

TFA EU DEEP DIVES

GEOLOCATION & TRACEABILITY SESSION: BEEF

CONTENTS

1	Beef production and supply chain	1
2	Beef traceability	5
3	Tools available for geolocation and traceability	9
4	Challenges / gaps (focus on Brazil)	14
5	Opportunities (focus on Brazil)	15
6	References / additional resources	16

1. BEEF PRODUCTION AND SUPPLY CHAIN

Global demand for meat, as a protein source, has raised greatly during the past decades propelled by rising incomes, population growth of many developing countries (Figure 1), and urbanization.

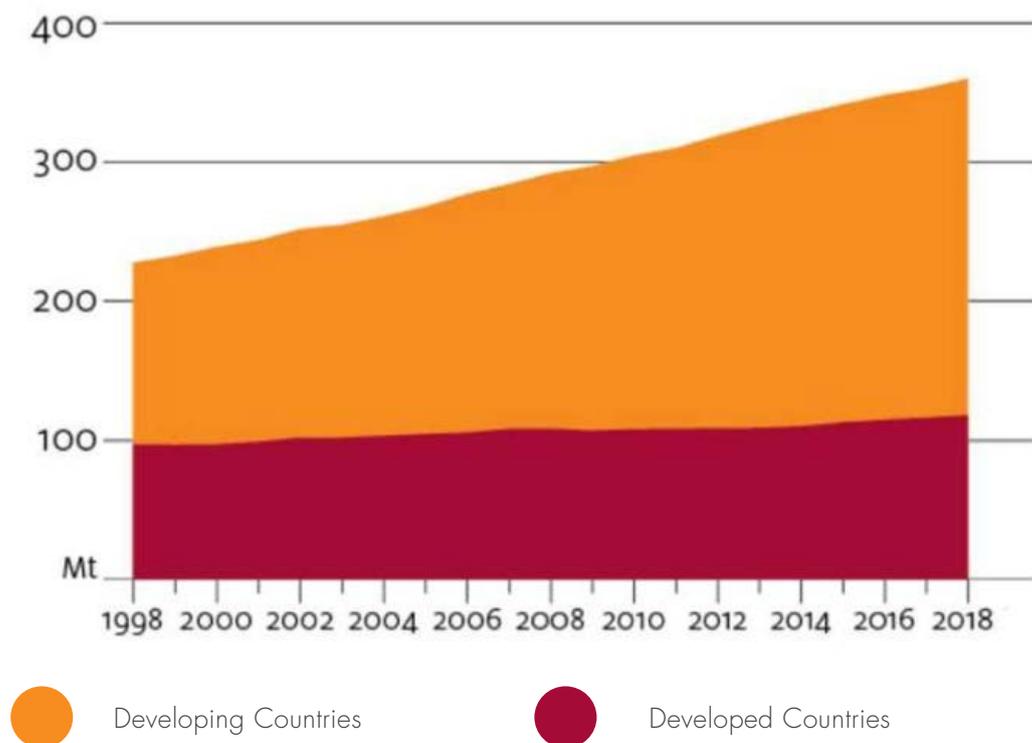


Figure 1. Meat consumption in developing and developed countries from 1998 to 2018. Source: OECD.

Beef production

Beef production has increased substantially since the 1960s. In 2020, Brazil had the largest bovine herd in the world, representing 13% of the global herd, with 187.5 million head, followed by India, with 186.1 million head, and the United States, with 94.3 million head. Brazil, India, and the United States accounted for roughly 36% of the world's beef production (Table 1).

Country	Herd			Beef Production		
	Cattle (million head)	Bubalus (million head)	Total (million head)	World %	1000 T CWE	World %
Brazil	187.5	1.4	189.0	11.5%	10.2	14.3%
India	186.1	116.5	302.6	18.4%	2.5	3.5%
USA	94.3	0.0	94.3	5.7%	12.3	17.4%
China	67.9	27.7	95.6	5.8%	7.2	10.1%
Ethiopia	63.7	0.0	63.7	3.9%	0.4	0.5%
Argentina	52.9	0.0	52.9	3.2%	3.2	4.5%
Pakistan	46.9	39.6	86.5	5.3%	1.8	2.6%
Mexico	35.4	0.0	35.4	2.2%	2.1	2.9%
Chad	29.6	0.0	29.6	1.8%	0.1	0.1%
Tanzania	27.9	0.0	27.9	1.7%	0.3	0.4%
European Union	78.5	0.4	79.0	4.8%	7.7	10.8%
Others	563.4	25.2	588.5	35.8%	23.3	32.8%
World	1,434.3	210.8	1,645.1	100%	71.1	100%

Table 1. Largest herds and beef producers in the world in 2020. Source: Athenagro, USDA, FAO.

Beef Exporters

In terms of exported beef in 2020, Brazil was the largest beef exporter in the world followed by Australia, the United States, Argentina, and India (Table 2). Together, the 5 top exporters countries accounted for roughly 61% of the world's beef exports.

Country	Herd			Beef Production		
	Cattle (million head)	Bubalus (million head)	Total (million head)	World %	1000 T CWE	World %
Brazil	187.5	1.4	189.0	11.5%	10.2	14.3%
India	186.1	116.5	302.6	18.4%	2.5	3.5%
USA	94.3	0.0	94.3	5.7%	12.3	17.4%
China	67.9	27.7	95.6	5.8%	7.2	10.1%
Ethiopia	63.7	0.0	63.7	3.9%	0.4	0.5%
Argentina	52.9	0.0	52.9	3.2%	3.2	4.5%
Pakistan	46.9	39.6	86.5	5.3%	1.8	2.6%
Mexico	35.4	0.0	35.4	2.2%	2.1	2.9%
Chad	29.6	0.0	29.6	1.8%	0.1	0.1%
Tanzania	27.9	0.0	27.9	1.7%	0.3	0.4%
European Union	78.5	0.4	79.0	4.8%	7.7	10.8%
Others	563.4	25.2	588.5	35.8%	23.3	32.8%
World	1,434.3	210.8	1,645.1	100%	71.1	100%

Table 2. Largest beef exporters in 2020. Source: Athenagro, FAO, USDA.

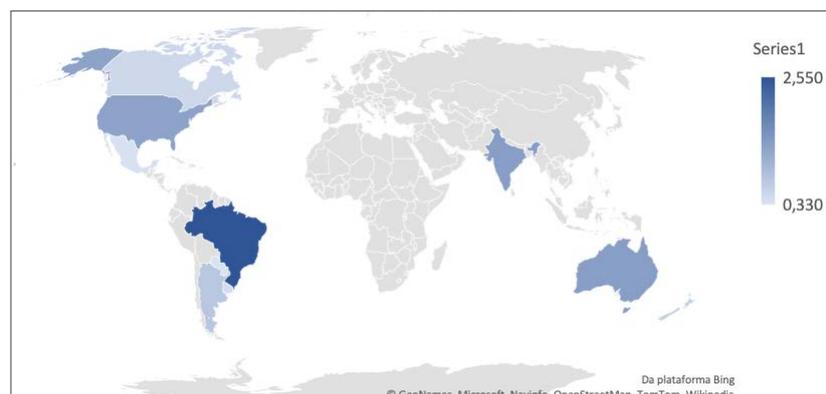


Figure 2. Key beef exporting countries (2020). Source: Proforest

Beef Importers

China was the largest beef importer in the world in 2020 followed by the United States, Japan, South Korea and Hong Kong.

The five top countries imported more than 1 billion pounds of beef in 2020: China, United States, Japan, South Korea and Hong Kong. China accounted for roughly 30% of the world's beef imports, while the EU represents the 7th largest importer of beef.

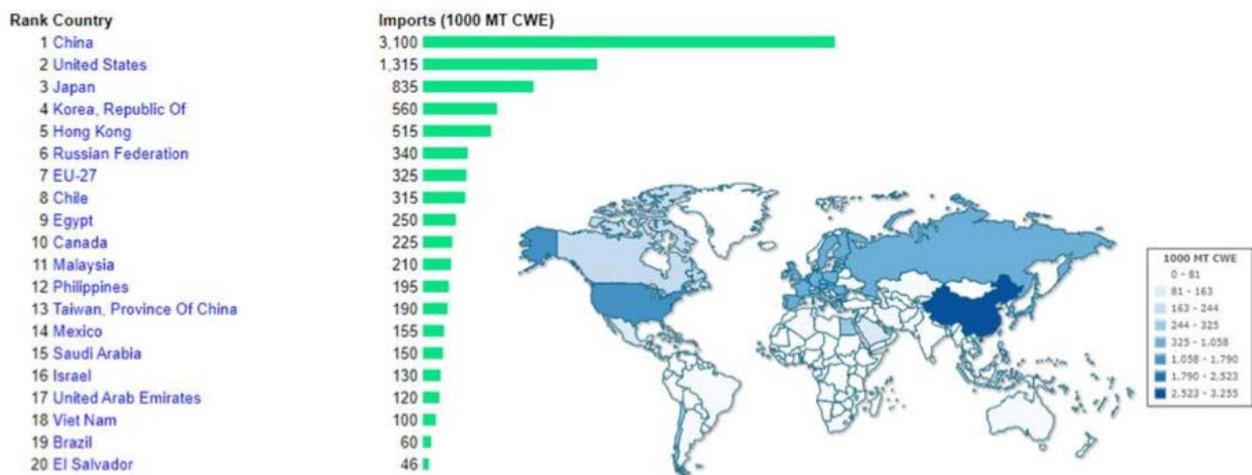


Figure 3. Largest beef importers in 2020. Source: United States Department of Agriculture

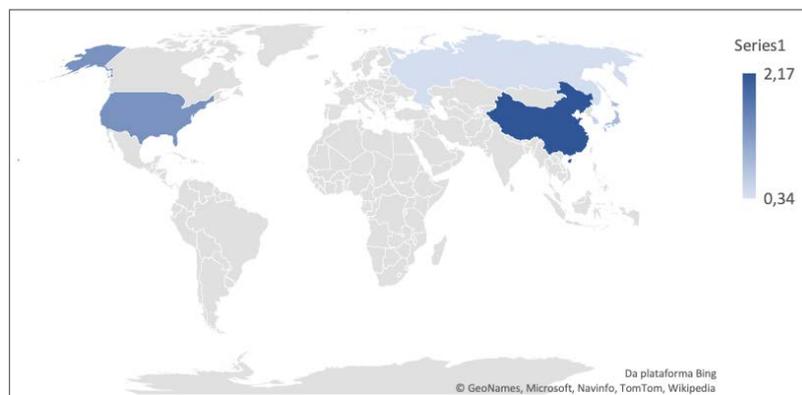


Figure 4. Key beef importing countries (2020). Source: Proforest

Past and Future Prospects

The drivers for the livestock productivity increment in the recent past have been the development of technologies in:

- » animal science, particularly in breeding;
- » nutrition and animal health.

Sustained innovation is essential to contribute to increasing potential production and further efficiency of beef production.

The Beef Supply Chain

The supply chain for beef and other cattle products is composed of a complex set of actors that are involved in different stages of cattle production, meat and cattle by-product processing; and ultimately the end buyers, which are as diverse as retailers, restaurants, pet food companies and leather industries (Figure 5).

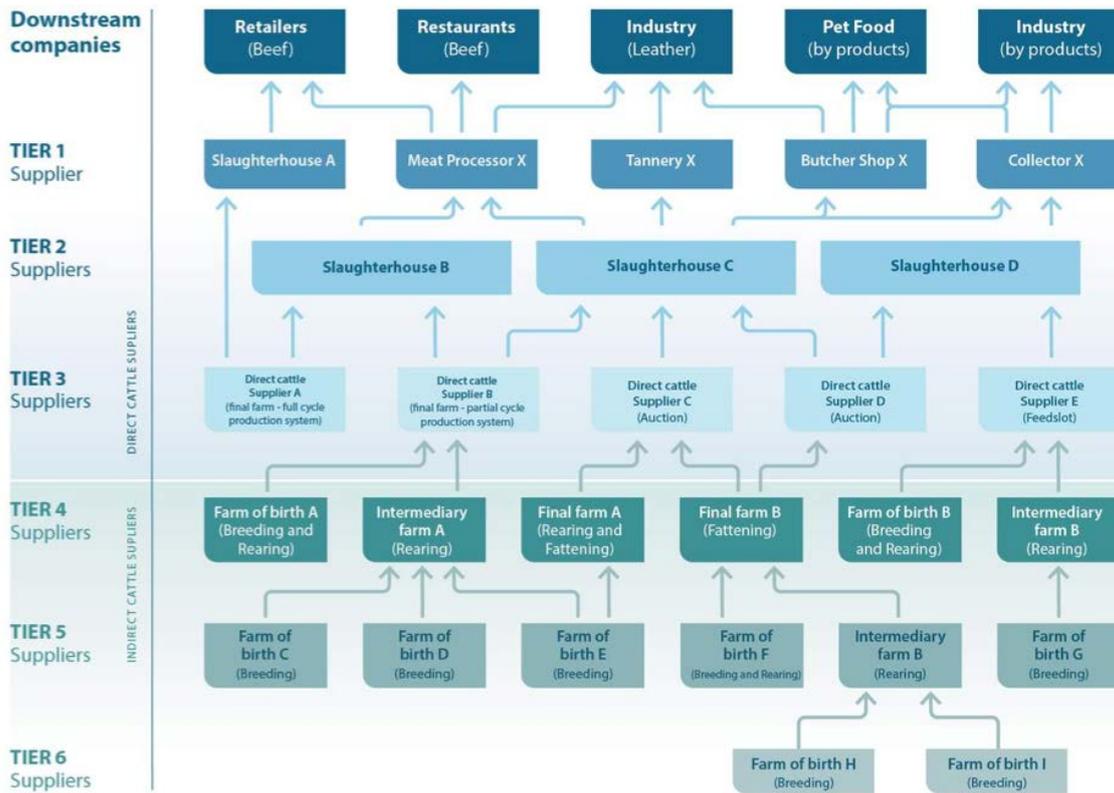


Figure 5. Example of a beef supply chain. Source: Proforest

Comprehending this complexity is essential for tracing beef or cattle-derived by-products back to the origin, where most risks occur (such as deforestation, labor, and land issues).

For companies to better understand and manage their exposure to risks, and assess progress towards implementing responsible sourcing policies, they need to ensure traceability through the supply chain. This can be challenging for commodities with a complex supply chain, such as beef and cattle by-products.

2. BEEF TRACEABILITY

According to the [Accountability Framework - AFi](#), traceability is:

“The ability to follow a product or its components through stages of the supply chain (e.g., production, processing, manufacturing, and distribution)”.

Traceability is important to enable companies to assess whether their procurement policies on deforestation and other issues are being met at the production level. In other words, the level of traceability can reflect whether an organization is able to comply with its commitments.

There are three main levels of complexity in the beef and cattle by-products supply chain as follows:

1. Different linkages in the supply chain:

There are many different:

- a. connections from the slaughterhouse until the products reach a downstream company,
- b. forms of cattle products: live animals, meat, processed offal, hides, or by-products, and the different types of Tier 1.

2. Animal Transit Guide (GTA):

In Brazil, GTA tracks cattle during transportation and indicates the farm that the lot derives from. However, its application is restricted to sanitary control purposes limiting access to relevant information.

3. Stages of production:

There are 3 stages of production which may or may not be combined in the same place (see below).

Stages of production

With a herd of over 210 million head of cattle, Brazil has the biggest cattle herd in the world and is the largest beef exporter. Cattle farming in Brazil often has three stages of production:

- » Breeding
- » Rearing
- » Finishing or fattening

The three phases can be carried out on the same farm (known as a full-cycle system) or on different farms (known as partial cycle).

Within this context, there are three different levels of producer visibility that affect the extent to which they can be reached via monitoring tools. A company has high visibility when the producer carries out the three phases on the same farm (full cycle) and medium or low visibility when there are two, three, or more farms before the meat processor (Figure 6).

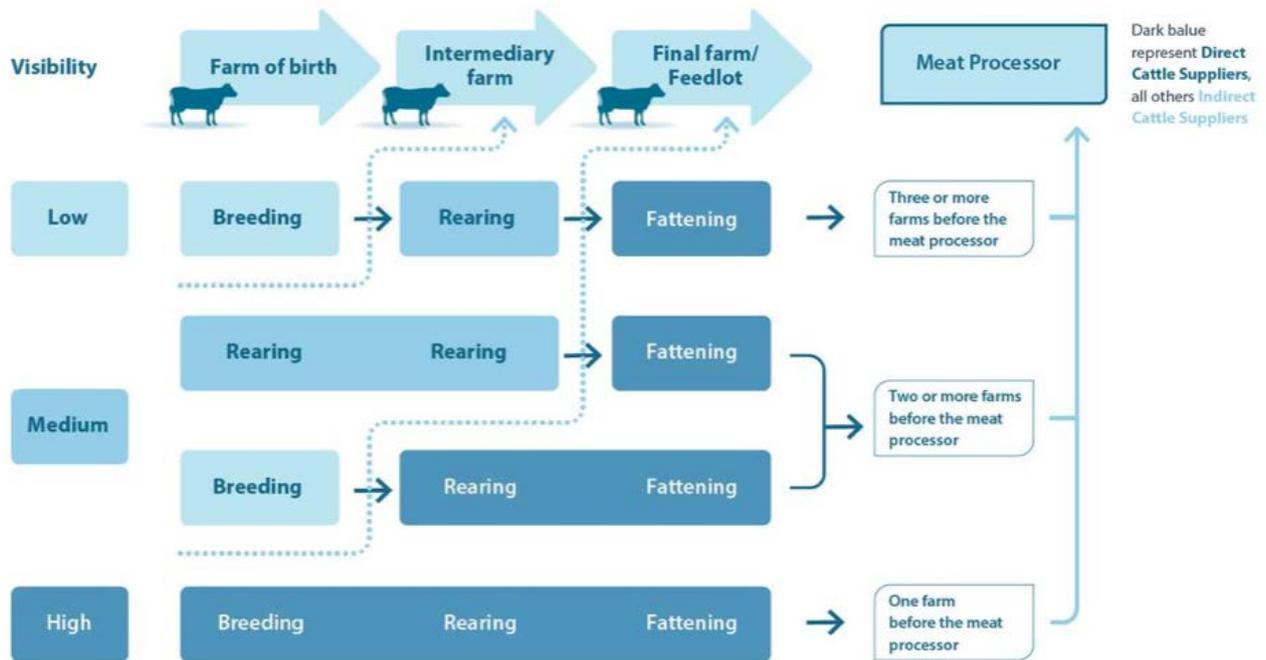


Figure 6. Stages in the production and levels of visibility before reaching the meat processor. Source: Proforest

Nonetheless, reaching the indirect cattle suppliers is one of the main challenges facing the sector that prevents full policy implementation. New innovative tools and approaches to deal with this issue are being developed by different organizations, but there are still challenges to be overcome.

This scenario can become even more complex when a company's supply chain also contains auctions or feedlots, as an extra layer of traceability is needed to reach the last farm before slaughter.

Different traceability systems across the countries

Each country has a system that may lead to a different level of traceability. For instance, the systems implemented in Argentina ([Servicio Nacional de Sanidad y Calidad Agroalimentaria](#)), Uruguay ([Sistema Nacional de Identificación Ganadera](#)), and Australia ([National Livestock Identification System](#)) and Brazil ([Brazilian Traceability Service of the Cattle and Buffalo Production Chain](#)), have similarities and differences among them.

Brazil

The Brazilian System of Identification and Certification of Bovine and Buffalo Origin (SISBOV) aims to identify, record, and monitor all cattle and buffalo born in Brazil or imported. Only exporting producers are obliged to join SISBOV. For the internal market, the adhesion is voluntary, and the individual identification of cattle or buffaloes is unique throughout the national territory, using a code of up to 15 (fifteen) numeric digits. The rural producer who adheres to the Operational Standard needs to forward five filled forms to the certifier: rural producer identification, rural establishment information, animal inventory, term of adhesion, and declaratory production protocol. Each animal identified without an electronic device needs to have an Animal Identification Document (DIA), used from its registration until it is discharged from the system, be it natural death, slaughter, or sacrifice. The DIA accompanies the animal during transit for any purpose, attached to the respective Animal

Transit Guide (GTA), a document accompanying the animal throughout its displacement. The animal health surveillance system and the GTA are the controls that demonstrate the animal health and origin information. GTAs are issued by state animal health control agencies, and they are mandatory documents that prove good sanitary status for the batch being transported. However, GTA identifies just the last property that the animals have gone through, so it does not provide full traceability to indirect suppliers.

Argentina

In the Argentine system, each animal transit document identifies the establishment of origin of the animals arrived at the destination establishment or slaughterhouse through the Renspa number. The caravan of the animals arriving at the destination has the Unique Livestock Identification Code (CUIG) printed, which is an abbreviated coding method for Renspa. Renspa is the code that Senasa (the Argentinian National Agri-Food Health and Quality Service) uses to identify each of the livestock establishments and their owners. By means of the CUIG printed on the animal's caravan, it is possible to trace the birthplace. All animal movements are registered in the Local Offices of Senasa through the Integrated Animal Health Management System (Sigsal).

Recently, an initiative called Carnes Validadas has launched a traceability platform in the beef supply chain in Argentina, using a digital identity of the animal and Blockchain technology, and allowing transparency to the production process from genealogy to consumer.

Uruguay

The Uruguayan system contemplates individual identification of cattle. Each animal has two independent and complementary devices: a visual caravan, which allows the identification of the animal with the naked eye, and a radio frequency device (RFID) that electronically stores the same number that is in the visual caravan. The devices provide a unique and permanent identification throughout the life of the animal, which cannot be altered or reused. The animal number is the only data stored in the electronic device. The rest of the data related to the animal and its movements are inserted in the SNIG database. The record in the SNIG database contains, for example, the identifier number, owner's data, the year of birth of the animal (and the season), sex and breed, among others.

This information is confidential. The SNIG focuses on the management of basic information of identified animals and their transactions, establishing integration strategies with specialized private operators or producer groups. There is also a group traceability system, in which controls are carried out by registering in DICOSE through the Affidavit and the issuance of Property and Traffic Guides.

Australia

The National Livestock Identification System (NLIS) combines three elements that enable full traceability: all animals are identified by a visual or electronic device, all properties are identified by a Property Identification Code (PIC), all livestock location data and movements are recorded in a central database. Therefore, the NLIS is able to provide a life history of animal's movements. In addition, NLIS database automatically generates the Early Warning Status (EW), which is a status assigned to a property carrying a high-risk animal. The EW status helps monitor and manage food safety and biosecurity risk along the entire value chain.

Differences and similarities among the systems

Regarding to the similarities, the use of standards to identify animals in these four countries is a legal obligation. Individual identification can be done through ear tag, chips, tattoos, marking or Radio Frequency Identification Devices (RFID). Regarding to the handling and transport, the monitoring of displacement and transport of animals are linked to the sanitary control system. Finally, the individual identification of animals in these countries is mandatory for the external market, which helps to promote traceability.

On the other hand, the system used in Brazil differs from the systems used in Argentina, Uruguay, and Australia in at least three aspects. Except for Brazil, the individual identification of animals is mandatory for the internal market. This is an important point since most of the beef produced in Brazil is consumed by the domestic market. Also, in the Brazilian system there is no obligation to inform and record the location of the sourcing property of the tracked animal. Unlike the three other countries, the data access to the Brazilian system is only partial.

In the following aspects analysed, the Brazilian system is similar to the Argentinian and different to the systems used in Uruguay and Australia. The Brazilian system is not total computerized, there is no public or private subsidies to cover the costs of traceability (directly nor indirectly), and there are no legal obligations of the traceability system related to industry nor market.

The results of the main features related to the systems adopted in Australia, Argentina, Uruguay, and Brazil are systematized in Table 3.

Features of the systems	AU	AR	UR	BR
Creation	1998	2003	2002	2002
Identification model	Yes	Yes	Yes	Yes
Handling and transport	Yes	Yes	Yes	Yes
Individual identification for external market	Yes	Yes	Yes	Yes
Individual identification for internal market	Yes	Yes	Yes	No
Source origin of animals	Yes	Yes	Yes	No
Data access	Yes	Yes	Yes	Partial
Computerization	Total	Partial	Total	Partial
Subsidies	Yes	No	Yes	No
Industry obligation	Yes	No	Yes	No
Market obligation	Yes	No	Yes	No
Batch identification	Yes	No	No	No
Management of the legal process	Public-private	Public	Public- private	Public
Centralized database	Yes	-	Yes	No

Table 3. Main features of the traceability systems model by country.
Source: adapted from “Beef chain traceability in Brazil”, Brazilian Coalition (2020)

3. TOOLS AVAILABLE FOR GEOLOCATION AND TRACEABILITY

How to include indirect suppliers in the traceability systems?

Several different organizations are developing new innovative tools and approaches to addressing this issue. A company-led example is the [PECSA \(Sustainable Livestock in the Amazon\)](#) model, which developed a pioneering business model to produce sustainable beef in the Amazon by increasing productivity while investing in forest protection and traceability.

Another example is the [Indirect Suppliers Working Group](#) (GTFI, acronym in Portuguese), which has been working to create advanced monitoring solutions for the tracing of indirect suppliers in the Brazilian livestock supply chain.

GTFI lists a few approaches to monitor indirect cattle suppliers:

- » GTA Verde (Green GTA) – It is a mandatory procedure adopted by JBS in which the GTA is issued only for properties registered in the Rural Environmental Registry (CAR).
- » Visipec – It is an “add-on” tool that cross-references CAR and GTA data to provide additional information on indirect suppliers.
- » Request for Information (RFI) – It is a voluntary procedure used by Marfrig direct suppliers where the information animals purchased from indirect supplier is added.
- » SMGeo Indiretos: A voluntary platform – It is a platform developed by Niceplanet that allows the socio-environmental monitoring of the properties and herds of indirect suppliers.

Key initiatives to improve traceability and to promote transparency along the beef supply chain in Brazil

INITIATIVES	AGROIDEAL	AGROSATÉLITE	TRASE	AGRICULTURAL OBSERVATORY
Objective	Creating a risk exposure map based on economic, social, and environmental monitoring	Risk monitoring on farms: environmental, social, and financial risks	Linking environmental and social risks in tropical forest regions	Integrates strategic bases to provide data, information, content, and dynamic panels on Brazilian agriculture
Methodology	Combining monitoring tools to identify risks	Socioenvironmental Compliance, Rural Property Assessment and Crop Monitoring	Spatially Explicit Information on Production to Consumption Systems (SEI-PCS) approach	Integration of statistical and geographical data
Scale	Amazon and Cerrado (Brazil)	Global	Global	Brazil
Tool	AGROIDEAL PLATFORM	SIMFAZ	TRASE PLATFORM	AGRICULTURAL OBSERVATORY PLATFORM
Main users	**	**	General	General
Blockchain	-	-	-	-
GTA/GTA-e	-	●	-	-
SISBOV	-	-	-	-
CAR	●	●	●	●
PRODES	●	●	●	-
DETER	●	●	-	-
MAPBIOMAS	●	●	●	●
IBAMA EMBARGOED AREAS	●	●	●	●
CONSERVATION AREA	●	●	●	●
INDIGENOUS LAND	●	●	●	●
TAC	-	-	●	-
Monitoring protocol	-	-	-	-
Direct suppliers	-	-	-	-
Strategy for indirect suppliers	-	-	-	-
Reach indirect suppliers	-	-	-	-

Combining traceability and monitoring tools to promote sustainability in supply chains

INITIATIVES	AGROTOOLS	VISIPEC	SAFE TRACE	NICEPLANET	ECO TRACE	CONECTA
Objective	Social and environmental monitoring of cattle suppliers	Deforestation monitoring of indirect cattle suppliers	Social and environmental monitoring of cattle suppliers	Identify good cattle supply farms that meet legal commitments.	Hub of information. Provides traceability from the origin to the final consumer	Social and environmental monitoring of cattle suppliers in Amazon
Methodology	Combining traceability and monitoring tools	Combining traceability and monitoring tools	Combining traceability and monitoring tools	Analysis of all socio-environmental criteria, purchase to purchase	IoT (Internet of Things) – Artificial Intelligence – Blockchain	Combining traceability and monitoring tools, and protocols
Scale	Amazon and Cerrado (Brazil)	Brazil	National	Amazon	Global	Brazil
Tool	TERRAMATRIX, TERRASAFE, GEOID	VISIPEC	SAFE TRACE PLATFORM	SMGEO INDIRECT	SMGeo Indirect (NICEPLANET)	CONECTA PLATFORM
Mains users	Slaughterhouses and retailers	Slaughterhouses	Consumers and retailers	Producers and slaughterhouses	Consumers	Producers and slaughterhouses
Blockchain	-	-	●	-	●	●
GTA/GTA-e	●	●	●	●	●	●
SISBOV	-	-	●	-	-	●
CAR	●	●	●	●	●	●
PRODES	●	●	●	●	●	●
DETER	●	●	-	-	-	●
MAPBIOMAS	●	●	●	-	-	●
IBAMA EMBARGOED AREAS	●	●	●	●	●	●
CONVERSION AREA	●	●	●	●	●	●
INDIGENOUS LAND	●	●	●	●	●	●
TAC	●	●	-	●	●	●
Monitoring protocol	●	●	-	-	-	●
Direct suppliers	●	●	●	●	●	●
Strategy for indirect suppliers	●	GTFI	Individual identification	SM-Geo indirect	SMGeo Indirect	GTFI
Reach indirect suppliers	Limited	Complete	Complete	Complete	●	Complete

Initiatives to promote transparency in Brazil

INITIATIVES	SELO VERDE PLATFORM	IMAC	GTFI	BEEF ON TRACK
Objective	Estimating the compliance with the Forest Code of properties registered in the CAR, linking with production and exportation	Certify the quality of the beef produced in the state, through the seal "Carne de Mato Grosso"	Identify, develop, and support the implementation of traceability solutions for indirect suppliers	Strengthening social and environmental commitments in the beef value chain in the Amazon and boosting their implementation
Methodology	Spatially explicit models*	Combining traceability and monitoring tools	The GTFI seeks to recommend complementary tools	Combining traceability and monitoring tools, and protocols
Scale	Pará	Mato Grosso	National	Amazonas, Acre, Mato Grosso, Pará, Rondônia
Tool	EGO SOFTWARE, TRASE, CONECTA, SAFE TRACE	BEEF OBSERVATORY	Complementary tools VISIPEC, SMGEO INDIRECT, RFI, RFID, GTA Green.	The Monitoring Protocol, the Audit Protocol, and the online BEEF ON TRACK PLATFORM
Main users	General	General	General	General
Blockchain	●	-	-	-
GTA/GTA-e	●	●	●	●
SISBOV	●	●	-	-
CAR	●	●	●	●
PRODES	●	●	●	●
DETER	●	●	-	-
MAPBIOMAS	●	-	-	-
IBAMA EMBARGOED AREAS	●	●	●	●
CONSERVATION AREA	●	●	●	●
INDIGENOUS LAND	●	●	●	●
TAC	●	-	●	●
Monitoring protocol	●	-	-	●
Direct suppliers	●	●	●	●
Strategy for indirect suppliers	●	●	Visipec, SMGeo Indirect	-
Reach indirect suppliers	●	●	●	-

Additional tools

Available solutions		Details	Gaps
Certification Not available			
National Efforts	Animal Transit Guide Brazil (GTA)	<ul style="list-style-type: none"> » Official tool used in Brazil » Used mainly for sanitary purposes » Traces only the last farm where the batches come from » Includes farms geographical location so from same farms, that is also traded by same traders, is worth doing. 	<ul style="list-style-type: none"> » Does not cover indirect suppliers
	Cattle and Buffalo Identification and Certification System (SISBOV)	<ul style="list-style-type: none"> » Official system for the individual identification of cattle and buffaloes in Brazil. » Provides individual identification » The Normative (IN) 51/2018 creates the system and defines that the animals' identification must be unique, individual, and will use a fifteen-digit numeric code issued by the Agricultural Management Platform (PGA). 	<ul style="list-style-type: none"> » Traceability from the birth » Adherence to the system is voluntary » Low adherence in the country
	GTFI Brazil	<ul style="list-style-type: none"> » Identifying, developing, and supporting the implementation of traceability solutions for indirect suppliers » The GTFI seeks to recommend complementary tools, such as VISIPEC, SMGeo, GTA 	
	Selo Verde Platform	<ul style="list-style-type: none"> » Estimating the compliance with the Forest Code of properties registered in the CAR, linking with production and exportation » Uses GTA, SISBOV, EGO SOFTWARE, TRASE, CONECTA, SAFE TRACE 	
	Beef On Track	<ul style="list-style-type: none"> » Strengthening social and environmental commitments in the beef value chain in the Amazon and boosting their implementation » Combining traceability and monitoring tools, and protocols » Uses GTA, the Monitoring Protocol 	

4. CHALLENGES / GAPS (FOCUS ON BRAZIL)

The challenges and opportunities for promoting traceability and transparency in the Brazilian beef supply chain are related to integration between available tools and platforms; communication and coordination among stakeholders; as well as sectoral, cultural, political, and economic matters.

Lack of technical and financial support for small and medium producers

Currently, small (and medium) producers are one of the links in the beef supply chain that are more hidden, and that need greater technical and financial support. It is known that to promote sustainability, it is necessary to address social and economic aspects as well, as they are inseparable of environment matters. In this way, small and medium producers – that supply mainly the national market – need technical and financial support for reducing costs, increasing productivity, as well as having their properties in compliance. As producers find themselves more competitive making investments for traceability, they will adhere to the changes. In this way, it is also extremely important to establish schemes to unlock producers who were blocked for non-compliance, allowing them to get back to the sustainable market.

Lack of traceability to indirect suppliers

In Brazil, the sanitary legislation provides the use of the GTA in traceability systems implemented by slaughterhouses. The GTA includes information about the farm that originated the lot origin, the destination of the animals, sanitation conditions, and the purpose of transport. However, this system only identifies the direct cattle suppliers – the last farm or aggregation point from which the batches derive. In addition, the slaughterhouses need farmer authorization to receive the GTA information, as it is not publicly available yet. Due to the lack of traceability to indirect cattle suppliers, a significant portion of the farms that are usually within the supply chains of slaughterhouses and downstream buyers remain unknown or hidden, like all the social and environmental risks associated with them.

Even though there is an individual cattle identification system in Brazil – the Brazilian Service for Traceability of Bovine and Buffalo Production Chain (SISBOV, acronym in Portuguese) that registers and identifies the bovine and buffalo herd in the national territory enabling the animal to be traced from birth to slaughter, this mechanism is not mandatory for the national market, only focuses on the sanitary aspects of cattle production, it has a high cost for small herds and requires technical capacity for its implementation. Thus, the identification by batches through the GTAs continues to be the main traceability tool adopted in the country.

Lack of integrated and accessible traceability data platforms

In Brazil, there is not any platform that makes traceability data integrated and accessible for users. Also, the access to data is partial and often restricted to public organisms and service providers, which limits transparency. There are many state-level online platforms where it is possible to check the GTA data¹, as well as a national platform that gathers data from all GTAs issued throughout the country ([Agricultural Management Platform – PGA](#)).

1 [ADAPEC/TO](#), [ADAB/BA](#), [IMA/MG](#), [AGRODEFESA/GO](#), [IAGRO/MS](#), [ADAPAR/PR](#), [IDARON/RO](#).

However, the lack of integration and difficulty in accessing this data is also an issue and makes it practically unfeasible to use this traceability tool for a full socio-environmental monitoring purpose. In this context, companies often adopt different approaches in the implementation of monitoring as there is a lack of an effective centralised and integrated platform to gather traceability information and make it available for different stakeholders to enable monitoring in a reliable and transparent way.

Communication and sectoral alignment for transparent beef supply chains

Traceability requirements need to be developed together with sectoral transparency for traceable beef supply chains. Without information and communication, both investors and buyers cannot assess their own exposure to risks or identify good opportunities for improvements. In this way, it is important to build MRV systems across the sector, as the monitoring and disclosure process need to be consistent, allowing comparisons among them. If each company has its own monitoring mechanism, delivering different reports on their commitments or level of compliance, it results in a lack of standards between industry actors. At the end, the lack of standardization hinders the expansion of the commitments to other stakeholders, restricting a more robust and transparent system of monitoring and enforcement.

5. OPPORTUNITIES (FOCUS ON BRAZIL)

Internal sector alignment in the supply chain aiming at requiring traceability

When different sectors bring onboard both social and environmental agenda, incorporating into them, the awareness raises, and existing approaches to address challenges and empower stakeholders get spread easier. Sectorial alignment is also extremely important to avoid leakages. For example, if the slaughterhouses do not align themselves to be transparent and demand traceability from their suppliers, part of the suppliers may sell their production to companies that do not have these requirements. Likewise, if financial institutions do not align themselves to require their clients to establish robust traceability and monitoring systems, part of them may access credit from banks that do not have these requirements.

In this way, it is important to promote internal alignment aiming at requiring traceability: alignment among financial institutions, among downstream companies, among slaughterhouses, and so on. The whole sector needs to move along together. For instance, three of the biggest companies on beef supply chain in Brazil (JBS, Minerva and Marfrig) have recently published the expansion of their commitments (Table 2). This is an example of companies moving together to target their commitments, but other actors of this sector need to be engaged in the same direction.

Ultimately, sourcing commitments are to be met at farm-level. Slaughterhouses, being the first aggregation point of cattle, are the ones in the best position to support them, and they can do it more easily with support of the other sectors, working to roll out their commitments.

Cross-sector alignment, engaging state and municipal governments

In terms of cross-sector alignment, ongoing initiatives such as IMAC (Mato Grosso) and Selo Verde (Pará) show that government's engagement is important to support the processes, to build trust and enforce law, collaborating with their success. As federal government organizations are currently weakened in Brazil, the engagement among financial institutions, private organizations, and state and municipal governments is a promising approach.

	JBS	MINERVA	MARFRIG
Platform	Pecuária Transparente	Road Map 2035	MARFRIG Verde +
Commitments and goals	Achieve a beef supply chain traceability (including indirect suppliers) free from illegal deforestation in the Amazon, Cerrado, and other Brazilian biomes by 2025.	Monitoring of indirect suppliers in the Amazon by 2021 / Zero illegal deforestation in the entire supply chain and monitoring of indirect suppliers in all operating countries by 2030.	Achieve full traceability in the beef supply chain in Amazon by 2025 / in Cerrado and other Brazilian biomes by 2030.
Tools being used	Conecta, EcoTrace, Agritrace	Visipec, SMGeo Indirect	Visipec, Agroicone, Conecta, RFI
Producer support program	Green offices: support suppliers in environmental regularization processes for their properties through free legal and environmental advice. The offices are distributed across 13 JBS plants in the states of Goiás, Mato Grosso do Sul, Mato Grosso, Pará, Rondônia.	Speaking of livestock - offers lectures to discuss issues between the industry and farmers, such as, meat quality, inputs, among others. Forest Restoration System (SIRFLOR) - simplified administrative process for rehabilitation of properties that currently do not meet TAC criteria due to illegal deforestation. This process can also be used in joining the Environmental Regularization Program (PRA).	Marfrig Club Protocol: Since 2010, it encourages the adoption of good practices (such as traceability and preservation of vegetation), ensuring safer and less impactful production through the Marfrig Club sustainable practices guideline.

Table 4. Expansion of JBS, Minerva and Marfrig's commitments.

New regulations in importing countries to guarantee the purchase of quality raw materials that meet social and environmental criteria

External regulations are extremely important because they can guide the production practices and the traceability in Brazil, having the potential to also impact the domestic market (such as the establishment of due diligence outside companies' offices, including their subsidiaries). In a future scenario, external regulations tend to increase pressure in Brazil for stronger and more unified traceability and monitoring mechanisms.

Emerging blockchain technologies

Emerging blockchain technologies can be an alternative for integrating not only GTAs, but also GTAs with other tools available and necessary for the socioenvironmental monitoring of cattle ranching, such as CAR, as well as protecting sensitive information. It could be applied either on the existing public platforms or on a new privately owned platform, developed with the purpose of tracing cattle batches to their origin and covering the whole cattle supply chain.

6. REFERENCES / ADDITIONAL RESOURCES

- » [The Beef Toolkit](#)
- » [PECSA \(Sustainable Livestock in the Amazon\)](#)
- » [Indirect Suppliers Working Group](#)
- » [Carnes Validadas](#)
- » [TRASE](#)
- » [TFA - Comparative Analysis Of Sustainable Beef Protocols, Platforms, And Initiatives](#)