could generate substantial forest conservation benefits. With sustainability objectives already embedded in both countries' national agendas, conditions are favorable for advancing such commitments.

Brazil, as the host of COP30 and a signatory to the Paris Agreement, has made ambitious pledges—such as eliminating illegal deforestation by 2030 and reducing greenhouse gas emissions by 67% by 2035 (compared to 2005 levels)—, which place the country on a pathway toward climate neutrality by 2050 (Silverwood-Cope et al. 2025). Meanwhile, China has advanced its environmental agenda through the Belt and Road Initiative and the Kunming-Montreal Global Biodiversity Framework (GBF), signaling a growing commitment to sustainable practices. Legal and sustainable soy and beef supply chains directly reinforce this agenda and China's broader vision of an "Ecological Civilization", as articulated by President Xi Jinping, who emphasized that the country should "develop spatial layouts, industrial structures and ways of work and life that help conserve resources and protect the environment" (19th National Congress of the Communist Party, 2017).

During President Lula's visit to China in May 2025, more than 20 cooperation agreements were signed, including initiatives on native vegetation restoration, space-based environmental monitoring, and sustainable supply chains, signaling strong political momentum for a bilateral environmental agenda and reinforcing the relevance of a unified legal and sustainable protocol (Santos, 2025). In parallel, China is advancing voluntary, policy-oriented efforts to green soft commodity supply chains through CCICED studies, tools such as the Green Commodity Supply Chain Index under the BRI International Green Development Coalition (BRIGC, 2020), and emerging traceability initiatives. Recent examples include China's announcement of plans to require full traceability for imported beef (Vilarino, 2024), COFCO International's first shipment of deforestation- and conversion-free Brazilian soy, and commitments by 64 Chinese companies under the Chinese Sustainable Meat Declaration (Toledo 2024; WWF-Brasil 2017, 2024).

Despite this momentum, Brazil's existing monitoring systems for sutainable supply chains remain fragmented across soy and beef initiatives. This fragmentation, combined with uncertainties regarding alignment with Brazilian legal frameworks, can create challenges for international stakeholders—including importers, trade associations, and buyers—in navigating requirements, reducing efficiency, and scaling sustainability commitments. The absence of a consolidated reference further complicates compliance processes and the consistent adoption of socio-environmental standards.

The adoption of more robust sustainability protocols by Chinese public or private sector remains limited, primarily due to technical and financial barriers—such as access to quality data for monitoring and verification (Fripp et al. 2023)—and a lack of ambition among companies that do not recognize deforestation as a material business risk (Thomson et al. 2024). For example, the Soy Moratorium

has faced growing political and sectoral pressure, including legislative proposals aimed at weakening or replacing it, creating uncertainty about its long-term continuity and scope. This underscores the need to expand collective action, strengthen governance, and improve data availability and information exchange to ensure the effectiveness and durability of DCF commitments.

Rather than proposing a new regulatory instrument, this study compiles a consolidated set of requirements that can inform the development of such a protocol, as detailed in the minimum requirements presented earlier. The unified list functions as a phased roadmap that balances ambition and feasibility, allowing Brazilian and Chinese stakeholders to progressively adopt best practices. In this sense, the proposed requirements are intended to serve as a foundation for a future bilateral protocol grounded in shared technical references—an objective reinforced by the sustainability goals of both countries and recent diplomatic advances.

A unified protocol would establish a shared language and technical reference between Brazil and China, outlining minimum requirements and pathways toward sustainable soy and beef supply chains for both the public and private sectors. It would also provide consolidated guidance for data collection and use of official public databases, enhancing transparency and interoperability. Brazil already offers tools to demonstrate legal and sustainable compliance—such as state-level SeloVerde platforms, CAR validation systems, and deforestation alerts (DETER, PRODES, MapBiomas[18]). Integrating these tools into a coherent framework would improve usability, align supply-chain actors, and better connect Brazilian systems with foreign buyers' requirements. Clear minimum requirements—such as active CAR status, deforestation cut-off dates, absence of embargoes, and non-overlap with protected areas can help companies guide suppliers toward the progressive adoption of legal and sustainable practices, particularly for Chinese associations and traders seeking reliable verification pathways.

In summary, developing a common protocol is a strategic opportunity to reinforce Brazil-China environmental cooperation, anchor trade in legality and transparency, and respond to the growing global demand for verified sustainable soy and beef supply chains. Rooted in Brazilian standards, the protocol can bridge national legislation and international market expectations, creating the enabling conditions to progressively advance toward sustainable soy and beef trade between Brazil and China, thereby driving more responsible, traceable, and resilient supply chains.

Appendix A. categories of initiatives and their descriptions

Table A-1. **Categories of initiatives and their descriptions**

CATEGORY	DESCRIPTION
Socio-environmental agreements, commitments, and protocols	Formal commitments signed by companies—often with civil society, public prosecutors, or government agencies—and accompanied by implementation protocols. When adopted, they typically require supplier screening and blocking in case of non-compliance.
Public platforms	Government-backed tools that integrate official data to support transparency and monitoring. While they do not enforce blocking, they provide critical information for compliance assessments.
Certification standards	Voluntary frameworks built around standards, indicators, and third-party audits. Full compliance is required for certification, and non-conformity may result in exclusion from certified markets.
Multistakeholder forum recommendations	Voluntary technical guidelines developed by diverse actors to improve practices or establish pre-competitive norms, without enforcement or supplier blocking.

Source: WRI authors.

Appendix B. soy supply chain initiatives

This appendix provides a detailed description of the six criteria evaluated across the soy initiatives.

Scope of monitoring, report and verification

Monitoring scope in Brazil's soy supply chain varies significantly across initiatives. The ASM covers 553 Amazon municipalities but monitors only those with over 5,000 ha of soy per season—124 municipalities in 2022/23, covering 98% of the biome's soy area. The PVG applies solely to Pará, covering 1.01 million ha (14% of Amazon soy). In the Cerrado, the CSA and SCF operate across all states. SCF monitored 61 "focus municipalities" in 2021/22 (5.5 million ha, or 26% of Cerrado soy) and maintained this scope with a 2024 update on risk methodology.

Government platforms—SeloVerde PA, MG, and SIFMA/SeloVerde MA—have subnational coverage but operate at the property level, together covering ~1.3 million rural properties (20% of the CAR registry). The federal ABSP aims to cover Brazil's full soy area (44.45 million ha), though still under development. Certification schemes (RTRS, ProTerra) have no fixed scope and covered ~5% of the 2022/23 harvested area. Their traceability requirements span production, storage, and processing.

Initiatives also differ in terms of target audiences. All agreements and SCF focus on companies buying from direct and/or indirect suppliers. Public platforms target authorities and society but are limited for large-scale company use due to CAR-based queries, though APIs are in development. Certification schemes mainly target producers but also apply to traders and processors of certified soy.

Regarding auditing, ASM, PVG, CSA, and SCF undergo annual independent audits to review blocking systems and internal procedures. SeloVerde platforms and ABSP are not independently audited but promote transparency by integrating public data. Notably, SIFMA/SeloVerde MA is the only tool linking satellite and fiscal data for soy lot traceability. ABSP plans to add traceability in future updates through voluntary participation of supply chain actors.

Finally, reporting formats also differ. ASM and SCF publish annual reports verifying signatory companies, along with summaries or indicator dashboards. PVG requires technical reports including auditor recommendations. SeloVerde platforms and ABSP offer real-time dashboards but lack standardized or audited reports.

Deforestation

Deforestation is the central compliance criterion and was assessed in terms of five elements: cut-off date, monitoring unit, size threshold, blocking unit, and conditions for supplier reintegration.

Cut-off dates and definitions vary across initiatives. ASM uses July 22, 2008 (Forest Code), while the SCF adopts December 31, 2020 (EUDR- aligned), both targeting DCF soy. However, the SCF does not apply the Forest Code cut-off date, meaning it may tolerate deforestation considered illegal under Brazilian law.

Both CSA and PVG monitor only illegal deforestation, based on ASV (Authorization for Native Vegetation Suppression). CSA applies a cut-off date of August 1, 2020; PVG uses July 22, 2008. Public platforms (SeloVerde PA, MG, MA) apply the Forest Code date for assessing illegality. Notably, SeloVerde MG and SIFMA/MA have introduced optional DCF modules using the 2020 cut-off date. These tools are non-blocking but flag non-compliance.

ASM, CSA and SCF consider planted soy areas as their monitoring unit, offering specific land-use accuracy but overlooking deforestation elsewhere on the property, while PVG, SeloVerde platforms (PA, MG and SIFMA) and certification schemes use the full rural property, allowing broader accountability even if deforestation isn't linked to soy production, expanding the scope for blocking non-compliant suppliers.

Certification schemes apply their own parameters: RTRS uses May 2009 for natural wetlands and June 3, 2016 for zero conversion of any natural land; ProTerra uses December 31, 2004 for zero deforestation in High Conservation Value Areas (HCVAs) and July 22, 2008 for any deforestation or land conversion.

All initiatives use PRODES data (Amazon or Cerrado), except SeloVerde MG, which applies the State Forest Institute (IEF)'s Continuous Monitoring System. Most apply a 25-ha threshold (ASM, PVG, SCF) - which is four times larger than the minimum mapping unit used by PRODES (6.25 ha) - while SeloVerde MG reaches down to 1 ha, enhancing detection of small-scale deforestation.

Conditions for supplier reintegration also vary. For instance, ASM requires commitment terms and a 5-year monitoring period, while CSA demands recovery via a PRAD (Degraded Area Recovery Plan). These differences reflect varying environmental governance approaches and directly impact supply chain traceability and efforts to curb native vegetation conversion.

Environmental embargoes

Only ASM and PVG include environmental embargoes as a blocking criterion, with different approaches. ASM mandates that signatory companies block properties listed in IBAMA's embargo list and encourages routine checks of federal and state databases.

PVG allows sourcing from embargoed properties only if soy is produced outside the embargoed area and compliance is certified by an authority. Unlike ASM, PVG permits conditional sourcing. Neither SCF nor CSA reference embargoes, suggesting the criterion is not considered in these initiatives. SeloVerde platforms

Table B-1. **Comparative table of analyzed socio-environmental criteria, their categories and selected soy supply chain initiatives**

INITIATIVES	SCOPE OF MRV	DEFORESTATION		ENVIRONMENTAL EMBARGOES		OVERLAPS WITH PROTECTED AREAS			ENVIRONMENTAL COMPLIANCE								LABOR CONDITIONS ANALOGOUS TO SLAVERY
	Soy Sales Invoice	No Overlap with PRODES Polygons	Zero Deforestation and Conversion	Environmental Embargo List	No Overlap with Embargoed Polygons	No Overlap with Protected Areas (IL, QT, CU)[a]	No Overlap With FPNDs[b]	No Overlap with Rural Settlements	Presentation and Status of CAR	Environmental License	Presentation of ASV[c]	Changes to CAR Boundaries	No Overlap with Other CARs Registrations	Environmental Infractions Notices and Inspections	Environmental balance[d]	Productivity[e]	Labor Analogous to Slavery
Amazon Soy Moratorium (ASM)		✓	✓	✓													✓
Green Grain Protocol of Pará (PGV)		✓		✓		✓			✓		✓						✓
Control of Authorized Suppression of the Cerrado (CSA)		✓									✓						
Soft Commodities Forum (SFC)			✓														✓
SeloVerde PA		✓		✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
SeloVerde MG		✓	✓	✓	✓	✓			✓	✓				✓	✓	✓	✓
SIFMA/ SeloVerde MA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
AgroBrasil + Sustentável (ABSP)		✓							✓								✓
Roundtable on Responsible Soy (RTRS)		✓	✓														✓
Pro Terra		✓	✓														✓

Notes:

[a] IL = Indigenous Land; QT= Quilombola Territories; CU = Conservation Units.

[b] FPNDs = *Florestas Públicas Não Destinadas* (Unallocated Public Forests)

[c] ASV = Authorization for Native Vegetation Suppression

[d] Surplus and deficit of Legal Reserve and Permanent Preservation Areas

[e] Proportionality Between Commercialized Soy Volume and Productive Area

Source: Table adapted by WRI authors, based on an internal document prepared by Amigos da Terra (ADT) as part of a consulting service.

LEGEND

- MODULE 1: Legality-Based Criteria for Socio-Environmental Compliance Under Brazil's Policy Framework
- MODULE 2: Sustainable Soy: Beyond-Legal Compliance
- Socio-environmental agreements, commitments and protocols
- Private collaborative platform
- Public platforms
- Certification standards

(PA, MG, MA) provide lists and geospatial data on embargoed areas. In Pará, data comes from IBAMA, ICMBio, and SEMA-PA. MG and MA use IBAMA and ICMBio data in both formats.

According to information collected in interviews, ABSP currently does not include embargo data but plans to incorporate IBAMA's database in future updates. As noted in the deforestation section, this is a critical gap.

Overlaps with protected areas and environmental compliance

Some initiatives assess overlaps between rural properties and protected or sensitive areas. PVG verifies overlaps between CAR and Indigenous Lands or Protected Areas, excluding Environmental Protection Areas (APAs) where soy cultivation may be permitted. While no specific threshold is defined, audits must report the percentage of overlap and non-compliant suppliers are blocked until regularization. SeloVerde platforms (PA, MG, MA) assess overlaps with ILs, PAs, and Quilombola Territories. SeloVerde PA also includes data layers on agrarian settlements and FPND. ASM does not assess overlaps, and monitoring is limited to Amazonian portions of municipalities. SCF and CSA also do not consider this criterion.

CAR is a formal requirement only in the PVG and SeloVerde platforms. PVG requires CAR to be active, pending, or rectified, and registered under the National System of Rural Environmental Registry (SICAR[19]) - Brazil's federal CAR database. It also cross-references reported productivity with the declared productive area, allowing a maximum of 70 sacks/ha. ASM uses CAR informally for deforestation checks; SCF and CSA do not refer to it.

Only the SeloVerde platforms provide data on Environmental Regularization Program (PRA) enrollment, CAR overlaps, licensing, infraction notices, and environmental balances (per the Forest Code). SeloVerde PA is the most detailed, using a state database and including CAR boundary changes and overlaps. MG and MA rely on SICAR, with Maranhão's parameters still under development.

Occurrence of labor conditions analogous to slavery

The ASM and PVG agreements and the SeloVerde PA, MG and MA platforms adopt this criterion, using the MTE "dirty list" to identify non-compliant CPF/CNPJ registrations. However, public platforms are consultative: they flag violations but do not block suppliers unless companies have adopted commitments or policies making this a blocking criterion. ABSP also provides this information, but for consultation only. CSA and SCF do not include this as a blocking requirement, although SCF uses the MTE list to guide eligibility for sustainability incentives.

Finally, the RTRS and ProTerra certification standards go further, incorporating human rights and labor due diligence. Their audits include detailed field verification of working conditions and grievance mechanisms, ensuring higher accountability. Table B-1 below presents a comparison of the initiatives, the requirements they meet, and the respective criteria categories for the soy supply chain

Appendix C. beef supply chain initiatives

This annex provides a detailed description of the six criteria evaluated across the beef initiatives.

Scope of monitoring, report and verification

Monitoring initiatives in Brazil's beef supply chain vary in geographic scope, biome focus, monitoring units, and traceability. Beef TAC, CPP, PMFGA, and GTFI are focused on the Amazon biome, while PMVFGC applies to the Cerrado. In contrast, PRIMI, GIPS, ABSP, and the SeloVerde platforms (PA, MG, MA) operate at the national or state level. The implementation of these commitments depends on the activities of signatory companies in each state. Beef TAC is the most comprehensive, with 111 slaughterhouses across six Amazon states. CPP is limited to three major companies — JBS, Marfrig and Minerva. PMVFGC includes five slaughterhouses (the three players above plus Frigol and Masterboi). GIPS has 944 registered properties in various regions across the country.

Most initiatives (TAC, CPP, PMFGA, PMVFGC) monitor only direct suppliers, while PRIMI, SeloVerde (PA, MG), and SIFMA/MA include indirect suppliers. GTFI focuses on first-tier indirect suppliers, complementing PMFGA. Traceability is generally batch-based via CAR and GTA cross-referencing. PRIMI is the only initiative using individual traceability, aimed at voluntary certification. The SeloVerde platforms and

ABSP offer public dashboards for consultation; GIPS is self-declared and unaudited, for internal use only, which makes it unsuitable for sectoral monitoring, and is therefore excluded from our comparative analysis.

Verification is typically carried out through third-part audits, except for PMVFGC, which has not yet implemented any verification mechanisms. Beef TAC began audits in Pará and expanded in 2023 to other states. Despite limited access to state-level data, coverage has been high—e.g., 78% in Pará, 66% in Acre, and 95% in Amazonas (via automated checks). The Federal Prosecutor's Office (MPF) has also begun auditing non-signatory companies, expanding oversight. A second audit cycle is planned for 2025. For analysis purposes, TAC, CPP and PMFGA are assessed jointly, as PMFGA harmonizes the former two commitments.

Deforestation

All initiatives monitor deforestation, but differ in approach—focusing either on illegal deforestation or zero deforestation, each with its own cut-off date. Beef TAC and SeloVerde PA monitor only illegal deforestation, applying the Forest Code's cut-off date (July 22, 2008). GTFI uses a more recent threshold: August 1, 2019.

Initiatives like PRIMI, SeloVerde MG and SIFMA/MA align with Brazilian law up to December 31, 2020 (EUDR cut-off date) and apply a zero-deforestation criterion from that point onward. The CPP includes zero deforestation as an optional commitment, using October 5, 2009, a date close to the legal threshold. PMFGA applies both approaches, depending on whether companies adhere to the TAC or CPP.

In short, Beef TAC, SeloVerde PA, GTFI, GIPS and ABSP focus on illegal deforestation, while PRIMI, PMVFGC, SeloVerde MG, SIFMA/MA and CPP incorporate zero deforestation principles, whether as mandatory or optional elements. PMFGA bridges both categories.

All initiatives use PRODES as the baseline dataset (min. 6.25 ha polygons), with the rural property as the analysis unit. Some initiatives use more sensitive filters: GTFI assesses properties >100 ha; PRIMI and SeloVerde MG monitor polygons ≥0.5 and ≥1 ha, respectively, for zero deforestation assessments after 2020. SeloVerde MG also uses its own state monitoring system (IEF-MG) and SIFMA/MA may integrate legacy data from Maranhão's native vegetation monitoring module.

Government platforms (SeloVerde PA, MG, MA) operate via manual CAR-based queries, limiting large-scale monitoring. Although analysis is conducted at the property level, companies with thousands of suppliers face operational challenges unless they automate this process. Currently, only private systems allow for batch processing of CARs, shifting the cost and infrastructure burden to companies. These platforms identify non-compliant properties but do not trigger blocking; blocking is typically a business decision, informed by monitoring results.

In PMFGA and PMVFGC, overlaps between CAR boundaries and PRODES polygons after their respective cut-off dates (2008 or 2020) result in a procurement block. Generally, the lifting of this block requires companies to submit: ASV, Deforestation Authorization (AD), or Controlled Burning Authorization (for the Cerrado biome); a multitemporal geospatial analysis proving a false positive; a Term of Commitment for enrollment in the PRA; or, in states lacking a PRA, documentation proving regularization through a private reintegration system approved by the competent authorities and/or a recovery project and annual technical monitoring report. It is worth noting that although the PMFGA only enforces blocks for zero deforestation after more recent dates, it allows unblocking based on procedures defined in Brazilian legislation.

Environmental embargoes

All initiatives analyzed consider environmental embargoes as a monitoring criterion, using overlaps between CAR boundaries and embargo polygons from federal and state agencies, and cross-referencing CPF/CNPJ records against public lists.

PMFGA, Beef TAC, CPP, and GTFI require consultation of IBAMA's embargo lists and illegal deforestation lists from state agencies, such as SEMA/PA. PMVFGC mandates verification against IBAMA, ICMBio, and SIMLAM/MT[20]. PRIMI also uses data from the Mato Grosso Integrated Environmental Licensing and Monitoring System (SIMLAM/MT), SEMA/PA, and other state sources.

When an active embargo is found, PMFGA, PMVFGC and GTFI require a procurement block for the property. Lifting the block requires proof of error or compliance, such as a technical report from the MPF or Terms of Reference for a Compliance Report. If the embargo is tied to a CPF/CNPJ linked to multiple properties, suppliers

may demonstrate distinction by submitting data such as coordinates, property names, and municipalities—while meeting additional criteria (e.g., PMFGA's auxiliary property rules).

The SeloVerde platforms (PA, MG, MA) and ABSP also display embargo data from IBAMA, ICMBio, and (in PA) SEMA. They flag embargo status, including official lifts. However, these platforms are consultative only: they support decision-making but do not automatically block suppliers.

Overlaps with protected areas and environmental compliance

Most initiatives monitor overlaps between CAR registrations and protected areas such as Indigenous Lands, Protected Areas, and, in most cases, Quilombola Territories. However, GTFI, PRIMI and CPP do not formally include Quilombola Territories. While the CPP refers to the PMFGA as a technical reference (which includes Quilombola Territories), this is not part of its own commitment scope. All initiatives apply similar thresholds, proportional to property size, but differ in spatial data used. For ILs, all initiatives include Declared, Ratified, and Regularized stages, but some also consider the "Interdicted" stage or more advanced phases[21].

All initiatives apply similar thresholds, proportional to property size, but differ in spatial data used. For Indigenous Lands, most include Declared, Ratified, and Regularized stages; some also consider "Interdicted" or "Advanced" stages. SeloVerde PA goes further, including overlaps with agrarian settlements and FPND—criteria not yet adopted by PMFGA or Beef TAC. ABSP plans to include public forests, but not settlements. Limited public information on methodologies used by SeloVerde MG, SIFMA/MA, and ABSP hinders comparison.

CAR status is required in all initiatives except GTFI. "Active" and "pending" status are generally accepted; PRIMI also accepts "rectified" status. Most rely on the SICAR federal database, although SeloVerde PA uses state-level data. PMFGA, PMVFGC, and SeloVerde PA also monitor changes in CAR boundaries and require annual updates for data integrity, as boundary modifications can be used to conceal deforestation or other liabilities, undermining traceability.

SeloVerde PA and SIFMA/SeloVerde assess overlaps between CARs. These overlaps may result from georeferencing errors, land disputes, duplicate entries or fraudulent claims, and are indicators of land tenure insecurity. They complicate environmental accountability and must be resolved for CAR validation (Law No. 12,651/2012), as they affect traceability and legal clarity.

These two platforms are the only initiatives that conduct environmental balance analyses (Legal Reserve and APP deficits/surpluses). Licensing is also monitored: PMFGA and SeloVerde PA check Rural Environmental Licensing (LAR) in Pará, while MG and MA monitor state-specific permits (such as the Unified Environmental License – LAU). These licenses authorize rural activities under local environmental rules, and their absence may indicate legal noncompliance. ABSP does not adopt these criteria, as it does not use state-level data.

Only SeloVerde PA, MG, and MA assess infraction notices, with variations in jurisdiction (federal and/or state). Participation in the PRA is directly verified only in SeloVerde PA, while the other platforms use this criterion solely for unblocking properties. This platform remains the most complete in supporting public policy for legal compliance.

Finally, to prevent cattle laundering, PMFGA and PMVFGC apply traceability rules: matching GTA origins/destinations, productivity limits (three Animal Units per hectare/year), and cross-checks between properties linked to the same CPF/CNPJ within a 100 km radius, blocking transactions if irregular auxiliary properties are identified. While PRIMI and SeloVerde (PA, MG) don't block for triangulation, their data can support monitoring.

Occurrence of labor conditions analogous to slavery

All mapped initiatives monitor slave labor by cross-referencing the CPF/CNPJ of property owners, tenants, or partners with the MTE Dirty List. If a match is found at the time of purchase, all properties linked to the identified CPF/CNPJ are blocked and remain so until the name is removed from the list—unblocking is not permitted under this criterion. In PRIMI, CPF/CNPJ verification is required for protocol entry. SeloVerde PA, MG, and SIFMA/MA provide this information via CAR-based queries. On ABSP, it is accessible through consultation of the rural owner's CPF. Table C-1 below presents a comparison of the initiatives, the requirements they meet, and the respective criteria categories for the beef supply chain.

Table C-1. **Comparative table of analyzed socio-environmental criteria, their categories and selected beef supply chain initiatives**

INITIATIVES	SCOPE OF MRV		DEFORESTATION		ENVIRONMENTAL EMBARGOES		OVERLAPS WITH PROTECTED AREAS				ENVIRONMENTAL COMPLIANCE										LABOR CONDITIONS ANALOGOUS TO SLAVERY
	Presentation of the Animal Transit Guide (GTA)	Individual Animal Identification	No Overlap with PRODES Polygons	Zero Deforestation and Conversion	Environmental Embargo List	No Overlap with Embargoed Polygons	No Overlap with Protected Areas (IL andCU)[a]	No Overlap with QT[a]	No Overlap with FPNDs[b]	No Overlap with Rural Settlements	Presentation and Status of CAR	Environmental License	Presentation of ASV[c]	Environmental Infraction Notices and Inspections	Property Enrollment in the PRA	Environmental Balance[d]	Auxiliary Properties	Changes to CAR boundaries	No Overlap with Other CARs Registrations	Productivity[e]	Labor Analogous to Slavery
Terms of Conduct Adjustment (Beef TAC)	✓		✓		✓	✓	✓	✓			✓										✓
Public Livestock Commitment (CPP)	✓		✓	✓	✓	✓	✓				✓		✓								✓
Monitoring Protocol for Amazon Cattle Suppliers (PMFGA)	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓				✓	✓		✓	✓
Voluntary Monitoring Protocol for Cattle Suppliers in the Cerrado (PMVFGC)	✓		✓	✓	✓	✓	✓	✓			✓						✓	✓		✓	✓
Individual Traceability and Indirect Monitoring Program (PRIMI)	✓	✓	✓	✓	✓	✓	✓				✓									✓	✓
Good Practices of the Indirect Suppliers Working Group (GTFI)	✓		✓		✓	✓	✓														✓
Guide to Sustainable Livestock Indicators (GIPS)	✓		✓		✓		✓	✓			✓	✓									✓
SeloVerde PA			✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			✓
SeloVerde MG			✓	✓	✓		✓	✓			✓	✓		✓				✓			✓
SIFMA/SeloVerde MA			✓	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓		✓			✓
AgroBrasil + Sustentável (ABS)			✓				✓	✓			✓										✓

Notes:

[a] IL = Indigenous Land; QT= Quilombola Territories; CU = Conservation Units.

[b] FPNDs = *Florestas Públicas Não Destinadas* (Unallocated Public Forests)

[c] ASV = Authorization for Native Vegetation Suppression

[d] Surplus and deficit of Legal Reserve and Permanent Preservation Areas

[e] Proportionality Between herd size and pasture area.

Source: Table adapted by WRI authors, based on an internal document prepared by Amigos da Terra (ADT) as part of a consulting service.

LEGEND

- MODULE 1: Legality-Based Criteria for Socio-Environmental Compliance Under Brazil's Policy Framework
- MODULE 2: Sustainable Beef: Beyond-Legal Compliance
- Socio-environmental agreements, commitments and protocols
- Monitoring protocol
- Recommendations from multistakeholder forums
- Public platforms

Glossary

All definitions are based on the Accountability Framework Initiative – Definitions, unless otherwise specified in the text.

TERM	DEFINITION
Audit/Auditing	A structured process to independently assess whether practices and data accurately reflect stated commitments.
Blocking unit	The level (e.g., farm, property, supplier) at which commercial restrictions are applied due to non-compliance.
Buyer	A company that purchases raw materials, processed materials, or finished products from a supplier.
Chain of Custody	The process by which materials and associated information are transferred, monitored, and controlled as they move through each step in a supply chain.
Commitment	A public declaration by a company outlining specific environmental or social goals.
Compliance	The state of complying with or fulfilling a given commitment, policy, or other obligation.
Conversion	Loss of a natural ecosystem as a result of its replacement with agriculture or another land use, or due to a profound and sustained change in a natural ecosystem's species composition, structure, or function.
Cut-off Date	A specified date after which deforestation or conversion disqualifies a product from being considered deforestation- or conversion-free.
Deforestation	Loss of natural forest as a result of: (i) conversion to agriculture or other non-forest land use; (ii) conversion to a tree plantation; or (iii) severe and sustained degradation.
Deforestation and Conversion Free (DCF)	Means that a product or supply chain is not associated with deforestation or the conversion of natural ecosystems, after a specified cut-off date.
Direct Supplier	A supplier that has a direct commercial relationship with the buyer.
Detection thresholds	The minimum area of deforestation that triggers monitoring or blocking measures.
Due Diligence	A risk management process implemented by a company to identify, prevent, mitigate, and account for how it addresses environmental and social risks and impacts in its operations, supply chains, and investments.
Indirect Supplier	A supplier that is part of the upstream supply chain but does not sell directly to the buyer.
Milestone	A specific, time-bound step marking progress toward a commitment or goal—such as a target, action, or result within an implementation plan.
Monitoring	An ongoing function that uses the systematic collection of data on specific metrics to assess and document the extent to which actions, progress, performance, and compliance are being carried out or achieved.
Monitoring unit	The spatial units used to track deforestation activity, such as satellite pixels, plots, farms, or other defined geographic areas.
Natural ecosystem	An ecosystem that closely reflects native conditions in species, structure, and function, even if partially managed by humans.
No-conversion / Conversion-free / Zero conversion	Commodity production, sourcing, or financial investments that do not cause or contribute to the conversion of natural ecosystems (as defined by the Accountability Framework initiative).
No-deforestation / Deforestation-free / Zero deforestation	Commodity production, sourcing, or financial investments that do not cause or contribute to deforestation (as defined by the Accountability Framework initiative).
Non-compliance	The state of not complying with or fulfilling (or only partially complying with or fulfilling) a given commitment, policy, or other obligation.
Outcome	Social, environmental, or other conditions or results.
Plot (of land)	A defined parcel of land used to assess compliance and trace the origin of production.
Producer	The owner or manager of a production unit. This includes smallholders and other individual owners/managers, corporate entities, and communities that own or manage production systems.

TERM	DEFINITION
Remediation	Actions to address and repair harm caused to people or nature due to non-compliance.
Reporting	Conveyance of information on compliance, performance, or actions from one party to another.
Reintegration / Reinsertion	Process by which a previously non-compliant supplier is allowed to re-enter the supply chain after demonstrating corrective actions and sustained compliance with socio-environmental and legal requirements. This may include restoring deforested areas, signing formal agreements, and undergoing monitoring to prevent recurrence.
Restoration	The process of assisting the recovery of an ecosystem, and its associated conservation values, that has been degraded, damaged, or destroyed.
Risk Assessment	A systematic process of evaluating risk in a company's current or future operations, supply chains, and investments.
Sourcing Area	An area or region from which materials in a supply chain originate.
Supplier	A producer or company that supplies raw materials, processed materials, or finished products to a buyer.
Supply chain mapping	The process of identifying the actors in a company's supply chain and the relationships among them.
Target date	The date by which a given company (or other commitment- or policy-issuing entity) intends to have fully implemented its commitment or policy.
Traceability	[ISO 9001:2015] Traceability refers to the ability to trace the history, use, or location of a product or service by means of recorded identification. According to the GS1 Global Traceability Standard, when considering a product or service, traceability can relate to the origin of materials and parts, the processing history, and the distribution and location of the product or service after delivery.
Trader	A business that purchases and sells raw or primary processed agricultural or forestry materials. Traders commonly also provide transport services for these goods. Trading companies may also engage in primary or secondary processing.
Transparency	The public disclosure of information in a form and manner accessible to stakeholders.
Verification	Assessment and confirmation of compliance, performance, and/or actions relative to a stated commitment, policy, goal, target, or other obligation. Verification signifies that information is checked and confirmed by people other than those involved in the operation or entity being assessed.

Abbreviations

ACRONYM	FULL NAME	TRANSLATION (IF APPLICABLE)
ABIOVE	Associação Brasileira das Indústrias de Óleos Vegetais	Brazilian Association of Vegetable Oil Industries
ABSP	Agro Brasil + Sustentável Platform	–
AFi	Accountability Framework Initiative	–
ANEC	Associação Nacional dos Exportadores de Cereais	National Association of Cereal Exporters
ASM	Amazon Soy Moratorium	–
APA	Área de Proteção Ambiental	Environmental Protection Area
APP	Área de Preservação Permanente	Permanent Preservation Area
ASV	Autorização de Supressão de Vegetação	Authorization for Native Vegetation Suppression
CAR	Cadastro Ambiental Rural	Rural Environmental Registry
CMA	China Meat Association	–
CPF	Cadastro de Pessoa Física	Individual Taxpayer Registry

ACRONYM	FULL NAME	TRANSLATION (IF APPLICABLE)
CNPJ	Cadastro Nacional da Pessoa Jurídica	National Registry of Legal Entities
CPP	Compromisso Público da Pecuária	Public Livestock Commitment
CSA	Controle da Supressão Autorizada do Cerrado	Control of Authorized Suppression of the Cerrado
CSR/UFMG	Centro de Sensoriamento Remoto da Universidade Federal de Minas Gerais	Remote Sensing Center of the Federal University of Minas Gerais
DCF	Deforestation- and Conversion-Free	–
DETER	Detecção de Desmatamento em Tempo Real	Real-Time Deforestation Detection
EUDR	European Union Deforestation Regulation	–
FPNDs	Florestas Públicas Não Destinadas	Undesignated Public Forests
GIPS	Guia de Indicadores da Pecuária Sustentável	Guide to Sustainable Livestock Indicators
GTFI	Grupo de Trabalho de Fornecedores Indiretos – Boas Práticas	Good Practices of the Indirect Suppliers Working Group
GTA	Guia de Trânsito Animal	Animal Transit Record
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis	Brazilian Institute of Environment and Renewable Natural Resources
ICMBio	Instituto Chico Mendes de Conservação da Biodiversidade	Chico Mendes Institute for Biodiversity Conservation
IEF	Instituto Estadual de Florestas (Minas Gerais)	Minas Gerais State Forestry Institute
LAR	Licença Ambiental Rural	Rural Environmental Licensing
LAU	Licença Ambiental Única	Unified Environmental License
MMA	Ministério do Meio Ambiente	Ministry of Environment and Climate Change
MPF	Ministério Público Federal	Federal Prosecutor's Office
MRV	Monitoring, Reporting and Verification	–
MTE	Ministério do Trabalho e Emprego	Ministry of Labor and Employment
PMFGA	Protocolo de Monitoramento de Fornecedores de Gado na Amazônia	Monitoring Protocol for Amazon Cattle Suppliers
PMVFGC	Protocolo de Monitoramento Voluntário de Fornecedores de Gado no Cerrado	Voluntary Monitoring Protocol for Cattle Suppliers in the Cerrado
PRA	Programa de Regularização Ambiental	Environmental Regularization Program
PRIMI	Programa de Rastreabilidade Individual e Monitoramento de Indiretos	Individual Traceability and Indirect Monitoring Program
PRODES	Programa de Monitoramento do Desmatamento da Amazônia Legal por Satélite	Amazon Deforestation Satellite Monitoring Program
PVG	Protocolo Verde dos Grãos do Pará	Green Grain Protocol of Pará
RTRS	Round Table on Responsible Soy	–
SCF	Soft Commodities Forum	–
SEAPA	Secretaria Estadual de Agricultura, Pecuária e Abastecimento	State Secretariat of Agriculture, Livestock, and Supply
SEMA	Secretaria de Estado de Meio Ambiente	State Environmental Secretariat
SICAR	Sistema Nacional de Cadastro Ambiental Rural	National System of Rural Environmental Registry
SIFMA	Sistema de Fiscalização e Monitoramento do Agronegócio do Maranhão	Maranhão Agribusiness Inspection and Monitoring System
TAC	Termo de Ajustamento de Conduta	Terms of Conduct Adjustment
WBCSD	World Business Council for Sustainable Development	–

Endnotes

1. For the purposes of this report, the term "sustainable soy and beef" is used in the specific context of supply chains that comply with Brazilian legal requirements and address risks related to deforestation and native vegetation conversion after established cut-off dates. While sustainability in agricultural supply chains may encompass a broader range of environmental, social, and economic dimensions, this report focuses primarily on legal compliance and deforestation- and conversion-related criteria, alongside associated socio-environmental safeguards. The report also recognizes that there is no single internationally agreed definition of "sustainable" commodities and does not intend to prescribe a specific regulatory or governance model. Rather, within the scope of this analysis, the term is used as a practical reference to supply-chain outcomes commonly associated with deforestation- and conversion-free (DCF) approaches, while also considering broader legal and socio-environmental criteria.
2. Refer to lands traditionally occupied by quilombola communities—Afro-Brazilian groups descended from enslaved people who established independent settlements (quilombos) as a form of resistance. According to Article 2 of Decree 4.887/2003, these territories are those used by quilombola communities to ensure their physical, social, economic, and cultural reproduction.
3. Refer to areas of land redistributed by the Brazilian government as part of agrarian reform programs.
4. Brazil's Forest Code (Law 12.651/2012) is the national legislation that governs the protection and sustainable use of native vegetation on private rural properties, establishing rules for permanent preservation areas, legal reserve requirements, environmental restoration, and land-use control mechanisms.
5. In Brazil, an agrarian settlement refers to rural land redistributed by the federal government, usually through land reform programs, to provide small plots for families of landless farmers. These settlements are intended to promote social inclusion, support family farming, and ensure the productive use of land, often with government assistance for housing, infrastructure, and agricultural activities.
6. Active status refers to CAR registrations that have been successfully submitted and remain valid as long as the information is kept updated and the property is found in compliance, with verified accuracy, regarding Permanent Preservation Areas (APP), Legal Reserves (RL), restricted-use areas, and remaining native vegetation.
7. Pending status applies when the registration contains incorrect declarations, overlaps with Indigenous Lands, Conservation Units, federal lands, embargoed areas, or other rural properties. It also applies when irregularities are identified in APP, RL, restricted-use areas, consolidated areas, or native vegetation remnants, and the required revisions or updates have not yet been fulfilled within the established deadlines.
8. The PRODES system (Amazon Deforestation Satellite Monitoring Program), developed by Brazil's National Institute for Space Research (INPE), conducts annual mapping of deforestation in all Brazilian biomes. Using high-resolution satellite imagery, it identifies clear-cut areas larger than 6.25 hectares where native vegetation has been entirely removed. PRODES data have been publicly available since 2003 and serve as the official reference for deforestation statistics in Brazil. Source: (INPE, n/d.).
9. DETER (Real-Time Deforestation Detection) is a near real-time, satellite-based alert system developed by Brazil's National Institute for Space Research (INPE) since 2004. It rapidly identifies and flags signs of native vegetation removal—such as clear-cutting, degradation, mining scars, and selective logging—across the Amazon and other Brazilian biomes, using MODIS (250 m) and higher-resolution sensors (AWiFS, WFI) to detect changes as small as ~3 ha, with public alerts released at a minimum of 6.25 ha (INPE, n/d.).
10. The "Dirty List" (Lista Suja) is an official public registry maintained by the Ministry of Labor and Employment in Brazil that identifies employers found to have subjected workers to conditions analogous to slavery, following inspection and due administrative process.
11. The field verification of certification schemes often includes labor aspects such as housing, working hours, education access, and grievance mechanisms, ensuring more robust due diligence practices.
12. The GLAD (Global Land Analysis and Discovery) Deforestation Alerts system was developed by the University of Maryland's GLAD lab and uses Landsat satellite imagery to detect, in near real time, changes in tropical forest cover at a 30 × 30 m resolution—roughly the size of two basketball courts. Each alert identifies areas potentially deforested or subject to canopy disturbances. The system operates within the Google Earth Engine platform and is updated weekly as new cloud-free imagery becomes available (Weisse & Pickens, 2020).
13. CPF (Cadastro de Pessoas Físicas) and CNPJ (Cadastro Nacional da Pessoa Jurídica) are Brazil's federal tax identification numbers for individuals and companies, respectively, used for property and supply chain registration.
14. The Federal University of Minas Gerais (UFMG), the institution responsible for developing the SeloVerde platforms, operates under a technical cooperation agreement with the Government of Pará, which provides direct access to the GTA database maintained by ADEPARA (the Pará State Agency for Agricultural Defense, responsible for animal health control and the issuance of animal transit permits), including the most recent records. It is important to note, however, that GTA data contain sensitive information, and are not part of a publicly accessible database.
15. Permanent Preservation Areas (APPs) are protected zones defined by the Brazilian Forest Code, such as riverbanks, hilltops, springs, and steep slopes, where native vegetation must be maintained or restored to preserve ecological functions.

16. Legal Reserves (RLs) are portions of rural properties where a percentage of native vegetation must be conserved, as mandated by the Forest Code. The required share varies by biome (e.g., 80% in the Amazon, 35% in the Cerrado within the Amazon, and 20% in other regions).
17. The Brazilian Individual Identification System for Cattle and Buffalo (SISBOV), Ordinance No. 267/2006, is currently under review.
18. MapBiomas is a collaborative platform that uses satellite imagery and artificial intelligence to map land use and cover changes across Brazil, supporting environmental monitoring and policy development. Available at: https://brasil.mapbiomas.org/
19. SICAR (National System of Rural Environmental Registry) is Brazil's national platform that stores and provides access to CAR records, supporting land-use monitoring and compliance with the Forest Code.
20. Integrated System for Environmental Monitoring and Licensing of Mato Grosso (SIMLAM/MT).
21. In Brazil, the administrative procedure for the demarcation of Indigenous Lands is defined by Presidential Decree No. 1,775/1996 and consists of several sequential phases. The process begins with the study phase, during which anthropological, historical, land tenure, cartographic, and environmental studies are conducted to identify and justify the territory. Once these studies are completed and approved by FUNAI, the territory is considered delimited. In the declared phase, the Minister of Justice officially recognizes the boundaries and authorizes the physical demarcation of the land. This is followed by the ratified (or homologated) phase, when the boundaries are confirmed by Presidential decree. Finally, in the regularized phase, the demarcated land is formally registered as Union property with exclusive usufruct rights granted to the Indigenous people (FUNAI, 2024).

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