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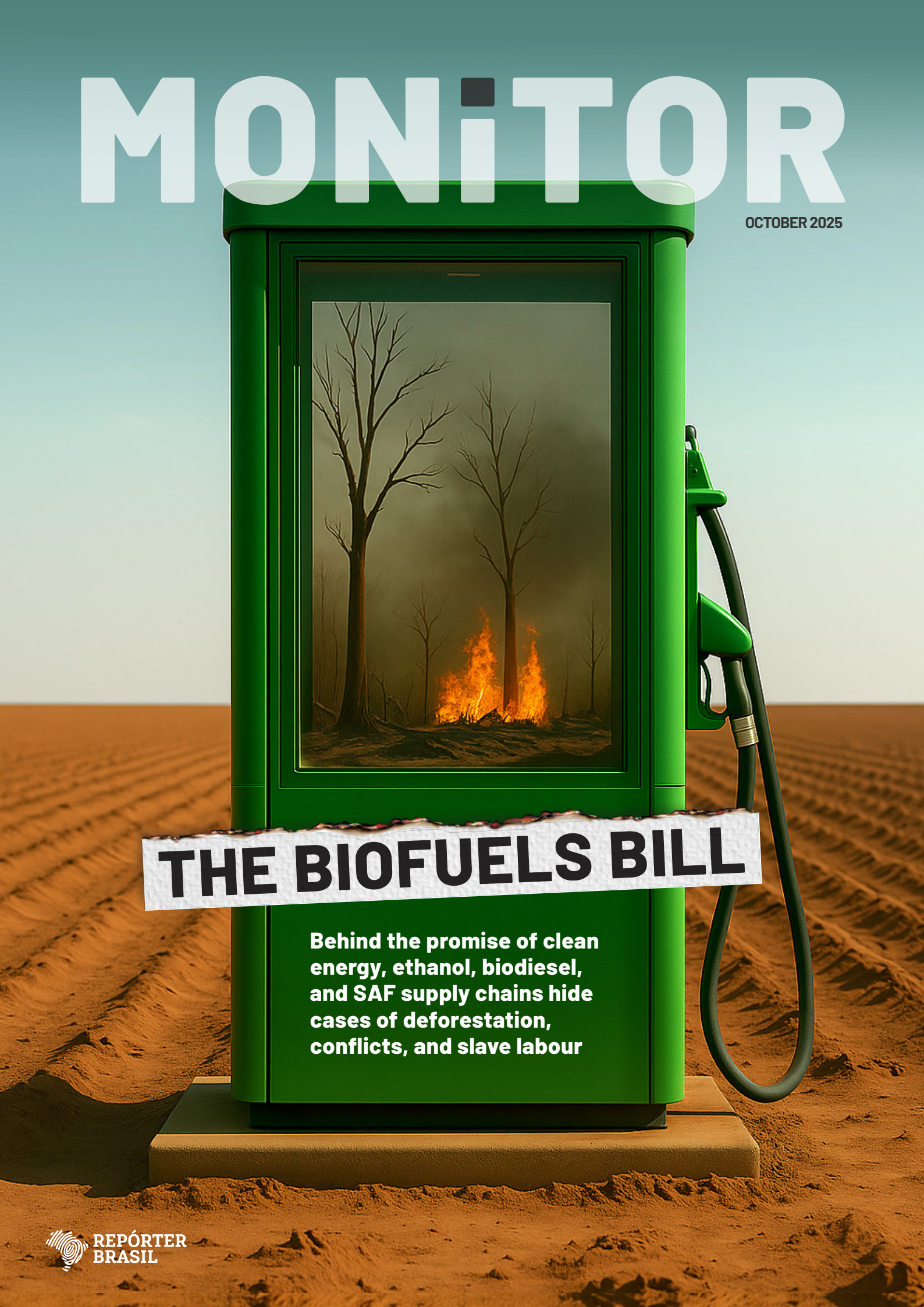

THE BIOFUELS BILL

Behind the promise of clean energy, ethanol, biodiesel, and SAF supply chains hide cases of deforestation, conflicts, and slave labour

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LEADERSHIP IN BIOFUELS

Climate change and the search for clean energy have positioned biofuels as one of the solutions for the global energy transition. In the transportation sector, responsible for a significant portion of GHG (greenhouse gas) emissions, several countries are investing in fuels derived from agricultural activities in order to meet the goals of the Paris Agreement. As a pioneer in this field, Brazil has become a concrete example of large-scale transition with its public policies and technological investment for the sector.

The oil crisis of the 1970s exposed the vulnerability of fossil fuel-dependent economies – a problem that remains relevant in the face of the war in Ukraine, instability in the Middle East, and volatile oil prices. It was in this context that Brazil created its own model, reducing its dependence on imports and building a biofuels supply chain that is now establishing itself as an international reference as pointed out by the IEA (the International Energy Agency).[1]

Since 1975, the country has implemented an energy diversification policy, which evolved from **Proálcool** (details in the next chapter) towards consolidating a supply chain in which various raw materials are used to produce biofuels, including soybeans, palm oil, corn, animal fat, and sugarcane.

Brazil's unique advantage lies in the combination of **natural conditions** – climate and available land – with **public policies** as well as strong integration with the agribusiness sector. Therefore, biofuels have become more than just an energy strategy; they have established themselves as a political force.

The sector enjoys broad support in Congress, which has recently passed the **Fuel of the Future**

Act with votes from both the government and the opposition. The new regulation expands the mandatory blending of ethanol and biodiesel in fossil fuels sold at petrol stations nationwide. Furthermore, it includes aviation and navigation biofuels on the list of policies encouraged by **RenovaBio**, a government programme that promotes the renewable fuels sector.

The environmental agenda favours the sector with facilitated financing. In the last three years alone, **BNDES** (the Brazilian Development Bank) and Finep (Study and Project Funding Agency), both related to the federal government, have approved R$11.7 billion to fund[2] biofuel projects. A significant portion of these resources comes from the Ministry of the Environment's **Climate Fund**, designed to boost a low-carbon economy.

These investments will be highlighted by Brazilian officials at **COP30** (the UN Climate Change Conference) scheduled for November 2025 in Belém, Brazil. The government has indicated that it will advocate the sector's role in achieving climate goals.

Brazil's NDC (Nationally Determined Contribution) under the Paris Agreement set a 59%-67% target for reducing national emissions by 2035 (over 2005).[3] The country argues that biofuels are a core component in achieving this target.

However, to what extent do agricultural fuels truly follow sustainable principles and reduce GHG emissions? Investigations by **Repórter Brasil** reveal irregularities in the supply chains of the main biofuels, including illegal clearing of native forests – a critical point, considering that loss of forest cover is the main source of GHG emissions in the country.

Furthermore, biofuel production involves cases of slave labour on farms supplying raw materials as well as conflicts with traditional communities in the expansion of new agricultural frontiers – topics that will be further detailed in the following chapters.

Driven by Proálcool and other policies, ethanol production has consolidated Brazil's position as an international benchmark in biofuels

GLOBAL CONNECTIONS_

Brazil produces biofuels for the domestic market, but in recent decades it has also established itself as one of the main global suppliers of their raw materials.

According to the **ANP** (Brazil's National Agency of Petroleum, Natural Gas, and Biofuels), the country exported 1.88 billion litres of ethanol in 2024[4] – approximately 313 million litres to the United States and 194 million to the European Union.

According to Comex Stat, which gathers data on Brazilian exports, the country also exported 76.6 million litres of biodiesel in 2024, almost entirely to Europe, especially Switzerland and the Netherlands.[5] Despite being a major producer, the country's biodiesel exports are limited because almost the entire production is intended for the domestic market.

Brazilian Biofuel Exports in 2024

PRODUCT	AMOUNT	MAIN DESTINATIONS
ETHANOL	**1.88** BILLION LITRES	USA 313 million litres EU 194 million litres
BIODIESEL	**76.6** MILLION LITRES	EUROPE mainly Switzerland and the Netherlands

Source: Brazilian Ministry of Development, Industry, Trade and Services

In addition to the already established ethanol and biodiesel programmes, Brazil has publicly and privately funded projects that promise to increase the country's production of SAF (sustainable aviation fuel) to 1.1 billion litres per year by 2027,[6] showing its intention to become a major producer of advanced biofuels.

Brazil's relevance is not limited to the volume of biofuels exported; it also includes agricultural raw materials. The country is a major supplier of sugarcane, soybeans, corn, and beef tallow to international renewable fuel supply chains,[7] according to Irena (the International Renewable Energy Agency).

In 2024, 98.8 million tonnes of soybeans were exported.[8] China was the main destination with 64%, while the European Union came third, with 12% of the total.[9] The Brazilian Association of Vegetable Oil Industries (*Associação Brasileira das Indústrias de Óleos Vegetais*, Abiove) projects an increase in soybean exports in 2025.[10]

Sales of beef tallow, also used in biodiesel production, increased in 2024, reaching 320,000 tonnes – 30% more than the previous year.[11] The US was the main buyer, having purchased 94% of the product.

Exports of Brazilian biofuel raw materials in 2024

PRODUCT	AMOUNT	MAIN DESTINATIONS
SOYBEANS	**98.8** million tonnes	China and Europe
BEEF TALLOW	**320,000** tonnes	United States
CORN	**39** million tonnes	Europe, Iran, and Japan
PALM OIL	**408** tonnes	United States and Europe

Source: Brazilian Ministry of Development, Industry, Trade and Services

As a raw material for ethanol, corn also stood out with 39 million tonnes exported in 2024. [12]

These figures reflect the growth in Brazilian agribusiness exports, which totalled US$164.4 billion last year – the second-highest value in the time series – accounting for 49% of the country's total exports.[13]

Europe, for example, is one of the main destinations for Brazilian soybeans. The European Union organizes its biofuels market through the **REDs** (Renewable Energy Directives). Under **RED III**, approved in 2023, the overall share of renewable sources in the energy portfolio will increase to 42.5% by 2030, with the possibility of reaching 45%, and at least 14.5% of the energy used in transportation will come from renewable sources.

The European regulation also gradually restricted the use of raw materials at high risk of causing ILUC (Indirect Land Use Change) such as palm oil,[14] which is expected to be banned from the European market by 2030. Palm oil is one of the components of biodiesel.

In a lower scale, Europe still sources palm oil from Brazil, but exports have been declining. In 2024, 408 tonnes[15] were shipped to the Netherlands, the United Kingdom, and Portugal. In the previous year, the volume had been much higher, with approximately 7,000 tonnes going to the UK, Germany, and France.[16]

In the same context, soy is under increasing political and regulatory scrutiny in Europe.[17] The European Parliament discussed the possibility of extending the process to phase-out soybean-based biodiesel, but the measure has not been formally adopted so far.[18]

Civil society organizations such as T&E (Transport & Environment), WWF, and Oxfam are demanding that soy receive the same treatment as palm oil. Reports published over the past five years indicate that the expansion of soy plantations in Brazil's Cerrado and Amazon biomes creates environmental and social impacts comparable to those of palm oil in Southeast Asia, and they advocate its formal inclusion in the European debate on high ILUC risk biofuels.[19]

According to the IEA, the European Union has been progressively replacing conventional vegetable oils – such as palm oil and soybean oil – with advanced biofuels derived from waste and non-food raw materials, in line with the RED III sustainability criteria.

In 2023, the European Union also approved the **EUDR** (European Union Deforestation Regulation), which bans imports of coffee, soybeans, meat, timber, rubber, cocoa, and palm oil from areas

Plantation in Bahia, Brazil; soybeans are used in 70% of the biodiesel produced in Brazil

deforested after 2020. The regulation will come into effect in December 2025 and will require traceability and due diligence adaptations in supply chains. Traceability bottlenecks of Brazilian products linked to the biofuel supply chain will be addressed in the next chapter.

The United States also stands out as a producer and exporter of biofuels and raw materials for sustainable fuels. Its main regulatory framework is the RFS (Renewable Fuel Standard). It was created in 2005 and sets annual mandatory blending standards and creates the market for RIN credits (Renewable Identification Numbers), consolidating corn ethanol and soybean biodiesel supply chains in the country.

While the US is a major producer of corn and soybeans, about 45% of the raw materials for its biodiesel and renewable diesel come from foreign sources.[20]

Brazilian sugarcane and its derivatives are already prominent in American decarbonization initiatives. One example is **LanzaJet**, the world's first ethanol plant for **SAF**. Opened in 2024 in the United States, the company plans to use Brazilian ethanol in its operation.[21]

Another highlight is American imports of beef tallow, which soared between January and April 2024, up 377% compared to the same period of the previous year. Brazil accounted for approximately 40% of this volume, according to a Bloomberg survey.[22]

Brazilian sugarcane ethanol retained a significant share of Europe's supply. The *Biofuels Annual 2025*[23] report highlights the country as one of the main suppliers of biofuels to the European Union,

_ DO NOT CONFUSE

Are biodiesel, renewable diesel, and green diesel all the same product?

They differ in their chemical compositions, production processes, and engine uses

Biodiesel: *Fuel based on vegetable oils and fats from renewable sources. It is obtained through a chemical process called transesterification, which produces molecules different from those of fossil diesel, as it generates esters (acid with alcohol) and may require engine modifications or blending with diesel. Used without blending, it may present technical limitations in engines, such as increased oxidation and risk of clogging at low temperatures.*

Renewable diesel: *It is also produced from oils and fats from renewable sources, including waste, but it undergoes advanced processes such as hydrotreatment. One of the best known is HVO (Hydrotreated Vegetable Oil). The result is molecules identical to those of fossil diesel (hydrocarbons), allowing it to be used pure or blended, without engine modifications. It is considered an advanced or second-generation biofuel with better stability and performance, besides even higher potential for reducing emissions depending on the raw material used.*

Green diesel: *The use of the term varies according to the context. Governments use it generically to designate fuels produced from renewable sources, so it can be a synonym for both biodiesel and renewable diesel.*

alongside the United States and Canada, and projects expansion of imports in 2025.

Expanding biofuel use is also on the agenda of major economies in the Global South. China, for example, adopts flexible blending rates for ethanol and petrol, adjusted according to fluctuations in corn and sugar prices.[24] At the same time, the country has advanced in rural biogas production and is developing studies on SAF.[25] In 2024, they created the Sustainable Aviation Fuel Research Centre, which promotes renewable fuel as an alternative to achieving decarbonization targets.

Another important player in this market is India. According to the IEA, the country has established a plan to increase biofuel production through the Ethanol Blended Petrol Programme,[26] which currently provides for a blending rate of 10% ethanol in petrol and has set a 20% target for 2025-2026. The programme also offers technical support for fleet transition and engine adaptation to biofuels.

In the international debate, major producers such as India, Brazil, and the United States participate in the **Biofuture Platform** and the **Global Biofuels Alliance**, using these initiatives for technical cooperation, product standardization, and investment attraction.

THE BIOFUTURE PLATFORM[27]

This is a multilateral initiative launched under the IEA's Clean Energy Ministerial programme. The platform gathers governments, the private sector, universities, and civil society to promote low-carbon bioeconomy solutions. It is a forum for harmonizing carbon methodologies and metrics and coordinating national initiatives. The international fuel market is marked by trade tensions and tariff disputes, and the platform is a space for dialogue and technical cooperation.

Soybeans are the main raw material for biodiesel production

Main biofuels produced in Brazil

BIOFUEL	WHAT IT IS	2024 PRODUCTION
ETHANOL 1G: sugarcane/ corn	Alcohol from sugarcane and corn fermentation	37.3 billion litres
ETHANOL 2G sugarcane	Alcohol from sugarcane bagasse fermentation	Under implementation Projection: 1 billion litres by 2035 ~142 million litres/year in the first round of implementation
BIODIESEL	Made from vegetable oil and fats and blended with fossil diesel	9.1 billion litres
BIOMETHANE	Renewable gas from organic waste	81.5 million cubic metres
SAF	Kerosene derived from treated vegetable oil	Under implementation Projection of 2.8 billion litres by 2035
BIOELECTRICITY	Electricity from burning sugarcane bagasse	2.4 GW on average

Source: EPE – Analysis of the Biofuels Situation – Year 2024

_ TO UNDERSTAND
The Evolution of Biofuels in Brazil

Brazil structured its biofuel production trajectory with Proálcool, a programme created in 1975 in response to the global oil crisis

It offered incentives to expand ethanol production and make ethanol-powered vehicles viable in the domestic market

According to the government, more than 90% of the automobiles sold in the 1980s were ethanol-powered.[28]

With the drop in oil prices and the influence of sugar prices, ethanol-powered vehicles became less advantageous, and sales had fallen to 1% by the late 1990s. Even so, ethanol still plays a significant role in the country's energy portfolio, being added to petrol in proportions of up to 25%.

In the 2000s, the development of technology for flex-fuel vehicles, which run on both ethanol and petrol, once again boosted the national industry. Today, Brazil is the world's second-largest ethanol producer.[29] The current mandatory blending rate of ethanol in petrol sold at service stations is 30%, with new regulations indicating an increase to 35%.

Biodiesel, in turn, became part of the country's energy portfolio in 2005, when the regulatory framework was approved, mandating its blending with diesel used by the truck fleet. The blending rate was adjusted based on cyclical price factors and industry expansion. Currently, biodiesel accounts for 15% of the diesel sold and it is expected to reach 20%.

The sector is supported by the National Biodiesel Production and Use Programme (*Programa Nacional de Produção e Uso do Biodiesel,* PNPB), which has boosted the supply chain and diversified raw materials, consolidating the predominance of soybean oil and increasing the share of animal fats and residues in biodiesel production.

Furthermore, Brazil has invested in SAF and renewable diesel in recent years. Projects are underway, but there is no large-scale commercial production yet. The government expects to start officially implementing these projects in 2026.[30]

CASE STUDIES_

SOY AND DEFORESTATION IN BRAZIL'S "WATER RESERVOIR"

BIODIESEL

The biodiesel produced primarily for domestic consumption in Brazil comes mostly from soybeans, which account for 70% of its raw material. Therefore, the increase in soybean production directly impacts the sector. Despite being a renewable resource, the expansion of plantations could increase pressure to deforest the Cerrado, which surpassed the Amazon in 2023 as the country's most deforested biome.[31]

In 2013, Bunge opened a biodiesel plant in Nova Mutum, Mato Grosso, a major producer of soybeans. Investigations by **Repórter Brasil** revealed that a farm supplying the company illegally deforested 98.7 hectares of Cerrado, and the grains were shipped to a Bunge unit.[32]

The same problem has already been found by **Repórter Brasil** at other Bunge units in the Cerrado. In 2023, three supplier farms located in the so-called Matopiba region together, had approximately 11,000 hectares of recent deforestation, with one case involving 6,800 hectares cleared within mandatory preservation areas.[33]

A Mato Grosso-based company in which Bunge is a minority shareholder – an indirect supplier linked to Agrícola Alvorada – received soybeans from a

producer sanctioned for illegal deforestation. At the time, Bunge declared that it kept strict socio-environmental control of more than 12,000 farms, using satellite monitoring. It also announced that, starting in 2025, it would block purchases from areas opened by clearing vegetation, even when authorized. Agrícola Alvorada stated that the aforementioned producer was not on any government embargo list when they received the product.[34]

Agricultural Expansion into the Cerrado

Approximately half of Europe's soybean imports come from Brazil.[35] Much of it originates in the Cerrado, a savanna that is the second largest Brazilian biome and serves as the country's water reservoir.[36] It is home to the headwaters of rivers vital to national agriculture such as Araguaia and Tocantins, as well as the Guarani aquifer, the second largest in the world, which covers almost 25% of the country's territory.

The area planted with soy in the biome has increased 16-fold since 1985, according to Mapbiomas.[37] The Cerrado has already lost almost half of its native vegetation – 74% was replaced with farming.[38] This expansion does not take place on empty land. The consequence, documented by civil society organizations, is the worsening of land conflicts, increased land grabbing, and private abstraction of water for irrigated crops.

The 2021 dossier "On the Border of (Il)legality: Deforestation and Land Grabbing in MATOPIBA" documented threats to traditional communities in Mato Grosso, Tocantins, Piauí, and Bahia. They were the targets of lawfare and forced evictions.

The Matopiba area accounted for 41% of the loss of native vegetation in the Cerrado, making it the main deforestation frontier.[39] According to an investigation by Global Witness, large trading companies buy soybeans from rural producers linked to these conflicts.[40]

T&E warns that EU policies encourage the expansion of the agricultural frontier, with soybeans as the second-largest emitter of greenhouse gases among biodiesel raw materials due to the deforestation it causes.[41]

The ICCT (International Council on Clean Transportation) points out that the demand for soybeans to produce biofuels is pushing the crop into areas previously covered by pastures – which, in turn, are replacing carbon-rich native vegetation areas such as the Cerrado.[42]

The approval of the European Union's anti-deforestation law comes in response to this pressure, but it excludes areas classified as "non-forest" by FAO (the UN Food and Agriculture Organization). This criterion leaves out 73% of the Cerrado, according to a study by the Climate Observatory.[43]

Amazon: Attacks on the Soy Moratorium

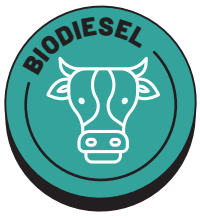
Instruments such as the **Soy Moratorium**, created in 2006, ban purchases of grain from Amazon areas deforested after July 22, 2008. Considered key to curb deforestation of the biome, the moratorium was preventively suspended by Brazil's Administrative Council for Economic Defence (*Conselho Administrativo de Defesa Econômica*, CADE) in August 2025 at the request of lawmakers linked to agribusiness.

Environmentalists denounced the measure as political: Greenpeace stated that it favours those who profit from the destruction of the Amazon, and Mighty Earth called the moratorium "perhaps the most effective environmental protection mechanism" in Brazil.

The suspension lasted only a few days. A Brazilian court cancelled the effects of CADE's decision and reinstated the Soy Moratorium while the merits of the case are still being examined. The judge pointed out the risk of environmental and economic damage if purchases of soybeans from deforested areas are authorized.[44]

The attacks on the moratorium are not limited to the federal level. In 2024, state governments began withdrawing incentives from companies that keep the pact, with the state of Mato Grosso going as far as enacting a law to this effect.[45]

The soy moratorium is in force, but it has its flaws. **Repórter Brasil** has already exposed purchases by trading companies from producers with embargoed areas and the use of "soy laundering" to mask the origin of the product. These loopholes allow soybeans from recently deforested areas to enter the supply chain, including through routes that supply biodiesel production in Brazil and abroad.[46]



BEEF TALLOW PUTS THE IMPACTS OF LIVESTOCK FARMING IN THE WAY OF 'GREEN' FUEL

Beef tallow is an important raw material for biodiesel in Brazil, but its use to produce "green fuel" masks socio-environmental risks. Because the fat is directly associated with livestock farming, its supply depends on a sector marked by deforestation[47] and responsible for 10%–15% of global GHG (greenhouse gas) emissions, according to UN estimates. In Brazil, livestock is the main source of this problem.

Brazil's beef tallow has gained international importance, supplying renewable diesel and **SAF** (Sustainable Aviation Fuel) chains. The United States is a major importer. The country received

63,000 tonnes of the product in 2022 and 202,000 tonnes in 2023; in the first eight months of 2025, Brazil exported 274,000 tonnes.[48]

American company DGD (Diamond Green Diesel), which claims to be the largest producer of renewable diesel in the United States and the second largest in the world,[49] has increased its tallow purchases and is part of a direct supply network from Brazil, through one of its parent companies.

DGD is a joint venture of Valero Energy and Darling Ingredients, which are also US-based companies. In 2022, Darling acquired the Fasa group, a Brazilian company that processes slaughter waste and operates in the Amazon. Customs documents obtained by **Repórter Brasil** indicate that DGD has been importing beef tallow from subsidiaries of the Fasa group since its acquisition by Darling.

DGD's supply chain includes Mato Grosso-based Frialto, a meatpacker that purchased cattle from rancher Bruno Heller. Arrested in 2023 and called the "largest deforester in the Amazon" by the Federal Police, Heller was accused of destroying an area equivalent to 12,000 American football fields.[50]

Beef tallow is the fat removed from carcasses and other inedible parts of cattle after slaughter. Treated as waste, it has gained importance in the energy transition.[59] Because it is classified as such, its use is interpreted by companies and institutions in the sector as a form of "animal recycling," aligned with the so-called circular economy. Under RenovaBio, it is considered a raw material of high environmental performance because it is a byproduct.[60]

Beef tallow is a raw material for biodiesel production. Brazilian exports of animal fat

There are also cases of human rights violations associated with tallow exports. Aramco Americas, a subsidiary of Saudi Arabia's state-owned oil company, imported tallow from a unit of Brazilian meatpacker Minerva in 2023 and 2024. In February 2024, the company purchased animals for slaughter from a farm where, eight months earlier, Ministry of Labour and Employment (MTE) inspectors had found 13 workers in slavery-like conditions.[51]

'Green' Seal and Valuable Waste

Tallow shipments abroad can be accompanied by certification. In 2020, for example, JBS shipped 3.6 million litres of biodiesel to Rotterdam.[52] The company was certified[53] by ISCC (International Sustainability & Carbon Certification). For two years, it also topped the ranking of meatpackers with socio-environmental irregularities following audits by the Federal Prosecution Service.[54]

DGD's Texas plant also holds the same seal to process animal fat into renewable diesel.[55]

For the ISCC, the traceability of "waste" such as tallow begins at the point of production, that is, meatpackers, without going back to farms.[56] The result is a governance gap: tallow from cattle raised in deforested areas or in places where labour violations have been found can enter the energy supply chain. It is in the rural link that environmental and social liabilities arise – illegal logging of native forests, land disputes, embargoed areas, and people rescued from slave labour – and it is precisely this link that remains invisible.

> **Because it is classified as waste, tallow also optimizes companies' results in programmes like RenovaBio. In GHG emissions calculations, it is only accounted for after it is collected at the meatpacker or rendering plant. The animal's farm phase is excluded from the carbon footprint calculation.[57]**

The idea that tallow is worthless waste is not borne out in practice. In Brazil, everything from cattle is put to use, and tallow has been used in hygiene, cosmetics, and food industries for decades. With growing energy demand, the price has increased[58] and competition for the raw material has intensified, undermining the argument that it is merely waste.

OIL PALM:
DISPUTES WITH INDIGENOUS PEOPLES IN THE LAND OF COP30

In the case of oil palm, the expansion of plantations intersects with land disputes in the Amazon. In Pará, the host state for COP30, it has a history of land disputes and reports of violence against traditional populations. This backdrop of conflicts intersects with the energy supply chain, which uses palm oil and its byproducts as raw material for biodiesel and renewable diesel, and plans to produce SAF.

In Acará and Tomé-Açu, Pará, riverside and quilombola communities and the Tembé Indigenous people report land enclosures, access restrictions, and armed surveillance in areas dominated by oil palm plantations. According to the communities, the situation worsened after BBF took over farms and oil mills previously owned by Biopalma, a company created by Vale in 2020. Local leaders reported gunfire incidents, threats, crop destruction, and violent attacks by security guards. **Repórter Brasil** accessed police reports, images, accounts of injuries and forced displacement, as well as lawsuits filed by affected communities.[61]

BBF announced commercial partnerships to supply raw materials to SAF[62] projects in Brazil, consolidating oil palm as an important energy item.

Oil palm sector is the "champion" of labour lawsuits in Pará

Biovale, which is owned by BBF, is one of four palm oil companies cited in a survey by the 8th Regional Labour Court. The study, commissioned by **Repórter Brasil**,[63] counted 1,697 labour cases involving companies in Pará – more than a third of the cases among the court's ten largest litigants. The lawsuits were filed by workers who reported problems with food, access to drinking water and toilets, as well as disputes over productivity and commute times.

Oil palm plantation near the Turé Mariquita Indigenous Land in Pará. The oil extracted from its fruit is used in biodiesel production

New cases of slave labour were found on plantations of sugarcane, a raw material for ethanol production

NEW BOOM IN SLAVE LABOUR ON SUGARCANE PLANTATIONS

New cases of slave labour were found on plantations of sugarcane, a raw material for ethanol production.

In March 2023, 32 workers were rescued from slavery-like conditions on a sugarcane plantation supplying sugar and ethanol to Colombo Agroindústria in Pirangi, São Paulo. The company is a supplier to Raízen, according to documents related to trading of agribusiness letters of credit and bonds accessed by **Repórter Brasil**.[64]

According to federal government inspectors, the group had no access to toilets or drinking water at the work site. "The workers arranged for old, dirty, and torn mattresses to be placed directly on the floor or on makeshift beds to avoid contact with venomous animals in their accommodation," reads an excerpt from the inspection report.

The slave labour charge was filed against the company providing the services, which was sanctioned for subjecting workers to conditions considered degrading, according to the inspectors.

The rescue is part of a series of cases that mark a new slave labour boom in sugarcane. Experts attribute this increase to plantation outsourcing, which has diluted control of and accountability for working conditions.[65]

A leader in the biofuels sector, Raízen is the world's largest producer of sugar and ethanol and ranks sixth among Brazilian agribusiness companies, according to the 2024 Forbes list.[66] The company also distributes and sells fuel at Shell stations in Brazil and neighbouring countries, which makes it a major global player in ethanol.[67] It became a pioneer in the sector when it obtained certifications that enabled it to supply the emerging SAF market.[68]

Details of this and other cases can be read in the report Enslaved in Ethanol, which highlights connections between multinationals and biofuel suppliers implicated in serious human rights violations.[69]

CONSTRUCTION AT ETHANOL PLANT EMPLOYING SLAVE LABOUR ACCESSED CLIMATE FUND

3Tentos, a company that produces and sells grains and works with biofuels, obtained R$500 million in loans from the Climate Fund linked to the Brazil's Ministry of the Environment *(Ministério do Meio Ambiente, MMA)*, to build a corn ethanol plant. Biofuel is classified as "green energy," which makes it easy to get loans in the sector.

A fire at the construction site caught authorities' attention and triggered an inspection of working conditions, which resulted in the rescue of 563 workers.[70] The plant was being built by construction company TAO, which was sanctioned for the conditions imposed on the workforce found by the Ministry of Labour and Employment *(Ministério do Trabalho e Emprego, MTE)*, the Labour Prosecution Service *(Ministério Público do Trabalho, MPT)*, and the Federal Police.

According to the inspectors, the workers slept in precarious conditions without water or electricity, with dirty toilets, overcrowded rooms, and no ventilation. Outraged by the situation, they started a fire at the plant's construction site.

In addition to the degrading conditions, inspectors found situations of debt bondage. Evidence of human trafficking was also found, with workers being recruited from states in Brazil's North and Northeast regions.

In a statement, 3Tentos stated that it is monitoring the case and weighing "appropriate action." TAO, meanwhile, stated that the fire was arson caused by an "isolated group of workers" and said it has been cooperating with authorities. "TAO vehemently condemns any practice of slavery-like labour or human trafficking."

Asked by **Repórter Brasil**, the development bank stated that it notified 3Tentos to provide clarification on the case and decided to suspend funding "until further investigation." The Ministry of the Environment confirmed the suspension.

RECOMMENDATIONS: **AN AGENDA FOR THE SECTOR**

Five decades separate Proálcool from the current effort to consolidate biofuels as part of the energy transition. In the 1970s, the main motivation was to reduce dependence on oil. Today the debate is different: are biofuels truly a viable alternative to combat global warming? How can we be sure that biofuel supply chains are free from socio-environmental violations?

Experts state that biofuels made from agricultural crops such as soybeans, sugarcane, and palm oil tend to replace other activities, putting pressure on the land and posing considerable risks to native forests.

According to the ICCT, RenovaBio does not count ILUC emissions, which could make a "low-carbon" biofuel more polluting than fossil diesel. Still, the programme seeks to minimize risk by limiting the raw material to already cleared areas – with no conversion of native vegetation after 2018 – and requiring registration at the Rural Environmental Register (*Cadastro Ambiental Rural*, CAR), in accordance with Brazil's Forest Code.

When assessing the actual climate impact of biofuels, T&E recommends including the expansion of agricultural areas. According to the organization, when this effect is considered, fuels derived from crops such as soybeans and oil palm tend to worsen the climate situation rather than mitigate it. The organization advocates phasing out support for oil palm and soybeans by 2030 and suggests investing in more efficient alternatives such as electrification in road transport and renewable hydrogen for aviation and navigation.

Chris Malins from Cerulogy, a renewable and low-carbon fuels policy consultancy, states that soybeans are one of the biodiesel feedstocks most associated with the conversion of high carbon stock areas, keeping continued pressure on the Cerrado, even with improved policies to combat deforestation in the Amazon.

Timothy Searchinger, a senior researcher at Princeton, underscores the inefficiency of producing fuels from plants: one hectare of solar panels generates much more energy for an electric car than the same area planted for ethanol. He believes that subsidizing biofuels from food crops should not be the priority, and resources should be redirected to protect forests and improve livestock and agriculture in already productive areas. As a concrete measure, he proposes an aviation tax of approximately US$100 per tonne of CO_2, which could generate approximately US$100 billion per year to fund forest protection and sustainable intensification of livestock farming, thus reducing the pressure for further deforestation.

SAFEGUARDS FOR BIOFUELS

Researchers argue that the sector's expansion must be accompanied by **effective traceability** and **due diligence in supply chains**.

Ane Alencar, Director of Science at the Amazon Environmental Research Institute (*Instituto de Pesquisa Ambiental da Amazônia*, IPAM), says: "Biofuels are important, but they must be produced in a way that allows us to monitor whether they are doing more harm than good." She believes this requires "enhanced traceability" to avoid opening new areas to meet demand. "The sector's expansion needs to be well planned to avoid more deforestation," she adds.

An example of how the complexity of the supply chain can create problems is the case of deforestation associated with the beef tallow supply network. Multiple suppliers and the fact that volumes are mixed at meatpacking plants make it difficult to identify the origin of each portion of the material that may be processed into fuel. IMAFLORA's ESG director Eduardo Trevisan notes that, despite the challenges, it is technically possible to implement traceability with animal identification and transport documentation as long as there is "adequate infrastructure, training, and legislation."

The experience of the meat supply chain can be transferred to biodiesel. Alencar suggests linking beef tallow traceability to existing cattle documentation such as Animal Transit Registrations (GTA, *Guias de Trânsito Animal*). This would help organize the data flow and be sure about the origin of the material. She believes the sector's expansion will only be viable if buyers demand proof of origin and contribute to structure the system.

Richa Mittal, vice president of the Fair Labor Association, emphasizes that companies are responsible for due diligence regarding labour and that the cost of compliance does not justify inaction. She advocates preventive investment in mechanisms for field assessment of risk, with on-site audits, reporting channels, and corrective actions.

CONCRETE MEASURES BY THEME

LAND USE

- Expanding plantations only in **already cleared and degraded areas.**
- **Mapping the origin** by polygon or plot and **publish**, by processing plant, each year, the **percentage of deforestation-free raw material** and the methodology used. Starting in 2026, the European Union will require operators and traders to submit a due diligence declaration with the geolocation of all plots where commodities were produced or harvested.[71]
- **Avoiding indirect deforestation**, which increases the risk of ILUC.

SUPPLY CHAINS

- **Implementing meat traceability for tallow:** identifying animals, linking the **tallow batch** to the **slaughtered cattle** via documentation (GTA, invoices, and transportation documents), and maintain an **auditable supplier network** from meatpacker to processing plant.
- Creating a **sector-wide measurement, reporting, and verification programme for byproducts** (such as tallow), with a **single standard** and **independent audit**; providing **support** for small suppliers to adapt.
- **Disclosing minimum tracking data** to enable social verification.
- **Conducting mandatory pre-screening** of suppliers based on **environmental embargoes, evidence of slave labour, and overlap with Indigenous Lands/ Conservation Units**, with a **suspension trigger** and **remediation plan.**

LABOUR AND FINANCE

- Implementing **proactive labour due diligence**: on-site risk assessment; functioning **reporting channels**; **on-site audits** commensurate with risk, and **verifiable remediation.**
- Defining socio-environmental **eligibility criteria** for **CRA/FIAGRO** and requiring **independent verification** with **disclosure accessible to investors.**
- Conducting **rigorous analysis while structuring** bonds, with **continuous monitoring** and **automatic cross-referencing** with CAR, embargoes, and public lists throughout the life of the security.

Who will foot the bill?

For experts, the cost of implementing traceability measures cannot be passed on to the weakest link: consumers. Trevisan, from IMAFLORA, states that, to be effective, a traceability system needs to be implemented throughout the supply chain. He advocates incentives for small producers and smaller meatpackers, as well as co-financing by large buyers and exporters. Alencar emphasizes that the demand for traceability must come from buyers, especially global players like Europe and segments that dictate supply chain standards.

On the labour front, Mittal recommends that standards and enforcement in destination markets – such as the US and the EU, with rules against forced labour – put pressure on global supply chains. She believes that exporters need to finance compliance and demonstrate control over suppliers.

Felipe Barcellos, a project analyst at the Institute of Energy and Environment *(Instituto de Energia e Meio Ambiente, IEMA)*, proposes shared responsibility and public policies that prevent the burden from being shifted to the weakest link. In practice, this means making access to markets and credit conditional on minimum traceability and transparency criteria for investors and consumers. For Barcellos, expansion should prioritize already deforested areas and clear non-conversion metrics, with compliance costs shared among those who produce, process, finance, and purchase. ■

ENDNOTES

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