July 2026

Cattle supply sheds for slaughterhouses in Brazil

Data access

You can visualise and download the full datasets here:
https://trase.earth/projects/brazil-beef-supply-sheds

Data description

The data covers cattle supply sheds for 1,249 Brazilian slaughterhouses. It includes relative estimates of deforestation and gross greenhouse gas emissions from deforestation exposure for each slaughterhouse. It uses the Trase dataset of slaughterhouses across Brazil and the methods for deriving cattle supply sheds and deforestation exposure set out in our Brazilian beef exports supply chain map and zu Ermgassen et al (2020).

The data comprises two datasets: a facilities dataset that provides a summarised view of the data at the facility level (Table 1) and a supply shed dataset that provides the data for each slaughterhouse in each of the municipalities within its supply shed (Table 2).

The aim is to support transparency, supply chain mapping, risk analysis and policy evaluation in the livestock and meat sectors.

Table 1: Column descriptions for the slaughterhouse facilities dataset

Column Name / Key	Description	Data type
Facility ID **facility_id**	Unique identifier for the facility, constructed as '<inspection_level>_<cleaned_cnpj>_<inspection_num>_1', where inspection_num is provided by the data source system or database (SIF or SISBI). The	string

Pereira, O. J. R., Pacheco Menezes, T., Santos Garcia, A., Martín, N., & Loureiro, B. (2026). Cattle supply sheds for slaughterhouses in Brazil: Data and methods (Version 1) [Dataset]. Trase. https://doi.org/10.48650/3HX5-K876

	same facility might have multiple records if it processes more than one commodity	
Company name **company_group**	Main company name that may own one or more facilities	string
Facility name **company**	The legal name of the company under which the facility operates. Specifically, this is the name registered in the SISBI (Sistema Brasileiro de Inspeção de Produtos) system or that holds the SIF (Serviço de Inspeção Federal) registration	string
TAC signatory **TAC_SIGN**	Did the slaughter company sign a TAC (Termo de Ajustamento de Conduta) for the respective state?	string
TAC signatory year **TAC_YEAR**	What year did the slaughter company sign a TAC for the respective state	number
TAC audit cycle year **AUDIT_CYCLE**	Audit cycle year	number
AUDIT4_RESPAR_GENERAL **AUDIT4_RESPAR_GENERAL**	General score on environmental compliance (0-1) from third party audit	number
AUDIT4_RESAUT_GENERAL **AUDIT4_RESAUT_GENERA**L	General score on environmental compliance (0-1) from automated analysis	number
AUDIT4_RESPAR_TFOR **AUDIT4_RESPAR_TFOR**	Forced labor cases in the company supply chain (FALSE - TRUE) from third party audit	number
AUDIT4_RESAUT_TFOR **AUDIT4_RESAUT_TFOR**	Forced labor cases in the company supply chain (FALSE - TRUE) from automated analysis	
Inspection Number **inspection_num**	Official registration number of the facility under the relevant inspection system (SIF, SIE, SIM)	string
Inspection Level **inspection_level**	The sanitary inspection agency under which the facility is registered, each corresponding to the level of government. SIF (Serviço de Inspeção Federal) is federal level, SIE (Serviço de Inspeção Estadual) is state level, SIM (Serviço de Inspeção Municipal) is	string

	municipal level, and CONSORCIO (consortium) is inter-municipal	
Longitude **destination_long**	Longitude coordinate of the facility location	number
Latitude **destination_lat**	Latitude coordinate of the facility location	number
Geocode **geocode_destination**	Brazilian municipal code (IBGE format) where the facility is located	string
Municipality **municipality_destination**	Name of the municipality where the facility is located	string
Supply shed methodology **source_data**	The methodology used to estimate the supply shed: GTA or SIG-SIF (see data sources section below)	string
Number of source_municipalities **sourcing_municiapalities_total**	The number of municipalities that supply each slaughterhouse	number
Slaughtered quantity **supply_network_scale_index**	Facility-size index used in the exposure calculation. It compares the facility's total GTA/SIG-SIF supply-network weight with the typical facility scale (normalised by the median); 1 means typical facility scale, while values below and above 1 represent facilities receiving less or more volume than the average, respectively.	number
Slaughterhouse facility deforestation exposure **Deforestation exposure index**	Deforestation exposure index is directly related to recent cattle deforestation and represents the aggregated cattle deforestation exposure of each municipality in the supply shed of a given facility. It combines the source municipality deforestation-per-tonne indicator, source municipality supply-network share (proportional flows), and facility supply-network scale. Higher values indicate greater relative exposure, driven by higher risk sourcing areas, larger sourcing shares and/or larger facility scale. It is a relative screening score for comparing facilities, not annual	number

Pereira, O. J. R., Pacheco Menezes, T., Santos Garcia, A., Martín, N., & Loureiro, B. (2026). Cattle supply sheds for slaughterhouses in Brazil: Data and methods (Version 1) [Dataset]. Trase. https://doi.org/10.48650/3HX5-K876

	attributable hectares of deforestation, although directly related to absolute deforestation. This index has no upper bound and the maximum value will depend directly on the maximum deforestation exposure in the dataset.	
Slaughterhouse facility gross greenhouse gas emissions exposure **GHG emissions exposure index**	Gross greenhouse gas emissions, measured as CO_2 equivalent, directly related to recent deforestation that represents the aggregated gross emissions associated with cattle deforestation exposure of each municipality in the supply shed of a given facility. It combines the source municipality emission-per-tonne indicator, source municipality supply-network share (proportional flows), and facility supply-network scale. It is a relative screening score for comparing facilities, not annual attributable tonnes of emissions, although directly related to absolute emissions. This index has no upper bound and the maximum value will depend directly on the maximum emissions exposure in the dataset.	number

Table 2: Column descriptions for the slaughterhouse supply sheds dataset

Column Name / Key	Description	Data type
Facility name **company**	The name of the facility	string
Facility ID **`facility_id`**	Unique identifier for the facility, constructed as '<inspection_level>_<cleaned_cnpj>_<inspection_num>_1', where inspection_num is provided by the data source system or database (SIF or SISBI). The same facility might have multiple records if it processes more than one commodity	string
Supply shed **source_municipality**	The name of the municipality that supplies the slaughterhouse	string

Pereira, O. J. R., Pacheco Menezes, T., Santos Garcia, A., Martín, N., & Loureiro, B. (2026). Cattle supply sheds for slaughterhouses in Brazil: Data and methods (Version 1) [Dataset]. Trase. https://doi.org/10.48650/3HX5-K876

Geocode **source_geocod**	Brazilian municipal code (IBGE format) of the supply shed municipality	string
Proportional flow prop_flow	Proportional flow of supplied cattle from the source municipality to the unique facility. Values sum to 1 across source municipalities for each facility.	number
Deforestation exposure index **Deforestation exposure index**	Network-scaled deforestation exposure index is directly related to recent cattle-linked pasture deforestation and represents the cattle deforestation exposure of each sourcing municipality. It combines source-municipality cattle deforestation per tonne, source-municipality supply-network share (proportional flow), and facility supply-network scale (slaughtered volume index). Higher values indicate greater relative exposure, driven by higher risk sourcing areas, larger sourcing shares and/or larger facility scale. It is a relative screening score for comparing facilities, not annual attributable hectares of deforestation, although directly related to absolute deforestation. This index has no upper bound and the maximum value will depend directly on the maximum deforestation. in the dataset.	number
Greenhouse gas emissions exposure index **GHG emissions exposure index**	Follows exactly the same logic as the deforestation index, replacing the source-municipality cattle deforestation per tonne indicator by source-municipality cattle greenhouse gas emissions per tonne. It represents the associated gross CO_2-eq emissions from cattle deforestation exposure of each sourcing municipality	number

Data sources

Cattle movement records (GTA): Cattle movement records were downloaded from state and federal sources (MAPA – Ministério da Agricultura, Pecuária e Abastecimento 2018a, INDEA 2018, IDARON 2018). This data details the movement of batches of cattle between properties, listing the date of each movement, the farms or slaughterhouses sending and receiving cattle, the number of cattle, and their ages and sex. 8.7 million cattle movement data records were used covering 26 states and the federal district.

Cattle production is derived from herd size (IBGE's Pesquisa da Pecuária Municipal), slaughter rate (Anualpec) and carcass weight (IBGE).

Deforestation and emissions from deforestation were estimated at municipality level based on PRODES (Programa de Monitoramento dos Biomas Brasileiros) annual deforestation mosaics at 30-metre spatial resolution. We overlapped the annual deforestation from PRODES with MapBiomas (2026) mosaics of cultivated pasture. We used the same data used by Trase (2025) to estimate the municipal deforestation and CO_2-eq emissions in 2024.

Road distances were estimated using OpenStreetMap database [PostgreSQL via API]. OpenStreetMap Foundation: Cambridge, UK; 2024[accessed 29 Jun 2026]. OpenStreetMap contributors. Available under the Open Database Licence from: openstreetmap.org.

Slaughterhouse list: List of meatpacking facilities in Brazil, published by Ministério da Agricultura, Pecuária e Abastecimento and the Sistema de Gestão dos Serviços de Inspeção (e-SISBI). Includes federal-inspected, state-inspected, and municipal-inspected facilities.

Original source: Pacheco, T., Mempel, F., Biddle, H., Garcia, A., Loureiro, B., Soares, J., zu Ermgassen, E.K.H.J., (2026). Brazil slaughterhouses and other animal products facilities: Data sources and methods. Trase. https://doi.org/10.48650/49YM-HZ10a, 2026. https://trase.earth/explore/facilities-data/map?facilityTypeId=brazil-facilities

TAC: Data on TAC da carne legal signatories and audit results from automatic analysis and third party audits is from Beef on Track (Boi na Linha).

Methodology

Cattle supply sheds for each slaughterhouse were mapped at the municipal level. This builds supply sheds that are weighted: some municipalities (typically near the slaughterhouse) supply more cattle than other (more distant) municipalities. These weightings are based on the origin and number of cattle purchased by the slaughterhouse. We use two different methods to calculate the supply sheds based on data availability. These methods are based on zu Ermgassen et al (2020) where they are described in detail.

Method one: Connecting direct and indirect GTAs to slaughterhouses

GTA records describe movements of batches of cattle between rural properties, animal fairs and slaughterhouses. Each movement record can include the date of movement, the origin and destination establishments, the number of animals moved, and the age and sex of those animals. GTA records were cleaned to remove duplicate records and records with invalid dates or locations. Establishments were identified using tax identifiers where available, and otherwise by matching property and owner information within municipalities (zu Ermgassen et al., 2020).

The cleaned records are loaded into a graph database and traversal searches are conducted to trace the movement of cattle across properties. Nodes correspond to properties, animal fairs and slaughterhouse facilities; directed edges correspond to GTA movements between those nodes. Edges retain attributes such as movement date, animal counts, age and sex. The resulting network captures not only direct suppliers, but also indirect suppliers identified through these traversal searches (Figure 1).

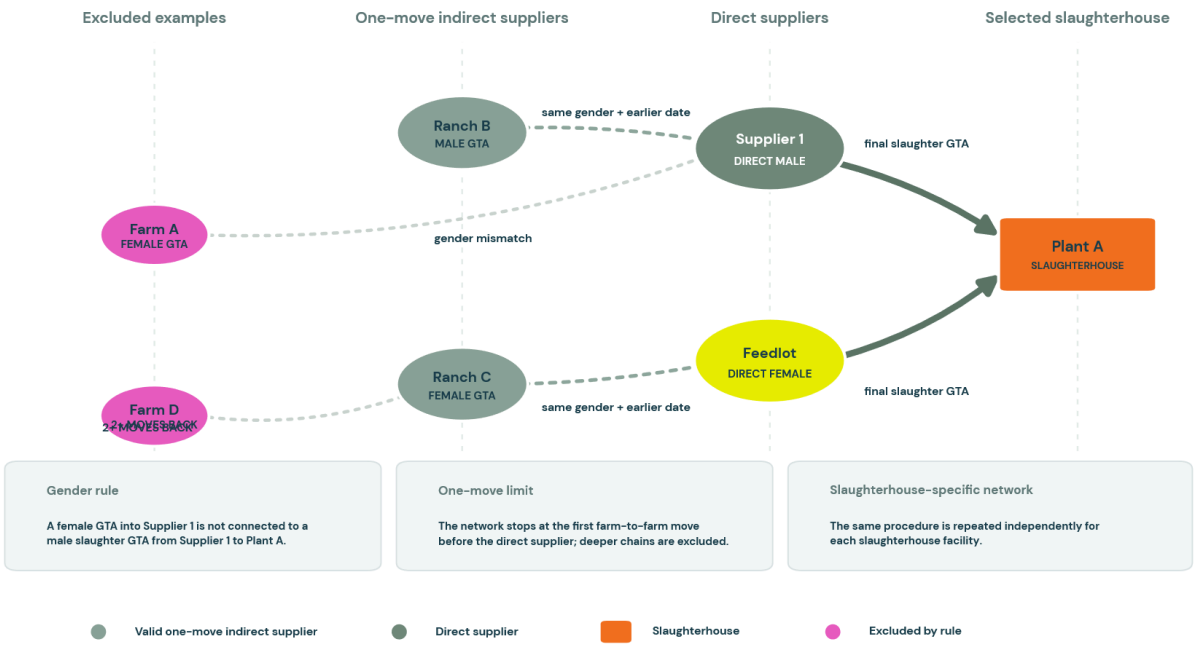

Figure 1: Illustrative GTA network showing how direct slaughterhouse suppliers are linked to one preceding farm-to-farm cattle movement. Connections are retained only when animal sex matches across the indirect and final slaughter movements.

Direct connections are followed for a maximum of one inter-property movement to reduce the risk of introducing weak or spurious links. Due to the batch nature of the data, each additional transaction exponentially increases the number of cattle that may potentially be mixed into the receiving property's herd and the probability that animals at the start of a long chain are purchased by the slaughterhouse declines. Connections are also constrained by animal sex. The result of this step is a slaughterhouse-specific supplier network containing the properties and GTA movements that plausibly contributed cattle to that slaughterhouse (in this method this includes both direct and tier 1 indirect suppliers). The same procedure is repeated independently for each slaughterhouse so that each facility has its own supply network.

Once the network of GTAs is constructed, it is transformed into liveweight movements (carcass tonnes) using conversion factors for cattle of different ages. The weighted movement data is then aggregated from the property level to the municipal level. For each slaughterhouse, this produces a matrix of inter-municipal cattle movements representing the flows that ultimately supply that slaughterhouse. This method was used for 600 slaughterhouses where GTA data was available.

Pereira, O. J. R., Pacheco Menezes, T., Santos Garcia, A., Martín, N., & Loureiro, B. (2026). Cattle supply sheds for slaughterhouses in Brazil: Data and methods (Version 1) [Dataset]. Trase. https://doi.org/10.48650/3HX5-K876

Method two: SIG–SIF for slaughterhouses without GTA supply sheds

For facilities that could not be linked to the GTA supply-shed data, we estimated a supply shed using SIG-SIF slaughter records and road-distance information. SIG-SIF is not facility-specific. The historical data we used from MAPA (2015–2020) links each slaughter state to municipalities of origin and reports the slaughtered volume associated with each origin municipality. We therefore used SIG-SIF as a state-level proxy to identify plausible source municipalities for facilities without GTA data.

The SIG-SIF method was constrained using patterns observed in GTA-derived supply sheds. First, we calculated road travel time between source and facility municipalities (where the slaughterhouse is located) for all facilities with GTA supply sheds. For each GTA-linked facility, source municipalities were ordered by their supply-share volume contribution, and the municipalities accounting for up to 95% of cumulative supply were retained. Within this GTA-derived subset, municipality-to-municipality travel times were grouped by facility-state/source-state pair. For each state pair, we calculated the 95th percentile travel time, creating a maximum plausible travel-time threshold based on observed GTA sourcing patterns.

For each facility without GTA data, SIG-SIF candidate source municipalities were selected from the facility's slaughter state and paired with the facility municipality. Each candidate was assigned a municipality-to-municipality road travel time. The candidate list was then filtered in two steps. First, only municipalities within the facility-specific median travel time were retained, keeping the closer half of SIG-SIF candidates for that facility. Second, candidates were retained only if their travel time was within the GTA-derived 95th-percentile threshold for the same facility-state/source-state pair. The remaining retained source municipalities were weighted using SIG-SIF quantities and re-normalised so that their shares summed to 100% for each facility (for more details see Appendix 1). This method was used for 649 slaughterhouses where GTA data was not available.

Cattle deforestation and gross greenhouse gas emissions exposure index per slaughterhouse

The cattle deforestation and gross CO_2-eq emissions exposure index were estimated by linking each slaughterhouse supply shed to municipality-level Trase indicators of cattle deforestation and associated gross GHG emissions. These indicators allocate pasture deforestation and emissions to cattle production using a five-year production cycle. For each source municipality, cattle deforestation per tonne is calculated as the five-year average deforestation

for pasture divided by five-year average beef production in carcass-weight tonnes. The same logic is applied to estimate gross CO_2-eq emissions per tonne associated with beef production. We attribute the municipality deforestation and emissions to each slaughterhouse facility *f*, based on their sourcing proportions from each municipality *m* weighted for relative slaughterhouse size, estimated as the facility supply-network weight *S*. The proportional flow for each facility-source municipality connection were calculated based in the GTA and SIG-SIF estimated sourcing volumes *kg* , and normalised so that source municipality shares sum to 1 for each facility:

$$w_{fm} = \frac{kg_{fm}}{\sum_{j \in M_f} kg_{fj}}$$

- w_{fm}: source weight for facility *f* and source municipality *m*;
- kg_{fm}: supply-network volume from municipality *m* to facility *f*;
- M_f: set of all source municipalities in the supply shed of facility *f*.

Relative slaughterhouse size *S*, was estimated using cattle sourcing volumes derived from the combination of the most recent GTA data and SIG-SIF data. Because these estimated volumes are based on multiple data sources and inference methods, they are more robust for representing relative differences among slaughterhouses than for estimating absolute annual slaughter volumes. To retain sensitivity to facility size while avoiding the use of uncertain absolute volumes, we calculated a facility supply-network scale index:

$$S_f = K_f / median_{(q \in F)}\left(K_q\right)$$

Where K_f is defined as:

$$K_f = \sum_{(m \in M_f)} kg_f m / 1000$$

S_f is the facility supply-network scale index. K_f is the total supply-network weight for facility *f*, converted from kilograms to tonnes. The denominator is the median K_q across all facilities *q* in the dataset. Thus, $S_f = 1$ represents a median-sized facility, values above 1 represent facilities with larger supply-network weights, and values below 1 represent smaller facilities. Finally, we estimated the facility level risk exposure index, as:

$$DEI_{fm} = D_m * w_{fm} * S_f$$

Pereira, O. J. R., Pacheco Menezes, T., Santos Garcia, A., Martín, N., & Loureiro, B. (2026). Cattle supply sheds for slaughterhouses in Brazil: Data and methods (Version 1) [Dataset]. Trase. https://doi.org/10.48650/3HX5-K876

Where:

- DEI_{fm}: deforestation exposure index for facility *f* and source municipality *m;*
- D_m: cattle deforestation per tonne in source municipality m;
- w_{fm}: source weight of municipality m within the supply shed of facility f
- S_f: facility supply-network scale index;
- Note: we used the same equation to calculate gross CO_2-eq emissions exposure, replacing D_m by gross CO_2-eq emissions from cattle deforestation per tonne in source municipality *m*.

Both indexes for deforestation and emissions should be interpreted as relative, network-scaled screening indices intended for ranking and comparing exposure between slaughterhouse facilities, and for prioritising supplier engagement. They do not represent annual attributable hectares of deforestation or annual attributable tonnes of CO_2-eq emission.

References

E.K.H.J. zu Ermgassen,J. Godar,M.J. Lathuillière,P. Löfgren,T. Gardner,A. Vasconcelos, & P. Meyfroidt, The origin, supply chain, and deforestation risk of Brazil's beef exports, Proc. Natl. Acad. Sci. U.S.A. 117 (50) 31770-31779, https://doi.org/10.1073/pnas.2003270117 (2020).

Instituto Brasileiro de Geografia e Estatística. *Pesquisa da Pecuária Municipal: Efetivo dos rebanhos, por tipo de rebanho* [Data set]. Sistema IBGE de Recuperação Automática — SIDRA. Retrieved May 2025, from https://sidra.ibge.gov.br/tabela/3939

MapBiomas Project. (2026). *Collection 10.1 of the annual land use and land cover maps of Brazil* [Data set]. Retrieved May, 2026, from https://plataforma.brasil.mapbiomas.org/

Ministério da Agricultura, Pecuária e Abastecimento. *Quantidade de abate mensal de todas as espécies por estado*. PGA-SIGSIF — Sistema de Informações Gerenciais do SIF. Retrieved June 9, 2026, from https://sistemas.agricultura.gov.br/pga_sigsif/pages/view/sigsif/abatemensalespecieporuf/indexAbateMensalEspeciePorUf.xhtml

PRODES. Instituto Nacional de Pesquisas Espaciais. *Monitoramento anual da supressão da vegetação nativa* [Data set]. TerraBrasilis / Programa de Monitoramento dos Biomas Brasileiros — Biomas BR. Retrieved May 2025, from https://terrabrasilis.dpi.inpe.br/

Trase. (2025). SEI-PCS Brazil beef v2.2 supply chain map: Data sources and methods. Trase. https://doi.org/10.48650/CP2S-SP59

Contact us

For further information contact
info@trase.earth

Appendix 1

The GTA method is preferred because it uses observed cattle movement records and can represent direct and indirect supplier links. However, some facilities do not have a GTA supply shed for the target year. For those facilities, the SIG-SIF method provides an approximate municipal supply shed so that we can derive supply sheds for all identified facilities across Brazil.

Data inputs

- **Facility list**: slaughterhouse location, CNPJ/tax number, municipality and coordinates.
- **GTA-derived supply sheds**: observed source municipalities and flow proportions for facilities with GTA matches.
- **Road travel-time matrix**: municipality-to-municipality travel times between the centroids of potential source and facility municipalities derived from Open Street Map API.
- **SIG-SIF slaughter statistics**: for each slaughter state, the source municipalities that sent cattle to the state of slaughter and their relative volume and share for the period 2015–2020.

Method

The SIG-SIF method is applied only to facilities that cannot be matched to the GTA supply-shed file. The method can be summarised in 5 steps:

1. **GTA benchmark construction**
   For facilities with GTA supply sheds, we connected each facility-source municipality pair to the road-distance matrix. This matrix calculates travel time using open street map data between the centroids of the municipality pairs. This gives a travel time from the source municipality to the facility municipality with GTA. Source municipalities are ordered by their GTA proportional flow volume, and the municipalities accounting for

up to 95% of cumulative flow are retained. These retained municipality-pair travel times are then grouped by facility state and source state. For each facility-state/source-state pair, the code calculates the 95th percentile of the municipality-pair travel times.

2. **SIG-SIF candidate construction**
   For each facility without GTA data, the code identifies all possible source municipalities from the SIG-SIF distribution for the facility's slaughter state. These candidates are not facility-specific observations. They are plausible source municipalities inferred from SIG-SIF state-level slaughter patterns.
3. **Facility-specific median filter**
   We calculated the road travel time from every SIG-SIF candidate municipality to the facility municipality. For each facility, it calculates the median of those candidate travel times and retains only candidates with travel time less than or equal to that facility-specific median.
4. **GTA-derived state-pair filter**
   The remaining candidates are then compared with the GTA-derived benchmark. A candidate municipality is retained only if its municipality-to-facility travel time is less than or equal to the 95th percentile travel-time threshold observed in GTA supply sheds for the same facility-state/source-state pair.
5. **Weighting**
   After filtering, the retained municipalities are weighted using SIG-SIF slaughter quantities. The weights are re-normalised within each facility so that the retained source municipalities sum to 100%.

Interpretation and limitations

The SIG-SIF method should be interpreted as a state-level, distance-constrained allocation of likely source municipalities that uses SIG-SIF state-level slaughter patterns and road-distance filters. It is not based on cattle movement transaction data and therefore does not account for the indirect supply chain. It is intended to fill data gaps where GTA evidence is unavailable, using the best available state-level slaughter statistics and plausible sourcing-distance constraints.

Resources

The full code used for the SIG-SIF method is available in github: https://github.com/sei-international/TRASE/blob/master/trase/data/brazil/beef/ciff/supply_shed/slaughterhouses_supply_shed.py

Pereira, O. J. R., Pacheco Menezes, T., Santos Garcia, A., Martín, N., & Loureiro, B. (2026). Cattle supply sheds for slaughterhouses in Brazil: Data and methods (Version 1) [Dataset]. Trase. https://doi.org/10.48650/3HX5-K876