

BRAZIL

Indicator	Relevant commodity	Description	Source
Agricultural indicators			
Production of soy (t)	Soy	Soy production per municipality, in tonnes (metric tons).	Brazilian Institute of Geography and Statistics (IBGE) (https://sidra.ibge.gov.br).
Soy yield (t/ha)	Soy	Average municipal soy yield (tonnes/hectare) from annual municipal production survey.	Brazilian Institute of Geography and Statistics (IBGE) (https://sidra.ibge.gov.br).
Agricultural land used for soy (%)	Soy	Percentage of agricultural land in the municipality that is used for soy production.	Brazilian Institute of Geography and Statistics (IBGE) (https://sidra.ibge.gov.br).
Pasture area (ha)	Beef	Area (hectares) of land used as pasture per municipality.	Mapbiomas 4.1 (https://mapbiomas.org/en).
Cattle stocking rate (heads/ha)	Beef	Number of heads of cattle per hectare of pasture in each municipality according to the preliminary results of the 2017 IBGE agricultural census. Municipalities with more than four heads/ha were excluded from this measure, as were the 53 municipalities originally without data.	Brazilian Institute of Geography and Statistics (IBGE) (https://sidra.ibge.gov.br/tabela/6783#notas-tabela).
Beef products	Beef	Specific cattle products aggregated into live cattle, processed, un-processed and frozen beef.	Per-shipment trade data (see SEI-PCS Brazil beef v2 data sources and methods document).
Pigs slaughtered (heads)	Pork	Number of pigs (heads) slaughtered per municipality.	Sistema de Informações Gerenciais do Serviço de Inspeção Federal (SIGSIF), Ministério da Agricultura, Pecuária e Abastecimento (MAPA), Brasil (http://sigsif.agricultura.gov.br/primeira_pagina/extranet/SIGSIF.html).
Chickens slaughtered (heads)	Chicken	Number of chickens (heads) slaughtered per municipality.	Sistema de Informações Gerenciais do Serviço de Inspeção Federal (SIGSIF), Ministério da Agricultura, Pecuária e Abastecimento (MAPA), Brasil (http://sigsif.agricultura.gov.br/primeira_pagina/extranet/SIGSIF.html).
Soy volume for feed (t)	Chicken and pork	Soy volume (tonnes) required for feed for pork and chicken, per municipality.	Derived from Sindirações (https://sindiracoes.org.br/).
Soy area for feed (ha)	Chicken and pork	Soy area (hectares) required to grow feed for pork and chicken, per municipality.	Derived from Sindirações (https://sindiracoes.org.br/).
Environmental indicators			

Territorial deforestation (ha)	All	Total deforestation per municipality for a given year (hectares). Calculated for all biomes except Caatinga and Pampa.	<p>INPE-PRODES Amazon (http://www.dpi.inpe.br/prodesdigital/prodesmunicipal.php).</p> <p>INPE-PRODES Amazon (http://www.dpi.inpe.br/fipcerrado/dashboard/cerrado-rates.html).</p> <p>SOS-MataAtlantica (http://mapas.sosma.org.br/).</p> <p>SOS-Pantanal (https://www.sospantanal.org.br/).</p>
Soy deforestation (ha)	Soy	Total area of deforestation (in hectares) per municipality that will become soy over the next five-year period (not including Caatinga and Pampa biomes). Calculated by comparing per-pixel annual deforestation and soy crop maps. Historical conversion factors of natural vegetation into soy are used to estimate soy deforestation in the last 5 years of the available time series.	<p>Soy crop area for South America provided by the University of Maryland GLAD team (https://glad.umd.edu/).</p> <p>Territorial deforestation data (see above).</p>
Soy deforestation risk (ha)	Soy	Soy deforestation risk (hectares) is the deforestation for soy that is allocated to the actors along the supply chain in proportion to the volume of soy that they export from a given municipality, relative to the total production of soy (by all producers) in the same municipality. Deforestation risk for a given year of export is based on deforestation for soy that occurred in the previous five years, during which time the soy that is being exported was planted and harvested. Available for all biomes except Caatinga and Pampa.	<p>Soy crop area for South America provided by the University of Maryland GLAD team (https://glad.umd.edu/).</p> <p>Territorial deforestation data (see above).</p>
Soy deforestation risk for feed (ha)	Chicken and pork	Soy deforestation risk (hectares) is the soy deforestation for feed allocated to the actors along the supply chain in proportion to the volume of livestock product that they export from a given municipality, relative to the total production (by all producers) in the same municipality. Available for all biomes except Caatinga and Pampa.	Derived from soy deforestation risk as allocated to feed for either chicken or pork.

Pasture deforestation (ha)	Beef	Total area of deforestation (in hectares) per municipality that will become pasture over the next five-year period (not including Caatinga and Pampa biomes). Calculated by comparing per-pixel annual deforestation and pasture maps. Historical conversion factors of natural vegetation into pasture are used to estimate pasture deforestation in the last 5 years of the available time series.	Mapbiomas 4.1 (https://mapbiomas.org/en). Territorial deforestation data (see above).
Cattle deforestation risk (ha/year)	Beef	Cattle deforestation risk (hectares) is the cattle deforestation that is allocated to the actors along the supply chain in proportion to the volume of beef that they export from a given municipality, relative to the total production of beef (by all producers) in the same municipality. Available for all biomes except Caatinga and Pampa.	Mapbiomas 4.0 (https://mapbiomas.org/en). Territorial deforestation data (see above). Cattle production (see above).
Land based CO ₂ emissions (t CO ₂ /year)	All	Carbon dioxide emissions (tonnes of CO ₂ per year) attributable to deforestation, including from above-ground and below-ground biomass and litter. Available for all biomes except Caatinga and Pampa.	Carbon map from FUNCATE (https://www.funcate.org.br/pt/). Territorial deforestation data (see above).
CO ₂ emissions from soy deforestation (t CO ₂ /year)	Soy	Carbon dioxide emissions (tonnes of CO ₂ emissions per year) attributable to soy deforestation, considering a five-year period (see above), including from above-ground and below-ground biomass and litter. Available for all biomes except Caatinga and Pampa.	Carbon map from FUNCATE (https://www.funcate.org.br/pt/). Soy deforestation (see above).
CO ₂ emissions risk from soy deforestation (t CO ₂ /year)	Soy	Carbon dioxide emissions attributable to the deforestation for soy, including from above-ground and below-ground biomass and litter, that is allocated to the actors along the supply chain in proportion to the volume of soy that they export from a given municipality, relative to the total production of soy (by all producers) in the same municipality. Emissions risk for a given year of export is based on deforestation that occurs in the previous five years, during which time the soy that is being exported was planted and harvested. Available for all biomes except Caatinga and Pampa.	Soy crop area for South America provided by the University of Maryland GLAD team (https://glad.umd.edu/). Territorial deforestation data (see above). Carbon map from FUNCATE (https://www.funcate.org.br/pt/).

CO ₂ emissions risk from soy deforestation for feed (t CO ₂ /year)	Chicken and pork	Carbon dioxide emissions attributable to soy deforestation for feed, including from above-ground and below-ground biomass and litter, allocated to the actors along the supply chain in proportion to the volume of livestock product that they export from a given municipality, relative to the total production (by all producers) in the same municipality. Available for all biomes except Caatinga and Pampa.	Derived from CO ₂ emissions risk from soy deforestation allocated to feed for either chicken or pork.
CO ₂ emissions from pasture deforestation (t CO ₂ /year)	Beef	Carbon dioxide emissions (tonnes of CO ₂ emissions per year) attributable to pasture deforestation, considering a five-year period (see above), including from above-ground and below-ground biomass and litter. Available for all biomes except Caatinga and Pampa.	Carbon map from FUNCATE (https://www.funcate.org.br/pt/). Pasture deforestation (see above).
CO ₂ emissions risk from cattle deforestation (t CO ₂ /year)	Beef	Carbon dioxide emissions (tonnes of CO ₂ per year) linked to cattle exports for a company or a municipality. As for deforestation, emissions are allocated to the companies along the supply chain in proportion to the volume of cattle products that they export from a given municipality, relative to cattle production (by all actors) in the same municipality.	Carbon map from FUNCATE (https://www.funcate.org.br/pt/). Cattle deforestation risk (see above).
Water scarcity (1-7)	All	Levels of criticality of water stress on a scale of 1-7 (1 being low stress). Aggregated to the median water stress level per municipality weighted by percentage of available water. Based on data from the Brazilian National Water Agency ANA (2013)	Flach, R. et al. (2016). Towards more spatially explicit assessments of virtual water flows: linking local water use and scarcity to global demand of Brazilian farming commodities <i>Environ. Res. Lett.</i> 11(7). 075003. DOI: 10.1088/1748-9326/11/7/075003 (http://iopscience.iop.org/article/10.1088/1748-9326/11/7/075003/meta).
Socio-economic indicators			
Human development index (0-1)	All	Municipal Human Development Index (score out of 1) based on 2013 analysis.	Atlas do Desenvolvimento Humano, PNUD (http://www.atlasbrasil.org.br/2013/en/)
GDP per capita (US\$)	All	Municipal GDP per capita per year (US\$).	Brazilian Institute of Geography and Statistics (IBGE)

			(https://www.ibge.gov.br/estatisticas-novoportal/economicas/contas-nacionais/9088-produto-interno-bruto-dos-municipios.html?=&t=o-que-e).
GDP from agriculture (%)	All	Percentage of the municipal GDP derived from the farming sector.	Brazilian Institute of Geography and Statistics (IBGE) (https://www.ibge.gov.br/estatisticas-novoportal/economicas/contas-nacionais/9088-produto-interno-bruto-dos-municipios.html?=&t=o-que-e).
Smallholder dominance (%)	All	The proportion of the total area of all rural properties that is inhabited by legally defined family farmers per municipality.	Imaflora's Atlas of Brazilian Agriculture (http://atlasagropecuario.imaflora.org/).
Reported cases of forced labour (number)	All	Number of people involved lawsuits relating to cases of forced labour or subjected to degrading working conditions per municipality.	Comissão Pastoral da Terra (http://www.cptnacional.org.br/); retrieved from LAPIG (http://maps.lapig.iesa.ufg.br/lapig.html).
Reported cases of land conflicts (number)	All	Number of land conflicts per municipality.	Comissão Pastoral da Terra (https://www.cptnacional.org.br/); retrieved from LAPIG (http://maps.lapig.iesa.ufg.br/lapig.html).
Population (number)	None	Population per municipality (2010 Census).	Brazilian Institute of Geography and Statistics (IBGE) (https://sidra.ibge.gov.br).
Territorial governance			
Legal Reserve deficit (ha)	All	The area of Legal Reserves (hectares) that must be restored or compensated off-farm to achieve compliance with the Brazilian Forest Code. Based on 2018 analysis.	Imaflora's Atlas of Brazilian Agriculture (http://atlasagropecuario.imaflora.org/).
Legal Reserve deficit as a percentage of private land (%)	All	The area of Legal Reserves that must be restored or compensated off-farm to achieve compliance with the Brazilian Forest Code – as a percentage of total private land. Based on 2018 analysis.	Based on Legal Reserve deficit.
Protected vegetation in private land (ha)	All	Protected vegetation is defined as native vegetation in Legal Reserves (hectares). It does not include Areas of Permanent Preservation. Based on 2018 analysis.	Imaflora's Atlas of Brazilian Agriculture (http://atlasagropecuario.imaflora.org/).
Unprotected vegetation in private land (ha)	All	Unprotected vegetation is defined as native vegetation area that surpasses the requirements of the Legal Reserves (ha). Does not include Areas of Permanent Preservation. Based on 2018 analysis.	Imaflora's Atlas of Brazilian Agriculture (http://atlasagropecuario.imaflora.org/).

Number of environmental embargoes (number)	All	Number of fines and embargoes associated with infringements of environmental legislation, per municipality, in a given year.	IBAMA (https://servicos.ibama.gov.br/ctf/publico/areasembargadas/ConsultaPublicaAreasEmbargadas.php).
Actor commitments			
Forest 500 score	All	Score for companies' deforestation commitments according to Global Canopy's Forest 500 assessment for 2018.	Global Canopy's Forest 500 score (http://forest500.org/).
Round Table on Responsible Soy (t)	Soy	Volume of soy (tonnes) produced per municipality that was certified according to the Round Table on Responsible Soy (RTRS) Standard for Responsible Soy Production. No conversion of natural vegetation is permitted after June 2016 under the RTRS Principles and Criteria.	RTRS (www.responsiblesoy.org).
Zero-deforestation commitments	Soy and beef	<p>Soy: Zero-deforestation commitments are either 'Soy Moratorium' if the trader has signed on to the Soy Moratorium in the Amazon, or 'company commitments' outside of the Amazon when the trader has a company-specific commitment.</p> <p>Beef: Exports were classified as being traded under a zero-deforestation commitment if they originated from a slaughterhouse that had signed a Terms of Adjustment of Conduct ('TAC'), a commitment to avoid illegal deforestation, or if they originated from a slaughterhouse that signed the 'G4' zero-deforestation agreement. Similar to soy, 'company commitments' are assigned to traders with a company-specific commitment.</p>	<p>Soy Moratorium: (http://abiowe.org.br/relatorios/).</p> <p>G4: (https://www.greenpeace.org/usa/research/minimum-criteria-for-i/).</p> <p>TAC: Amaral, T., Gibbs, H. and Rausch, L. L. (in review). Zero-Deforestation in the Brazilian Amazon: The Evolving Role of the Federal Public Prosecutors.</p> <p>And individual company websites and data collated by the Forest 500.</p>
Soy traded under zero-deforestation commitment (%)	Soy	Percentage of the exported soy that is exported by a trader with a zero-deforestation commitment, including traders with company commitments to zero deforestation across their global supply chains, as well as companies that are signatories to the Soy Moratorium and therefore have a zero-deforestation commitment on all soy sourced from the Amazon biome.	Calculated from the zero-deforestation commitments in the soy supply chain.

Cattle products traded under zero-deforestation commitment (%)	Beef	Percentage of exported beef that is covered by a zero-deforestation commitment, including traders with company commitments to zero deforestation, as well as exports sourced from slaughterhouses that had signed a Terms of Adjustment of Conduct ('TAC') or the 'G4' zero-deforestation agreement.	Calculated from the zero-deforestation commitments in the supply chain of cattle products.
Contextual layers			
Indigenous areas	All	Areas occupied by indigenous peoples (Terra Indígena)	FUNAI, the National Indian Foundation (Brazil) (http://www.funai.gov.br/).
Protected areas	All	Protected areas of all designations within Brazil. Does not include Areas of Permanent Protection.	Ministério do Meio Ambiente (Ministry of Environment) (http://mapas.mma.gov.br/i3geo/datado wnload.htm).
Land tenure	All	Public and private land holdings in Brazil derived from a number of public government datasets. Private land is derived from the CAR and SIGEF databases. Public lands were obtained from the Terra Legal Program; designated public lands include Sustainable Conservation Units and undesignated public lands include 'terras devolutas'. Based on 2018 analysis.	Imaflora's Atlas of Brazilian Agriculture (http://atlasagropecuario.imaflora.org/).
Land cover	Soy	Land cover classes	MapBiomas 4.0 (http://mapbiomas.org/en).
Water scarcity (1-7)	All	Level of criticality of water stress (1-7, 1 being low) by micro-basin.	Flach, R. et al. (2016). Towards more spatially explicit assessments of virtual water flows: linking local water use and scarcity to global demand of Brazilian farming commodities <i>Environ. Res. Lett.</i> 11(7). 075003. DOI: 10.1088/1748-9326/11/7/075003 (http://iopscience.iop.org/article/10.1088/1748-9326/11/7/075003/meta).
Deforestation polygons	All	Deforested areas in the Amazon, Cerrado, Atlantic Forest and Pantanal biomes (from 2006 to 2018).	INPE-PRODES (Amazon and Cerrado) (http://terrabrasilis.dpi.inpe.br/). SOS-MataAtlantica (Atlantic Forest) (http://mapas.sosma.org.br/). SOS-Pantanal (Pantanal) (https://www.sospantanal.org.br/).
States	All	Boundaries of Brazil's 26 states and the federal district (Distrito Federal, Brasília).	Instituto Brasileiro de Geografia e Estatística (2018) (https://cidades.ibge.gov.br/).
Biomes	All	Boundaries of the six Brazilian continental biomes.	Instituto Brasileiro de Geografia e Estatística (2004) (https://www.ibge.gov.br/geociencias/informacoes-ambientais/estudos-ambientais/15842-biomas.html?=&t=downloads).
Geocodes	All	Spatial codes given to municipalities, in the format BR-XXXXXXX.	Instituto Brasileiro de Geografia e Estatística — municipality boundaries (2017) (https://www.ibge.gov.br/).

