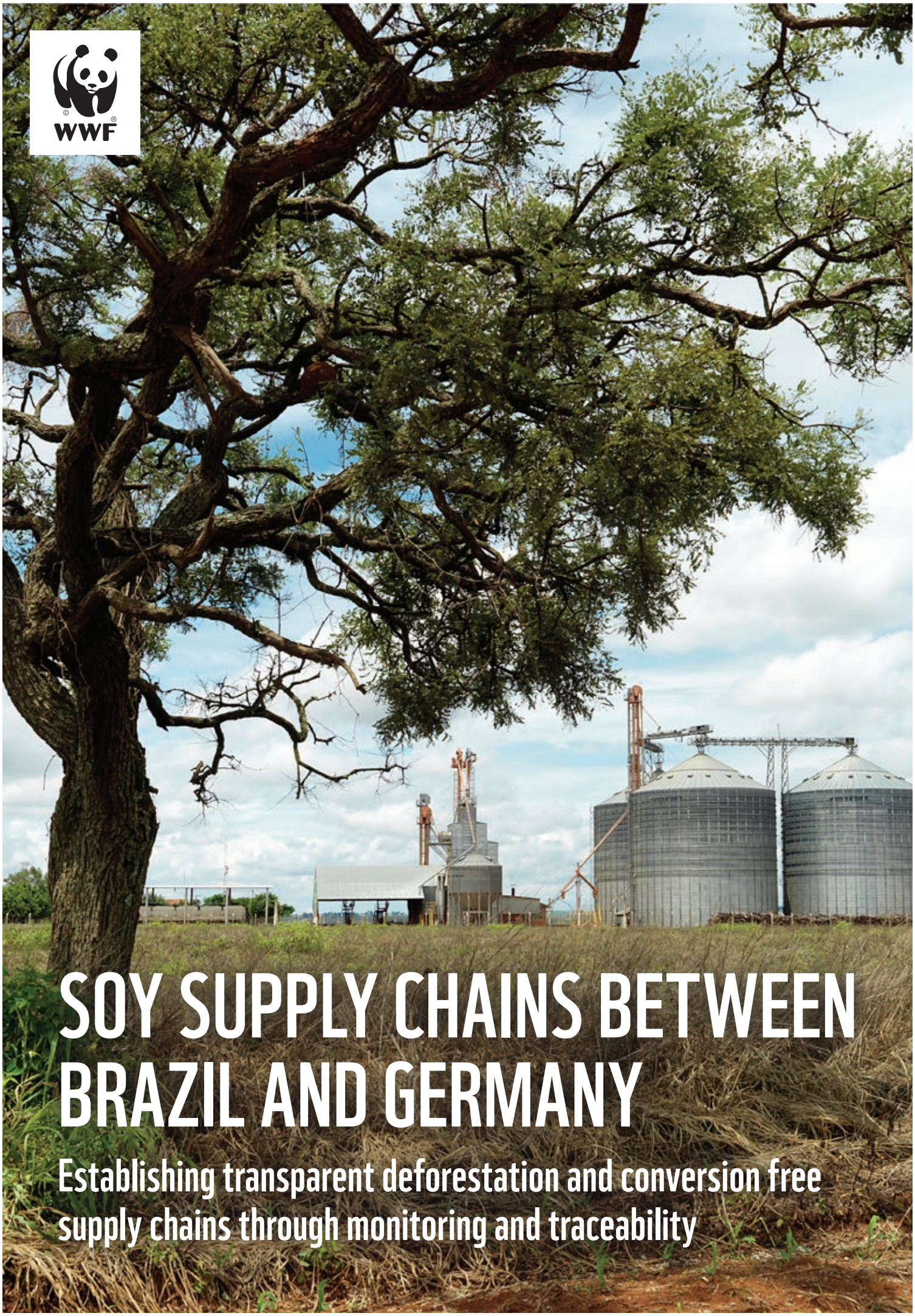

SOY SUPPLY CHAINS BETWEEN BRAZIL AND GERMANY

Establishing transparent deforestation and conversion free supply chains through monitoring and traceability

Imprint

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Contents

1. Introduction

Soy plays a pivotal role in the global food system due to its high protein and energy content. Soybeans are not only processed into food products like tofu, soy oil and meat substitutes, the crop is also processed into soybean meal, which is used as an important source of protein to feed poultry, hogs, dairy cows, farmed fish and beef cattle. As a result, soy is integral to the supply chains of other commodities like eggs, pork, and poultry meat, and dairy.

In the past two decades, soy cultivation has expanded significantly – mainly to meet rising demand for animal products. However, this growth has come at a significant cost to the environment. Vast areas of forest, savannah and grassland have been cleared over the last few decades to produce soy.[1]

In Brazil between 2013 and 2020, the expansion of soybean production was responsible for the deforestation and conversion of almost 6 million hectares of natural ecosystems.[2] After the expansion of pasture for cattle farming, soybean production is the next largest driver of deforestation in Brazil.[3] The acreage devoted to soy plantations in Brazil is expected to grow by almost 27% over the next decade, mainly through conversion of degraded pastureland and the development of new agricultural areas.[4]

6 million
hectares are deforested in Brazil

Additionally, the loss of natural ecosystems like tropical forests due to soy production and other drivers harms biodiversity and alters rainfall patterns and the local climate. The conversion of native vegetation – a forested area – to soy cultivation causes a three-fold increase in runoff precipitation and leads to a drying of the local climate.[5] Deforestation also destroys the livelihood of forest-dependent Indigenous peoples and local communities and can lead to their displacement.[6]

Consumers in the European Union (EU) are partly responsible for the conversion of ecosystems caused by soy in Brazil. In 2015, 20% of the deforestation resulting from soy production was linked to EU imports.[7] Companies that buy and sell soybeans – and the many products linked to this commodity – will play a crucial role in ending the conversion of natural ecosystems for soy farming.

The Accountability Framework initiative (AFi), a collaborative effort of civil society organisations, calls on companies to commit to eliminating deforestation and the conversion of all natural ecosystems from their operations, supply chains and financial investments.[8] Any production

area that was established on land that was forest or native vegetation before 1 January 2020, is considered non-compliant with no-deforestation or no-conversion commitments as set out by the AFi.

EUDR putting pressure on companies to monitor and trace soy

The EU Deforestation-free Regulation (EUDR), which entered into force on 29 June 2023, prohibits companies from selling products on the EU market unless they are deforestation-free and legally produced. This means that the products covered by the EUDR (e.g. meat and dairy) that contain, have been fed with or have been made using soy, palm oil, cocoa, rubber, cattle, coffee and wood must have been produced on land that has not been subject to deforestation after 31 December 2020. Under the regulation, it is also illegal to export any such products from the EU. The regulation is already putting pressure on companies to monitor and trace soy in their supply chains.

While the AFi provides a roadmap for establishing ethical supply chains by addressing deforestation, conversion and human rights in the agriculture and forestry sectors, the EUDR sets out clear legal requirements for companies to meet. Transparency will be crucial for achieving Deforestation and Conversion Free (DCF) goals and complying with the EUDR. Achieving transparency, however, is challenging, especially in soy supply chains due to various direct and indirect uses of soy and because commodities circulate through multiple collection and shipping points in supply chains. For companies to establish transparency and effectively manage ecosystem conversion risks in their soy supply chains, they need robust tools and mechanisms to monitor and manage these risks.

A monitoring, reporting and verification (MRV) system encompasses all processes for collecting, verifying, and reporting on supply chain policies and on specific metrics to assess and document the extent to which actions, progress, performance, and compliance are being carried out or achieved. Monitoring and traceability are two crucial elements of an MRV system to help companies retrieve, structure and report data on the volumes of their raw materials and the risks of ecosystem conversion associated with their sourcing. Suitable tools for any given company or supply chain depend on factors such as the raw material/commodity, sourcing origin, position in the supply chain and the company's capacity. However, companies struggle to identify which tools are right for them because they lack clarity on what effective tools entail and which data can play the decisive role at what points in the supply chain.

2. Approach to the study

2.1. Objective

This report aims to advance the sustainable procurement of deforestation and conversion free soy in Germany. To this end, it seeks to guide German companies on the monitoring and traceability approaches that should be used regarding the soy supply chain in Brazil to improve transparency and move towards DCF soy supply chains.

2.2. Methodology

The study was conducted through desk-based research and 13 stakeholder interviews with soy supply chain experts in Brazil and representatives of retailers and manufacturers in Germany (see Table 1). The inputs gathered in stakeholder interviews were used to identify challenges and possible options for the monitoring and traceability of soy from Brazil.

Based on the findings from desk-based research and interviews, the report also describes how the traceability and monitoring of two soy supply chains could be structured in practice.

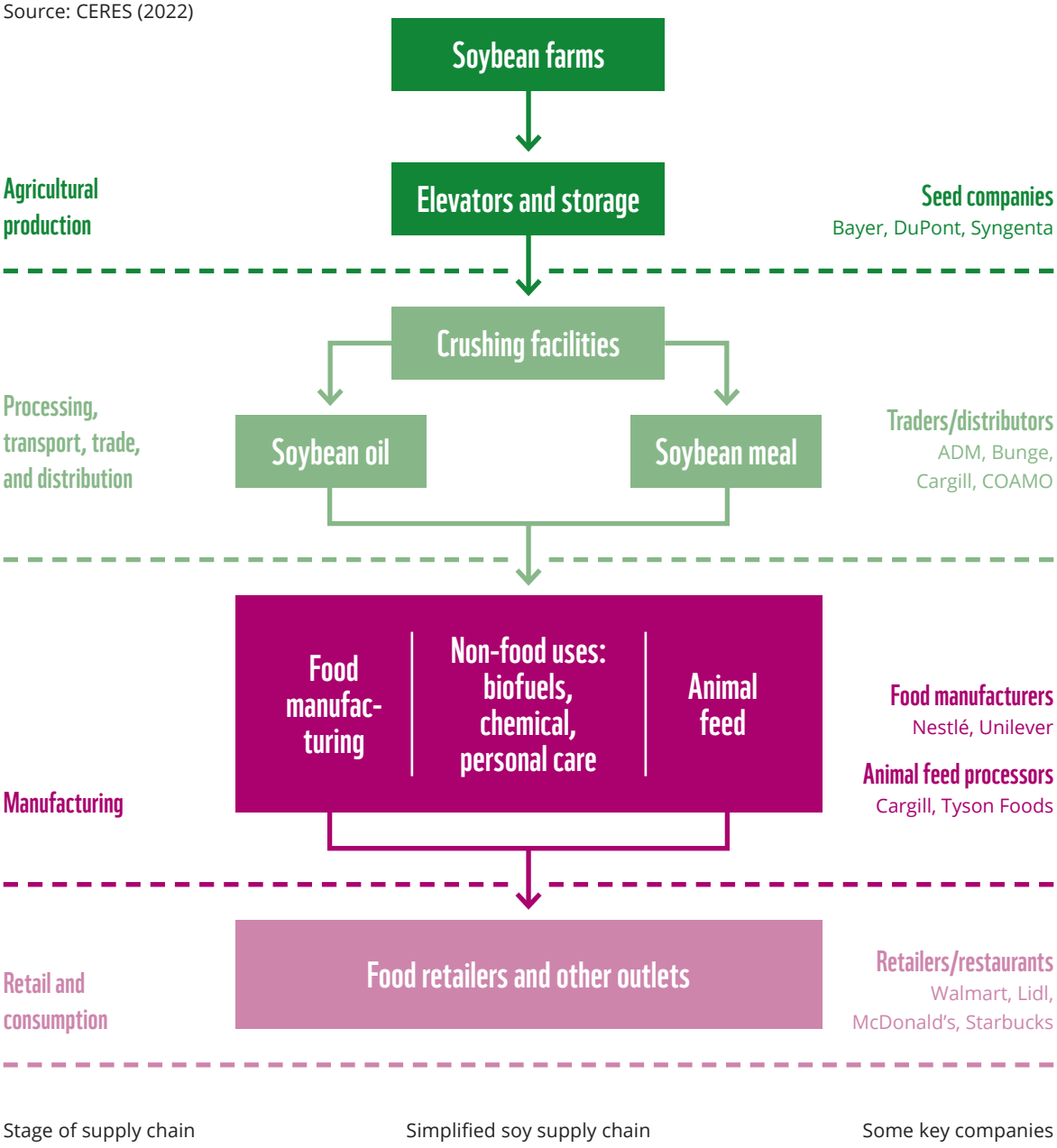
Table 1:
Stakeholders interviewed

Name	Organisation
Veronique Bovee	Proforest
Jane Lino	Proforest
Tiago Reis	Global Canopy Trase
Leah Samberg	Rainforest Alliance Accountability Framework initiative
Fernando Nauffal	Independent soy supply chain consultant
Anne Rosenbarger	World Resources Institute
Laura Echternacht	osapiens ftrace
Roland Heipke	osapiens ftrace
Sven-Heiko Hassebroek	AGRAVIS
Christian Grütters	AGRAVIS
Hannah Mittner	Lidl
Daniel E Silva	WWF Brazil
Jean François Timmers	WWF Brazil

3. Soy supply chains

Soy supply chains typically start with producers growing soybeans on medium-sized to large farms. These soybeans are then processed as food for human consumption or feed for animals, finding their way into multiple products sold in food and feed markets around the world. However, the path of soy from farm to table is not always straight forward. Along the way, multiple actors trade and process soy into a wide range of products that form part of our daily diets.

Figure 1:
Typical soy supply chain.
Source: CERES (2022)

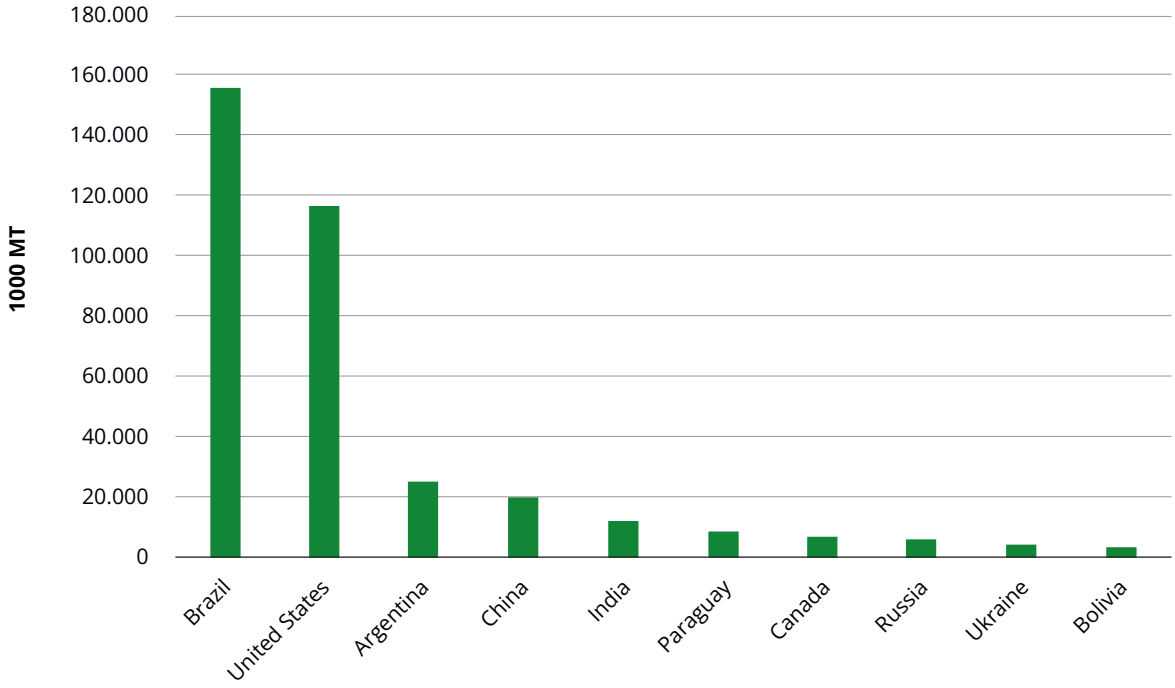


3.1. Where and how is soy produced?

Soybean is the second largest oil crop by volume in the world and is produced primarily by three countries: the United States, Brazil, and Argentina. In 2021, these three countries together were responsible for 83% of global soybean output. Other significant producers include China, India, Paraguay and Canada (see Figure 2).[9]

In 2021, global soy production was 372 million metric tonnes.[10] Soybean production has more than doubled since 2000.[11] This is primarily in response to demand from China and Europe for soy-based animal feed.[12]

Figure 2:
Largest soybean producer countries (1000 MT).
Source: USDA (2022)



Soybean production comes at a large environmental cost. Its production requires significant amounts of resources like energy, water, agro-chemicals, and soil. This means that large swaths of forests, savannahs and grasslands are cleared for growing soybeans, which in turn endangers invaluable habitats and biodiversity while putting at risk traditional, local livelihoods.

In Brazil, unsustainable soy production threatens natural ecosystems like the Amazon rainforest and the Cerrado, which is a vast, forested savannah, covering nearly a quarter of Brazil's land area.[13] However, today, over half of the Cerrado's 100 million hectares of native landscape has been lost largely due to livestock and soybean farming.[14]

3.2. Where and how is soy consumed?

China is the world's largest importer of soy, followed by the EU and the United Kingdom. Between 2019 and 2020, China accounted for 60% of traded soybeans and 9% of traded soybean meal, representing a combined share of approximately 42% of all traded soy products.[15] Together, the European Union and the United Kingdom accounted for 10% of soybean imports, 30% of soybean meal imports and 6% of soybean oil imports, or a share of around 15% of total global traded soy products during the same period.[16]

Nearly all soy used for livestock

The majority of soybeans produced are not consumed directly as food. Only 15% of global soybean production is used for human consumption. By contrast, 17% of the world's soybean production is allocated to soy oil, while a significant 68% is used as soy meal. Nearly all of this soy meal is used for livestock (primarily for beef, chicken, egg and dairy production), spanning products such as milk, cheese, butter, yogurt and various other products.[17] Soy oil is used for cooking and can also be found in margarine, chocolate, ice cream or baked goods, as well as in cosmetics and soaps.

3.3. Soy supply chains between Brazil and Germany

48 Billion
US $ generated by soy exports

Brazil is the world's largest soy producer and exporter. In 2020, the country produced almost 135 million tonnes of soy.[18] About 78% of Brazil's soy production that year (105.5 million tonnes) was exported in various forms: raw soybeans (82%), soybean meal (16%) and soybean oil (2%).[19] Generating annual revenues of almost US$ 48 billion, soy was Brazil's second largest export.[20]

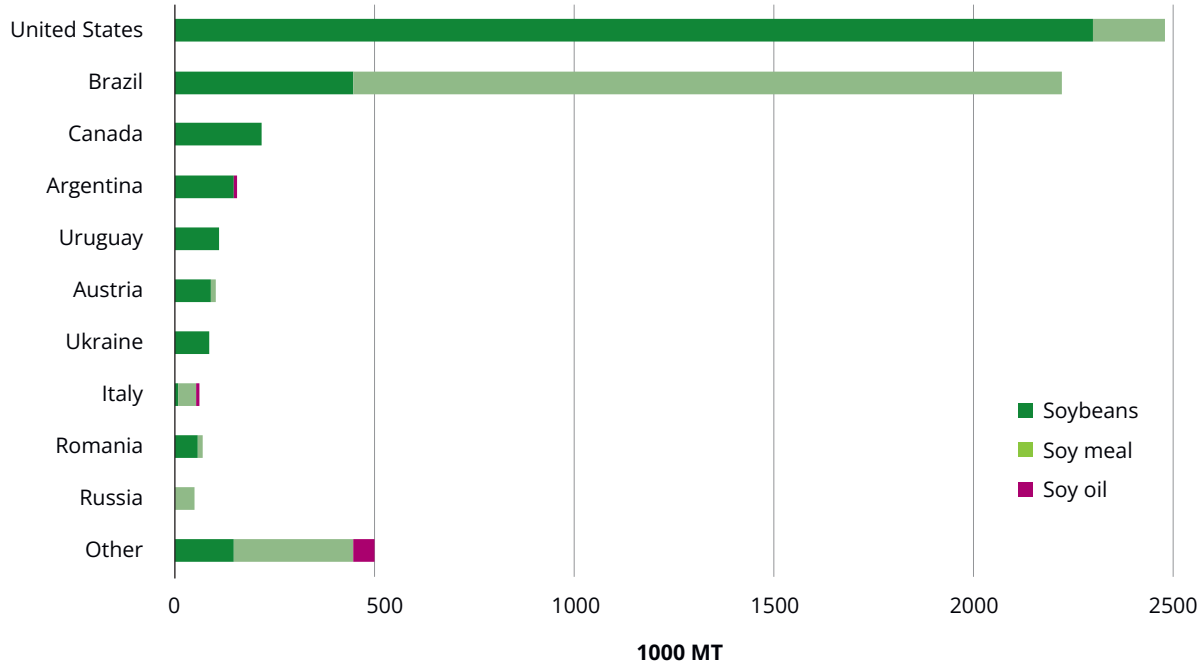
Germany mainly imports soy from Brazil in the form of soybean meal and unprocessed soybeans. The volume of soybean oil traded between Brazil and Germany is negligible (see Table 2). Around 31% the of soy imported to Germany is re-exported (mostly to other European countries) and the remainder is used for domestic consumption.[21]

Table 2: Soy trade balance, Germany, 2019. Source: Deutsche Umwelthilfe (2020)

Soy products (1000 MT)	Import	Domestic production	Processing (crushing)	Crushed products	Export	Net consumption in Germany
Soybeans	3,664	84	3,256	-	81	305
Soybean meal	2,320	-	-	2,556	1,653	3,223
Soybean oil	94	-	-	602	169	527
Total	**6,078**	**84**	**3,256**	**3,158**	**1,903**	**4,055**

Soy imported to Germany is primarily used as feed in the country's dairy and meat sectors. From 2004 to 2019, the country had average annual imports of 5.18 million tonnes of soybean equivalents, positioning it as the second-largest soy importer in Europe. Historically, most of the soy imported to Germany comes from Brazil, the United States, Canada, and Argentina. The United States mainly supplies soybeans, while imports from Brazil are in the form of soy meal (see Figure 3).

Figure 3: Origin of German soy imports in 2019 (1000 MT). Source: Deutsche Umwelthilfe (2020)



Environmental impacts of Germany's soy imports from Brazil

In 2020, the soy imported to Germany from Brazil was farmed on 229,000 hectares of land.[22] That is nearly equivalent to the combined areas of Berlin, Hamburg, Munich and Frankfurt. In Brazil, the expansion of soy cultivation is the second largest direct driver of deforestation and conversion of native vegetation after the expansion of pasture for cattle farming.[23] Land speculation is mainly attributed to soy production. First the land is cleared and transformed into pasture and few years after the land is sold at high cost to soy growers. Most (79%) of Germany's imported soy from Brazil is grown in the Cerrado biome while the remaining soy comes from Atlantic Forest and other biomes (see Table 3 below).

Table 3: German soy imports and related land use from different biomes in Brazil for 2020. Source: Trase.earth (2023)

Biome	Land use (hectares)	Volume (tonnes)
CERRADO	200,908.3	730,281.0
MATA ATLANTICA	57,346.8	212,984.8
AMAZONIA	32,044.4	111,381.9
PANTANAL	16.9	63.0
Total	**290,316.4**	**1,054,710.7**

These soy imports link Germany to the conversion of more than 3,000 hectares of forests and natural vegetation. Among the Brazilian municipalities, Formosa do Rio Preto, Alto Parnaiba and Urucui accounted for 62% of the total soy-related deforestation risk directly imported by Germany.[24]

Who are the key actors in the soy supply chain between Brazil and Germany?

There are about 240,000 small, medium-sized and large soybean farms in Brazil that meet the needs of importing countries including Germany.[25] Soybean production in Brazil occupies an area of approximately 35 million hectares, comprising a third of the total area of global soybean cultivation.[26] In 2023, Mato Grosso was the largest soy producing state in Brazil, followed by Paraná, Rio Grande do Sul, Goiás and Mato Grosso do Sul.[27] Most of the soy in Brazil is produced by large industrial farms, each of which covers an area of more than one thousand hectares and has their own grain storage facilities.[28]

Producers sell their grain mainly to traders or crushers, who can be cooperatives or private companies. Large farms deal directly with exporters, which can make traceability easier. Small and medium-sized farms trade with intermediaries. This creates longer, indirect supply chains that make traceability more difficult and impose challenges for ensuring DCF compliance.[29]

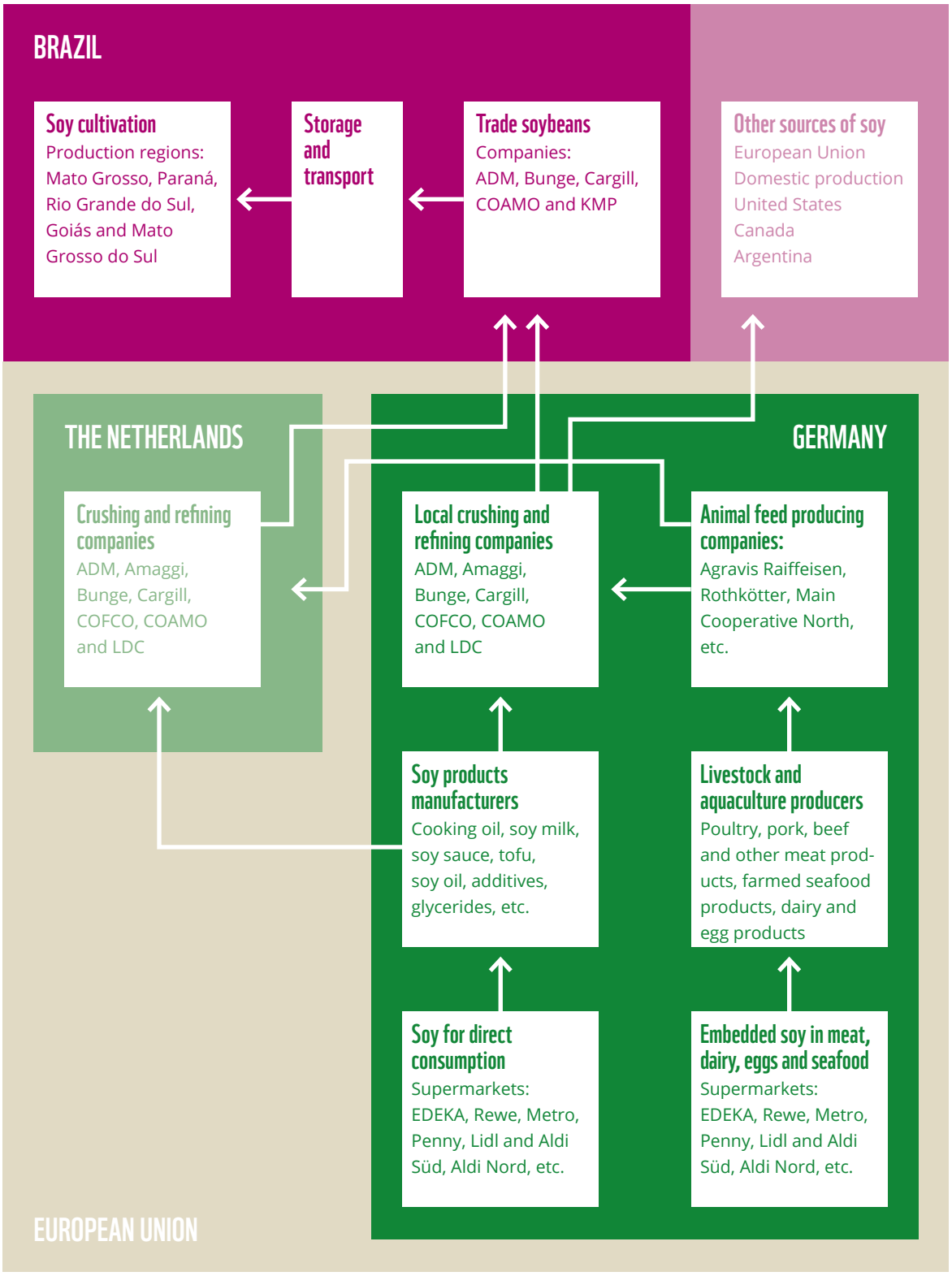
Supply chain dominated by 19 companies

A few companies dominate the upstream soy supply chain from Brazil to Germany. The soybean crushing and primary vegetable crude oil and meal extraction are carried out predominantly by 19 companies.[30] Together, these companies make up ABIOVE, the Brazilian vegetable oil industry association founded in 1981.[31] These same companies also play an important role in other phases of the soy supply chain. For example, they operate silos in soy production regions, where they have direct contracts with producers or buy from cooperatives and aggregators who, in turn, buy from a variety of farmers with sourcing that varies depending on the season.

Soybean is perishable and must therefore be transported quickly.[32] It requires drying and preparation in storage facilities. Even though many traders have their own storage facilities, they have increasingly started outsourcing drying and preparation activities to other companies in Brazil that offer these services since these processes are time and labour intensive.[33]

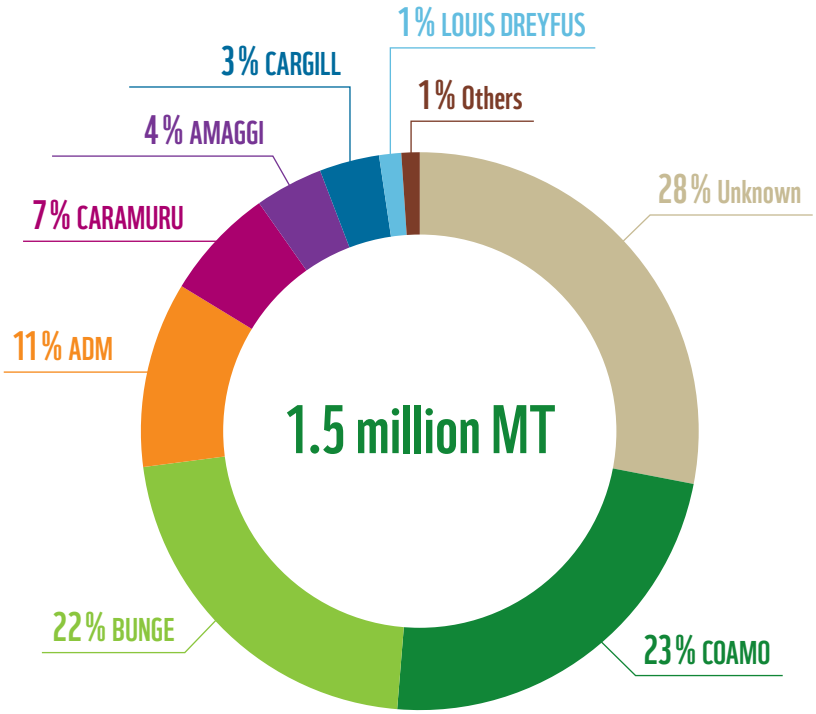
Figure 4: Soy supply chain between Brazil and Germany.

Source: Own diagram based on literature and stakeholder interviews



Among companies exporting soy from Brazil to Germany, the COAMO Agroindustrial Cooperative (a farmer's cooperative with 32,000 members) is the largest supplier of soy products accounting for almost a quarter of Germany's import from Brazil.[34] Other major soy traders include Archer-Daniels-Midland (ADM), Grupo André Maggi (AMAGGI), Bunge Limited, Cargill, the China Oil and Foodstuffs Corporation (COFCO) and Louis Dreyfus Company (LDC).[35]

Figure 5: Top exporters of soy from Brazil to Germany in 2020.
Total imports: 1.5 million MT. Source: Trase.earth



4. Monitoring and traceability for DCF supply chains

A crucial step in a company's DCF journey is establishing monitoring and traceability systems in their commodity supply chains. These systems collect information on various supply chain actors and the origins of raw materials to ensure that companies are effectively implementing their DCF commitments and policies. Monitoring entails the ongoing collection of data to assess and document progress, performance and compliance with the company's goals and targets.[36] Companies use this information to inform their own decision-making and continuous improvement processes.

When combined with robust reporting and verification mechanisms, this not only makes it possible to monitor processes, to track progress and review goals and strategies but also enhances transparency in the supply chain and strengthens company credibility and accountability. The quality and effectiveness of the monitoring and traceability mechanisms and tools can therefore facilitate or impede the success of companies along their DCF supply chain journeys.

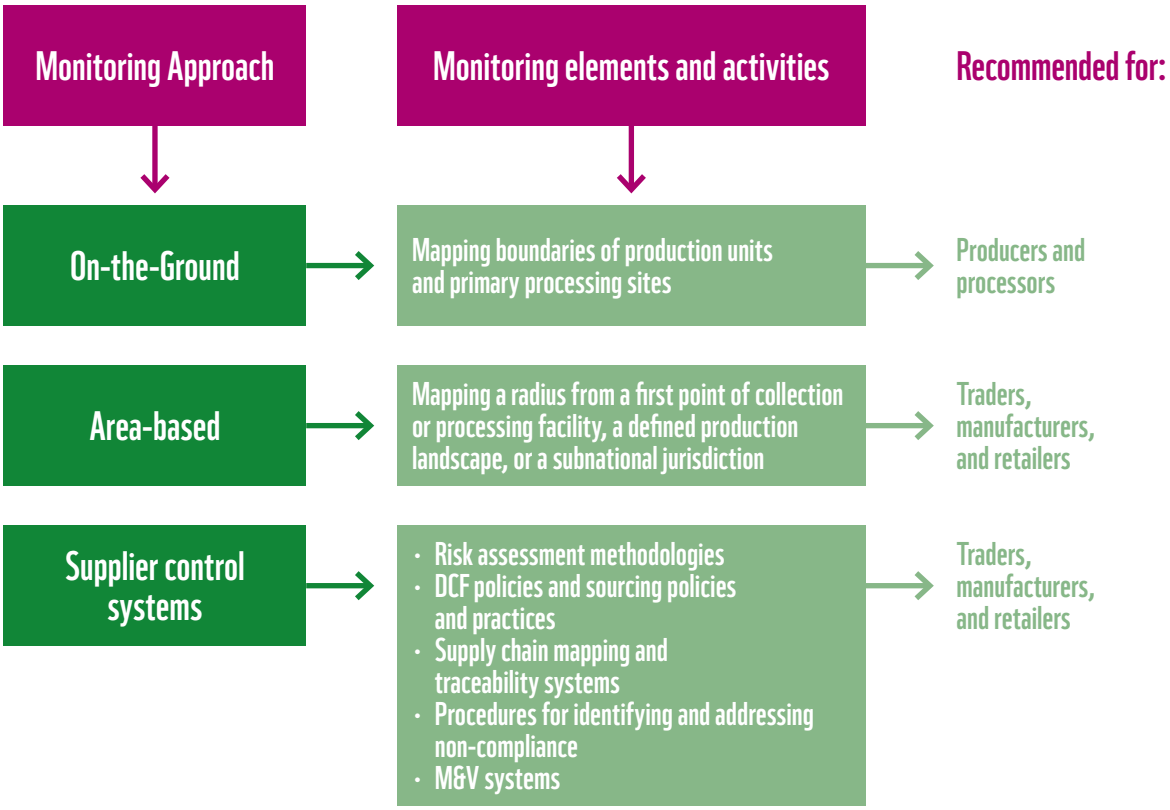
4.1. Approaches to monitoring and traceability

Monitoring and traceability are two complementary mechanisms that enable companies to identify, assess and address deforestation and conversion of natural ecosystems in their supply chains. Companies can use various approaches and tools to collect necessary information on the materials they purchase (e.g. place of origin) and information on all actors (e.g. their policies and commitments) in their supply chains to understand how these factors impact their supply chain goals and regulatory obligations. Companies can also use this information to engage with their suppliers to improve their suppliers' performance and compliance with DCF policies.

The approach that companies use for monitoring depends on their position in the soy supply chain. Upstream companies that are closer to production can collect information such as farm location and land-use practices directly from producers as their direct suppliers through site visits and inspections. In contrast, downstream companies have less direct influence on producers.[37]

Downstream companies, however, can monitor production practices through surveys or tools such as remote sensing. These companies can also monitor which measures their suppliers have taken and whether they are compliant, for example, by gathering information on their traceability systems, traceable volumes, certified volumes, and DCF volumes. This means that companies across the supply chain can use a combination of approaches and tools depending on their monitoring needs and plans. (see Figure 6).[38]

Figure 6: Approaches to monitoring supply chains based on AFi recommendations



For downstream companies (e.g. manufacturers and retailers), a crucial step in monitoring supply chain risks and DCF policy compliance is tracing a commodity's volumes, suppliers and places of origin. Companies can only determine if a specific volume is potentially linked to deforestation or ecosystem conversion or if it is truly DCF when they can trace their commodities to specific farms, producers, or intermediate suppliers. This traceability allows them to access information on the commodities' origins and production methods (see Table 4).[39]

Table 4: Traceability approaches recommended by WWF

Traceability approach	Definition	Recommended for
Full traceability	Tracking materials back to the production or processing units of origin	Intermediaries, processors, and traders who purchase soy from producers
Traceability to compliant suppliers	Tracking back to suppliers who can trace their supplies to the production or processing units of origin and can demonstrate their volumes are DCF-compliant based on adequate monitoring and verification.	Traders, manufacturers, and retailers
Assurance systems	If materials are certified using standards that have DCF requirements and link commodity volumes to production units that are verified to meet these requirements.	Traders, manufacturers and retailers

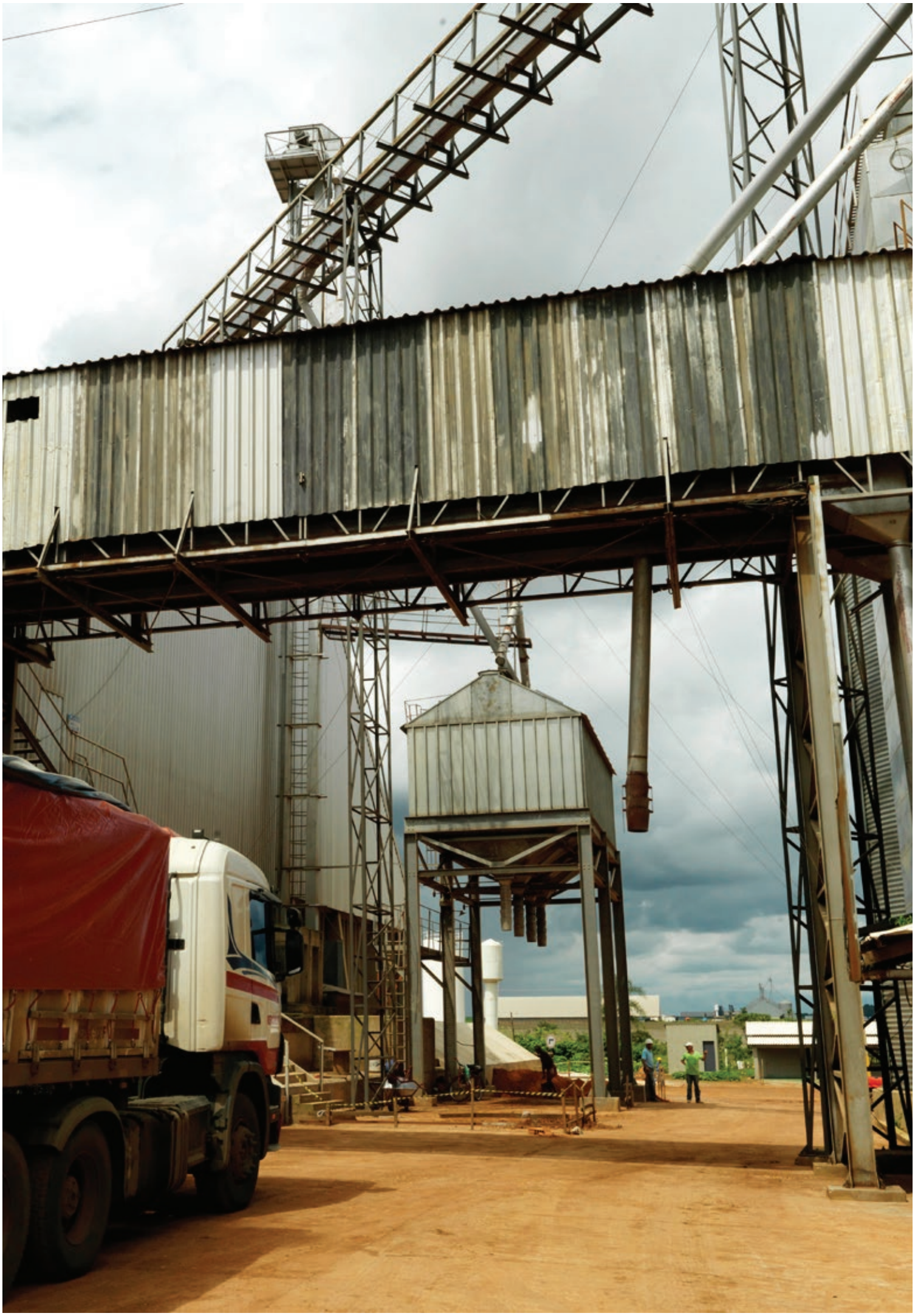
4.2. Monitoring and traceability under the EUDR

The EUDR prohibits companies from selling relevant commodities and products linked with deforestation and forest degradation that took place after 31 December 2020 within the EU market or exporting these products from the EU.[40] The regulation sets mandatory due diligence rules for companies that are associated with deforestation and forest degradation.

Monitoring and traceability are two components of the due diligence system that companies need to set up to comply with the EUDR (see Table 5).

Table 5: Monitoring and traceability under the EUDR

	Approach	Requirement
Traceability	Full traceability	Collect data on the product's supply chain, including information on the product, combined nomenclature code, quantity, country of production, geolocation coordinates, latitude, and longitude of all plots of land.
Monitoring	Spatial monitoring	Assess information including geolocation coordinates, latitude, and longitude of all plots of land to determine the risk of deforestation, conversion, forest degradation and illegality associated with the product.
	Supply chain monitoring	Ensure that all plots of land involved in a shipment are identified and that the raw materials are not mixed at any step of the process with commodities of unknown origin or from areas deforested or degraded.
	Supply chain monitoring	Request further information, independent surveys, scientific product testing or audits.



5. Monitoring and traceability in soy supply chains between Brazil and Germany

Companies that source soy from Brazil must implement effective mechanisms to accurately map their suppliers and trace the soy origins. These mechanisms can help identify risks of non-compliance and allow companies to take corrective measures to ensure compliance with the EUDR.

Ideally, companies should be able to trace soy supplies back to farm level to ensure that the soybeans have been grown in accordance with DCF requirements. When companies know how and where soy is produced, they can better comply with their individual company commitments and external regulations. Monitoring and traceability are an essential process that is part of sustained supplier engagement to ensure that soy cultivation does not cause deforestation and ecosystem conversion, as socioenvironmental and legal issues mainly occur at the farm level.

Long-term processes and appropriate methods ensure DCF-Soy

Tracing the journey of soy from origin to sale requires a thorough understanding of its characteristics, sourcing processes, production methods and established protocols. A company should therefore select the appropriate approach and tools for soy supply chain monitoring based on several factors. These include:

1 – Type of soy product

For soy products like whole soybeans for direct human consumption, monitoring and traceability involve direct interaction with soy crushers and traders. In contrast, companies that deal with soy derivatives like meal, oil and milk encounter an added layer of complexity for monitoring and tracing because the supply chain is longer. Procuring these soy derivatives requires engagement with their manufacturers who, in turn, source soy from crushers and traders. Furthermore, for products containing embedded soy (like pork and eggs), traceability involves multiple levels, including livestock farms, soy-feed producers, traders, storage facilities and soy farms.

2 – Role of companies within the supply chain

Companies interact in their supply chains with many different actors and institutions. These relationships within and outside of supply chains are often dynamic, with suppliers selling to different buyers, which can influence DCF outcomes in soy supply chains. Upstream companies have more insight into the origin of the materials they source, while downstream companies (like retailers, feed producers and livestock producers) face unique challenges in monitoring and tracing, because they require additional information about the origins of soy from their suppliers.

3 – Supplier agreements

Purchase agreements between companies and their suppliers can serve as gateways to essential information. These agreements offer insights into deforestation and conversion risks, GMO content and certification status of soy volumes or production areas. They also empower companies to promote transparent and ethical sourcing, thus influencing their tracing capabilities.

4 – Existing monitoring and traceability tools and resources

There are many established and emerging tools for supply chain traceability and monitoring. However, not all tools are free or publicly available, which can impact how effective they are, efficacy being dependent on their availability (e.g. publicly accessible or requiring upfront investment) and user-friendliness.

5.1. Options for monitoring and traceability in soy supply chains between Brazil and Germany

There are three approaches for effectively monitoring and tracing companies' soy volumes in Brazil to demonstrate that these volumes comply with DCF requirements.

If a company can trace soy to a farm, it should monitor land-use practices at farm level.

If a company can trace soy to an upstream supplier, it should monitor the control mechanisms of the supplier.

A company can also use soy certification schemes to assure compliance with DCF requirements.

1 – Monitoring at farm level

Soy can only be considered DCF if it can be traced to a farm on which no deforestation or conversion of native vegetation occurred after 31 December 2020. This farm-level monitoring to ensure that soy is DCF-compliant is in line with both the Accountability Framework and the EUDR.

Farm-level monitoring requires accurate mapping of production units and processing sites involved in soy cultivation and processing. This must be accompanied by well-documented reports detailing any observed changes on the farm with verifiable evidence of no deforestation and conversion such as time-series geospatial maps of the plot. The EUDR requires the geolocation to be reported using polygons, meaning latitude and longitude points of six decimal digits to describe the perimeter of each plot of land, which is more accurate.

While farm-level monitoring is possible when companies can confidently access accurate socioenvironmental spatial databases, tracing their soy back to the farm is necessary to understand how far they comply with their DCF commitments or with EUDR.

Publicly available satellite data enables traceability

Monitoring farm compliance in Brazil is already feasible as accurate data and systems are available. The Amazon Soy Moratorium, a zero-deforestation agreement in the Amazon biome that requires monitoring through spatial analysis and independent audits has laid the groundwork for traceability required by the EUDR. The official system to monitor annual rates of deforestation to report compliance under the Moratorium is the Project for Satellite Monitoring of the Brazilian Amazon Forest (PRODES) run by the National Space Research Institute. Deforestation is monitored using satellite images acquired at each growth season, to detect soy fields in the deforested areas. The PRODES data and the Cadastro Ambiental Rural (CAR) records can be used to trace soy to its production site. This data is publicly available and does not create barriers in terms of costs.

In addition to PRODES, there are other tools and platforms that companies may use to identify and interpret loss of forest cover or changes in other land cover types including MapBiomas [41] and Global Forest Watch which use satellite data to produce annual maps and analyses on land-use change across all of Brazil. They cover all biomes in Brazil, have a high spatial resolution, a long time series and are regularly updated. This can be supplemented by ground-level monitoring to accurately attribute land use and land cover change.

2 – Monitoring control mechanisms

If companies can trace their soy to specific suppliers, they can monitor the policies and mechanisms of these suppliers to address deforestation and conversion from soy. When a supplier's control mechanisms include traceability to soy farms and can provide sufficient evidence of compliance with DCF requirements through robust monitoring and verification, such soy volumes can be considered DCF. Companies can assess the robustness of suppliers' traceability systems by gathering information on how suppliers map their supply chains, they can then verify the data and check if the results meet DCF requirements.

3 – DCF certification

Suppliers may use soy certification schemes as compliance assurance mechanisms in which case, the DCF requirements and traceability systems of the certification mechanisms should be audited. When used by puchasing companies, these systems can ensure control of material flows in their supply chains. If soy volumes are certified under a scheme that has DCF requirements and include robust assurance and chain-of-custody models that enable physically traceable certified volumes, for example, through segregated and identity preserved models, these soy volumes can be considered DCF.

Currently two certification standards active in Brazil (i.e. the Roundtable for Responsible Soy and Proterra) offer segregation and/or identity preserved as chain of custody models and have DCF requirements. However, in practice, only a small share of soy certified under these standards may follow the segregation and/or identity preserved models.

The above approaches to monitoring and traceability are complementary and can be used in combination depending on the company's soy supply chain (e.g. soy volumes sourced from Brazil, suppliers' practices, and certified volumes available in the market). If soy suppliers have already implemented one or all of these options, downstream companies, including manufacturers and retailers, can rely on their suppliers' information to demonstrate the risks of deforestation and conversion in their supply chains and compliance with their DCF commitments. If a direct supplier sells only DCF raw materials/products/commodities, any soy volume sourced from them can be considered DCF.

5.2. Case study example

To understand the challenges of monitoring and tracing soy in the soy supply chains between Brazil and Germany, we reviewed the soy traceability and monitoring approaches by a German animal feed manufacturer.

COMPANY A
Company role: animal feed manufacturer
Soy product: soy as animal feed

Company A offers a wide range of agricultural services. Among its many operations, it manufactures feed for farm animals. Company A sources soy from the EU, India, Brazil, Argentina and the United States.

Company A ensures the compliance of its soy from Brazil with its DCF commitment using the following approach in sourcing:

Purchasing fully traceable and verified soy from Brazil
The largest part of Company A's soy volume comes from Brazil. It buys soy directly from a large soy trader 'Company X' in Brazil. Company X has developed a comprehensive, accurate and transparent traceability system that allows Company A to trace soy back from the port of Brake in Germany to soy farms in Brazil. This system is unique in the world and consists of a web interface where data on export/import quantities is combined with ship identifiers and satellite images that allow Company A to accurately trace the farms where the soy it uses originates (see Figure 7 below):

Figure 7: Company A – Company X soy supply chain.
Source: own diagram based on stakeholder interviews

In the traceability system, Company A can trace and locate the farm from which a specific bag of soybean originates using the following steps:

1. Select ship: Company A selects a ship from a list of recently arrived ships at the Brake port. This list gives details such as the ship's name, the date it left, the origin and how much it is transporting.

2. Select the cargo hold: once the ship is selected, Company A can select a specific cargo hold on the ship. This shows information on the product in the hold, how much product it contains and how much of it belongs to Company A.

3. Trace to Brazil: after the cargo hold, the system traces the soy's journey back to the port in Brazil (e.g. **Paranaguá**). Here, it shows the quantity of soy that is ready for export.

4. Storage location: from the port, Company A is then able to confirm which warehouse the soy was stored in and the exact quantity stored. Company A can use the zoom out option to identify the region where the warehouse is located. This step also provides an overview of the total soybean production in that region.

5. Identify origin at farm level: clicking on the warehouse shows the farms that contributed to the soybeans stored there. It also displays the total amount of soybeans sourced from each farm.

The system allows buyers including Company A to access information on farmers of each plot, including identities, plot sizes and the resources used for soy production. However, due to privacy considerations, this information is not disclosed to the public.

The information supplied by Company X undergoes an annual validation and certification process by a third-party entity to ensure its accuracy and reliability. In tandem, Company A representatives visit warehouses and farms where they directly engage with farmers and conduct comprehensive audits as a means of upholding accountability and transparency in their supply chain.

6. Challenges of and recommendations for establishing transparent soy supply chains between Brazil and Germany

Traders can create a bottleneck or facilitate traceability

Although building full traceability remains a challenge in complex supply chains involving multiple tiers, and even more so where sufficient information about the suppliers is not available, there has been considerable progress. In the case of Brazil, the Soy Moratorium is a good example of the power of a public-private collaboration to build monitoring systems to ensure compliance with DCF commitments. In Brazil, many soy farmers sell their crops to the few traders, who aggregate supplies from large areas and then ship the processed soy around the world. While the consolidation of the soy supply chain to a handful of soy traders can create a bottleneck in the progression toward DCF soy, it can also facilitate improving traceability.

Key challenges and recommendations for improving monitoring and traceability in soy supply chains between Brazil and Germany include:

Table 9: Challenges and recommendations for companies

Challenges	Description	Recommendations for companies
Many sources of soy	When companies source soy from multiple farms, the task of segregating soy into distinct categories becomes complex. Suppliers often blend soy from various origins for trading purposes through the mass balance method,[42] which is prevalent across the industry, but not enough to deliver DCF commodities to specific markets.	» Clearly outline segregation and traceability requirements in supplier contracts and agreements. » Engage with upstream partners and invest in establishing comprehensive, accurate and transparent traceability systems that reliably show the origin of soy at farm level. » Shorten supply chains by engaging with upstream actors for direct sourcing.
Limited storage capacities	When production yields are high, storage options can become limited, driving farmers and traders to seek out temporary storage solutions. This impromptu storage often takes place at multiple locations. Soy from different sources is unintentionally mixed, making the separation of soy according to its original source a challenge.	» Upstream companies can invest in or establish temporary storage facilities that can handle high volumes of soy, ensuring soy origins for each facility are known. » Collaborate with logistics partners to identify additional storage options and streamline transportation processes during peak periods. » Invest in modern inventory management systems and technologies, transitioning from paper-based records.[43]

Challenges	Description	Recommendations for companies
Existing infrastructure for transport	In Brazil, the geographical distance from farms to ports can lead traders to source soy from farmers closer to export regions, potentially compromising compliance with DCF requirements.[44] The location of export ports can also have impacts on deforestation and conversion of native vegetation. Available logistics such as ports, railroads and paved roads can therefore influence the supply chain dynamics.[45]	» Collaborate with government agencies and industry stakeholders to invest in infrastructure improvements such as roads, railroads and transportation networks.[46]
High costs of segregated supply chain	Completely segregated logistics lead to higher internal costs and require more time. Traders need resources to establish new storage and trading silos to separately store soy based on its origin. However, the need for segregated supply chains is short-term and once 100% DCF supply base is achieved, existing supply chain facilities could be used and there will be no need for segregation of soy volumes based on their origin.	» Invest in supporting farmers to adopt more environmentally friendly practices to address risks across the soy landscape, thus expanding the DCF supply base. » Invest in training programs for suppliers to understand what they need to monitor and report, then disseminate simple communication materials with this information. » Consider introducing incentives for suppliers to participate in traceability and monitoring efforts. » Allocate a dedicated yearly budget for traceability and monitoring efforts (e.g. engaging with suppliers). » Implement a gradual traceability and segregation strategy, prioritising high-risk suppliers and traders. » Divide the traceability and segregation efforts into manageable phases.
Limited data and data sharing	Soy suppliers and traders generally lack sufficient data or are reluctant to provide data about the sources of their soy.[47] Sectoral transformation becomes difficult if there is hesitancy to share information and data with other companies in the supply chain.[48]	» Communicate DCF policies, targets and objectives to suppliers and elaborate on how they can provide quality data. » Provide suppliers and traders with easy-to-follow templates and instructions for submitting data consistently and accurately. » Foster relationships with suppliers and traders, encouraging a culture of transparency and data sharing over time. » Support the government in building a national traceability system for soy.

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43 Stakeholder interviews

44 Stakeholder interviews

45 Stakeholder interviews

46 Stakeholder interviews

47 Stakeholder interviews

48 Stakeholder interviews

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