FROM PASTURE TO PLATE: SUBSIDIES AND THE ENVIRONMENTAL FOOTPRINT OF THE BEEF INDUSTRY IN BRAZIL

instituto Escolhas

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Study devised by Instituto Escolhas

Coordination:
**Sergio Leitão and
Shigueo Watanabe Júnior**
(Instituto Escolhas)

Technical implementation:
Economic analysis:
**Petterson Molina Vale
Kennedy Meira and Ricardo Vale** (support)

Environmental analysis:
**Pangea Capital team Roberto Strumpf and
Susian Martins Eduardo Pavão** (support)

Instituto Escolhas

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Instituto Escolhas develops studies and analyses on the economy and the environment aimed at enabling sustainable development.

ECONOMIC IMPACTS

What was the cost to the public coffers of the subsidies[1] granted to the beef chain over ten years?

R$ 123 BILLION*

between 2008 and 2017*
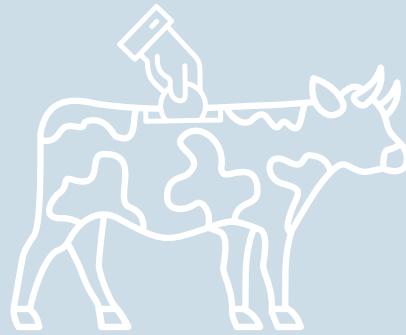
(R$ 12.3 billion per year)

SUBSIDIES, INCENTIVES, AGRICULTURAL CREDITS, FOREGONE TAX REVENUES, TAXES, DEBT AMNESTIES AND RELIEF

*All values in R$ 2019

**The study considers the following sources of tax exemptions and subsidies:**

PIS/PASEP
Cofins
IRPF/IRPJ
CSLL
Funrural
IOF
ITR
ICMS
FAT
PESA
PRONAF
FNO
FNE
FCO
FDA
BNDES
BB
BASA
BNB

*($30,8 billion/Euro 27,4 billion)

Between 2008 and 2017, the total amount of economic subsidies represented 9.7% of the average price of a kilogram of beef. This indicates the amount of taxpayer money in the price of a kilogram of beef reaching the consumer's plate.

each kg

= 9,7%
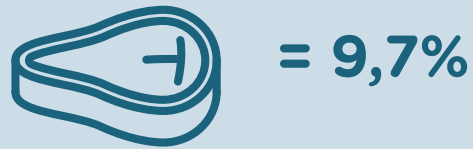
The subsidies corresponded to 79% of the estimated amount of all taxes collected along the beef chain . The subsidies granted were R$ 12.3 billion per year ($3.1 billion/Euro 2,7 billion) while the amount of tax collected in the industry was R$ 15.1 billion ($3.8 billion/Euro 3,4 billion).[3]

79% of annual collected taxes

From the total of **R$ 12.3 billion**, ICMS corresponded to **28.6%**, equivalent to **R$ 3.5 billion** ($0.9 billion/ Euro 0,8 billion), while the remainder was federal: 71.4%, representing **R$ 8.7** ($ 2.2 billion/1,9 billion). From the total percentage of **9.7%** of the average price of a kilogram of beef, **6.9%** is relative to the federal sphere and **2.8%** to the state sphere.

[1] In this summary, subsidies refer to all State disbursements and losses of revenue. The amounts of taxes collected and the volume of foregone tax revenue refer to the state and federal governments. The volume of credit subsidies and amnesties refers only to the federal government.
[2] For comparison, in the Brazilian economy as a whole, the number of subsidies for each R$ 100 in taxes collected was R$ 20.
[3] Annual average between 2008 and 2016. Data for 2017 were not yet available in the Instituto Brasileiro de Geografia e Estatística's (IBGE) National Accounts System (Sistema de Contas Nacionais or SCN) at the conclusion of this study.

ENVIRONMENTAL IMPACTS

1 kg
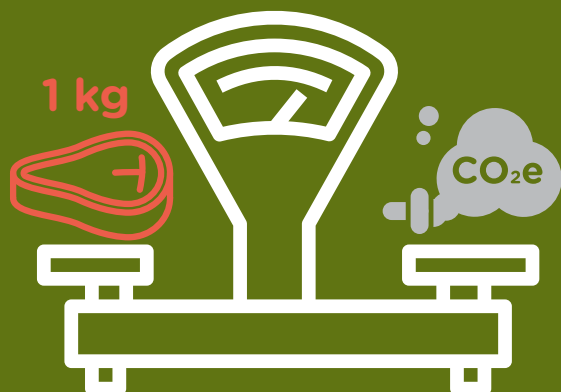
CO₂e

The average annual carbon footprint of the kilogram of beef was 78 kg of CO$_2$e[4] considering all the regions of the country in the period from 2008 to 2017.

78 kg

CO₂e

In the Matopiba region – which comprehends the states of Maranhão, Tocantins, Piauí and Bahia - the average carbon footprint is 183 kg of CO$_2$e/kg of beef.

183 kg

CO₂e

In the Amazon[5], the average carbon footprint is 145 kg of CO$_2$e/kg of beef.

145 kg

CO₂e

In all the other states the average carbon footprint is 23 kg of CO$_2$e/kg of beef.

23 kg

CO₂e

The water footprint for each kilogram of beef in the country is 64 litres[6] for the period from 2008 to 2017.

64 l

*Note: The results of the CO2 emissions in the Legal Amazon region do not include those from the state of Tocantins and part of the state of Maranhão. Their emissions were added to the Matopiba region.
[4] CO$_2$e or equivalent is the sum of all the greenhouse gases in a single unit. The national average of 78 kg of CO$_2$e between 2008 and 2017 is calculated taking into account all the production systems, emissions from deforestation, emissions and removals of pasture, all the emissions from transportation and from meat packers.
[5] The results of CO$_2$ emissions calculations in the Legal Amazon region do not include the states of Tocantins and Maranhão. The data from both states were included in the calculations of the Matopiba region
[6] The blue water footprint, that is the consumption of surface and groundwater, was used to calculate this footprint.

PRESENTATION

This study elaborated by Instituto Escolhas analyses the economic and environmental impacts of the beef chain in Brazil. This is an unprecedented approach that encompasses the entire trajectory of the product, from the birth of the calf to the plate of the consumer, over a period of 10 years. The analyses of economic impacts present the amounts of taxes collected and the subsidies granted by the state and federal governments. The environmental impact analysis shows the carbon footprint, with emissions and removals of greenhouse gases (GHG), and the water footprint, with data on water consumption.

With a herd of over 183 million head of beef cattle, in 2017 the beef chain represented 2.9% of Brazil's Gross Domestic Product (GDP) and 13.9% of the country's agribusiness GDP[7]. Throughout the country, annual CO$_2$e emissions totalled 2 billion tons (tCO$_2$e) PER YEAR, with emissions from beef cattle accounting for 14% of this total, that is, an average of 290 million tCO$_2$e from 2008 to 2017[8]. Added to this are the emissions from the conversion of the Amazon forest to pasture[9], which represented 22% of Brazil's CO$_2$e emissions, totalling 453 million tCO$_2$e during the same period.

The concession of subsidies is a policy instrument widely used by governments to stimulate economic activity. The beef chain has historically been a receiver of public support to drive its expansion. Just as subsidies are used to achieve specific objectives such as promoting social well-being, they could be used to incentivize more sustainable production practices or to produce healthier products.

In addition to identifying the volume of subsidies granted to the beef chain, the study brings forth the uses of these instruments and their negative impacts on the chain. In this regard, the study also analyses the environmental impacts in terms of greenhouse gas emissions and water usage - taking into account regional differences (biomes, types of management, grazing etc.) – to permit a understanding and analysis of the subsidy instrument and its foreseeable and unforeseeable impacts.

[7] Centro de Estudos Avançados em Economia Aplicada (Cepea) - Escola Superior de Agricultura "Luiz de Queiroz" (Esalq)/University of São Paulo (USP) / the Confederação Nacional da Agricultura (Brazilian Agriculture Confederation or CNA), GDP Agribusiness Chains.
[8] Data from the Sistema de Estimativas de Emissões e Remoções de Gases de Efeito Estufa (Greenhouse Gas Emissions and Removals Estimates System - Seeg) v7, 2019. Available at http://seeg.eco.br/
[9] Based on the technical literature that attributes part of the deforestation land to cattle grazing, this study attributed, on average, 73% of the deforestation emissions in the Legal Amazon region and 39% of the deforestation emissions in Matopiba are due to cattle grazing, using PRODES as reference for total deforested area and MapBiomas for classification of soil use after deforestation. (links available in PRODES Project – this carries out satellite monitoring of deforestation by shallow cutting in the Legal Amazon and since 1998 has produced, the annual deforestation rates in the region - http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes and Annual Mapping of Land Cover and Land Use in Brazil Project - (MapBiomas) - http://mapbiomas.org/)
Translated with www.DeepL.com/Translator (free version)

Some questions that the results raise:

- Since the subsidies correspond to almost the total amount collected in taxes in the beef chain, is the sector economically sustainable?

- Given the fiscal crisis in which the country is immersed, which is stifling federal and state finances and impeding State capacity to invest in infrastructure and the improvement of public services for the population, what justification is there for the beef sector to receive as much as it currently does from taxpayers?

- As Brazilian livestock breeding is very heterogeneous, comprising efficient producers and others whose productivity is extremely low, is it reasonable to question whether public funds are contributing towards the maintenance of producers who would be unable to compete under normal market conditions due to their inefficiency and low profitability?

- Another study[10] by Instituto Escolhas showed that eliminating deforestation would not impact the economy or hinder the expansion of production, which could make use of vast areas that have been opened for grazing and are currently underused. If there is already a large amount of available land that could be used to increase production, are the subsidies acting as a stimulus for deforestation? If this is the case, couldn't it be argued that deforestation is being financed by the taxpayer?

- As of now, when there is so much discussion about unrestricted State support for activities that should be self-sustaining (without public funding), shouldn't the funds granted to the livestock sector be conditional on commitments and targets that make the industry's production more environmentally and economically efficient, reducing emissions and improving productivity? Shouldn't funding for livestock breeding be granted exclusively via Brazil's ABC Program[11]?

- There are good cattle rearing practices that adopt a sustainable approach through the recovery of degraded grazing areas and the implantation of integrated production systems all over the country. These allow increased food production, help remove carbon from the atmosphere and generating negative emissions. What are the bottlenecks that need to be overcome by means of public policy to scale up these practices?

By examining the economic and environmental impacts of the beef chain, the results of the study contribute important evidence and information to the debate. This will serve as inputs for the choices that need to be made by public authorities and Brazilian society.
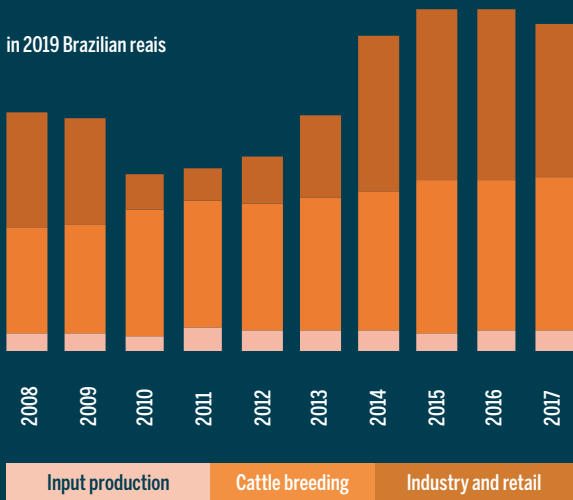
Beef chain trajectory
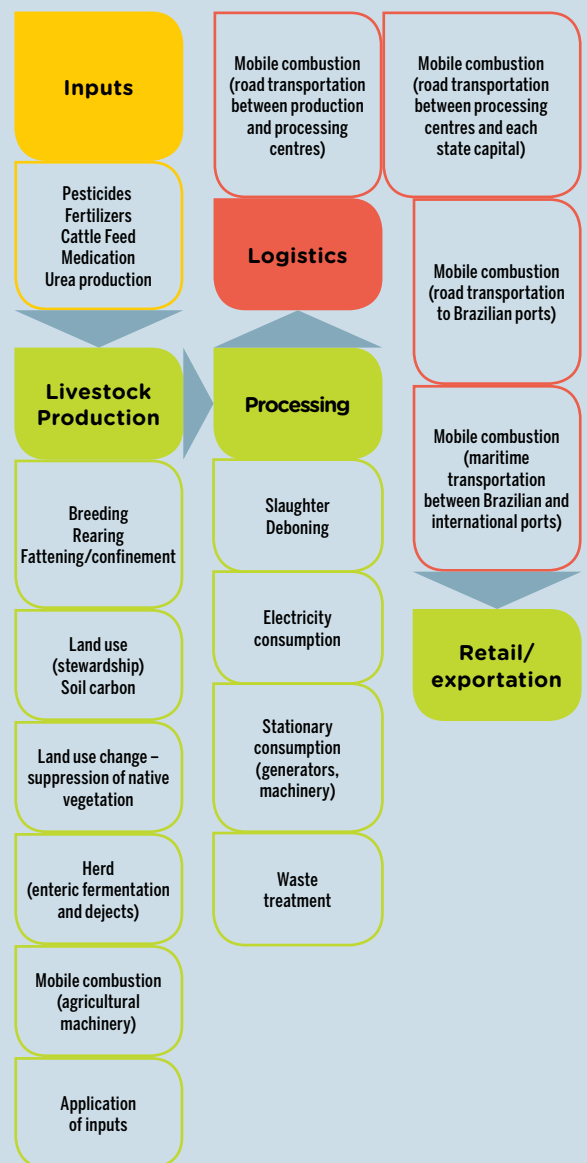
[10] "Qual o impacto do desmatamento zero no Brasil?" (What is the impact of zero deforestation in Brazil?) Available at http://escolhas.org/wp-content/uploads/2017/10/FD_210x280mm_DZ_11_AF.pdf

[11] Plano Setorial de Mitigação e de Adaptação às Mudanças Climáticas para a Consolidação de uma Economia de Baixa Emissão de Carbono na Agricultura (Sector Plan for the Mitigation and Adaptation to Climate Change to Consolidate a Low Carbon Emission Economy in Agriculture), which encourages the adoption of sustainable production technologies aimed at reducing greenhouse gas emissions

ECONOMIC IMPACTS[12]

R$ 7.9 billion is the annual amount of tax revenue forgone by the state and federal governments from 2008 to 2017.

Breaking down these tax expenditures by link in the chain, the results are: cattle production accounts for 51% of the tax volume forgone, the processing and the retail sectors account for 41.6%, and the production of inputs for the chain the remaining 7.4%.

## Taxes forgone by the state and federal governments by link along the beef chain

in 2019 Brazilian reais

| Input production | Cattle breeding | Industry and retail |

Source: Calculated based on IBGE (2017).

In the period from 2008 to 2017: of the tax expenditures, PIS and Cofins corresponded to 46.8%, ICMS to 28.6% and Income Tax, Funrural and ITR together totalled around 25%.
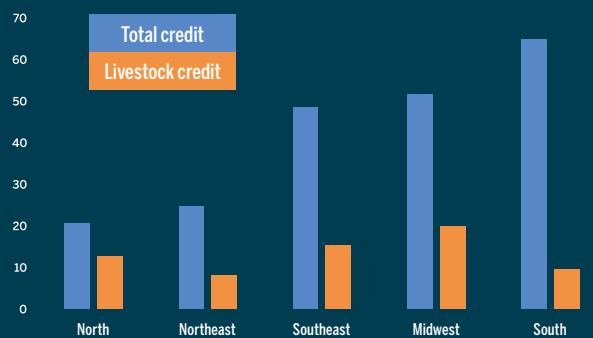
Taxes forgone by the state and federal governments by type

in 2019 Brazilian reais

| PIS/Cofins | ICMS | Imposto de Renda | Funrural | IOF | ITR |
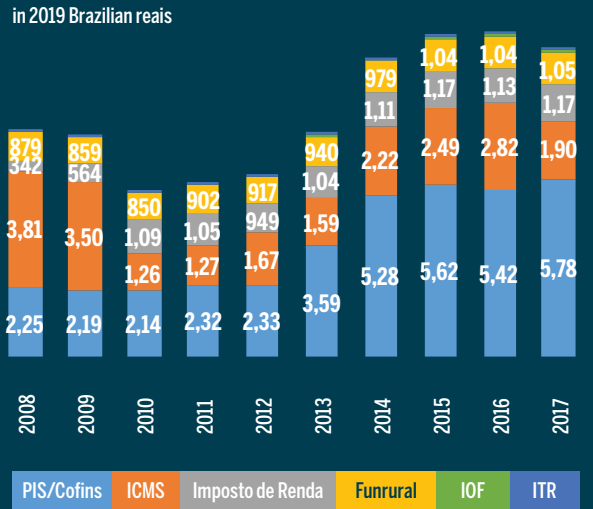
Source: Calculated based on IBGE data (2017)
Note: any ISSQN (Imposto Sobre Serviços de Qualquer Natureza) service taxes foregone were not assessed.

Between 2013 and 2017[12], livestock production absorbed 31% of the federal government agricultural credit concessions. The chart shows the total agricultural credits granted and the portion granted to the livestock sector, by region. In the North, livestock received 62%; in the Midwest 38.5%; in the Northeast 33%; in the Southeast 32%; and in the South 15%.
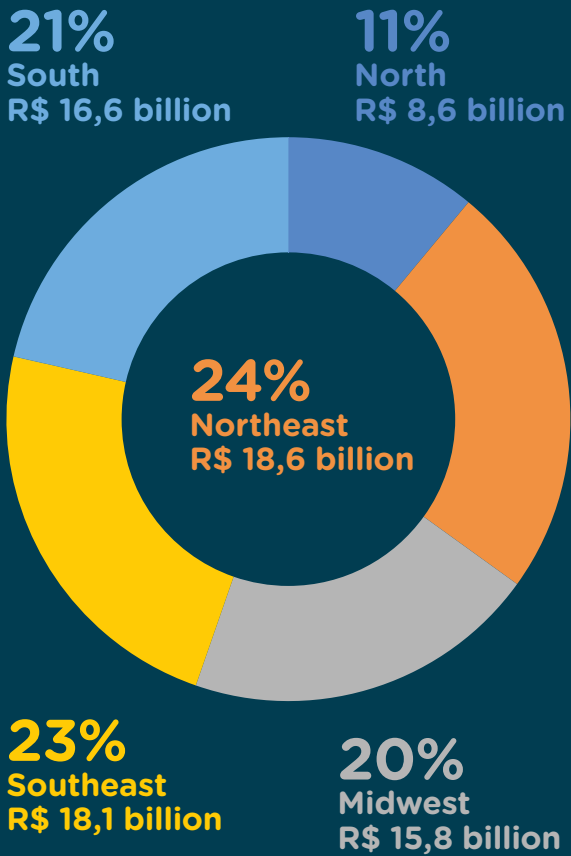
Agricultural credits granted by the federal government by region

Source: Brazilian Central Bank - Bacen (2019)

[12] Acronyms used in this summary: PIS/PASEP/COFINS (social security contributions); ICMS (state added value tax); PRONAF (national family agriculture support program); regional constitutional financial funds: North (FNO), Northeast (FNE), Midwest (FCO), and the Amazon (FDA); PESA (agricultural securitization program); IOF (tax on financial operations); ITR (rural property tax); Funrural (pension tax on rural activity); IR (Income tax)

Subsidies and amnesties granted, and taxes forgone by the state and federal government in the beef chain, by region. The Northeast benefited from 24% of the subsidies; the Southeast from 23%; the South from 21%; the Midwest from 20%; and the North from 11%. For each region, the cumulative totals during the period were R$ 18.6, R$ 18.1, R$ 16.6, R$ 15.8 and R$ 8.6 billion respectively).

R$ 4.4 billion is the annual average provided by the federal government in the form of credit subsidies, price subsidies and amnesties granted to the chain from 2008 to 2017. Of this total, 46.4% came from Constitutional Development Funds and 29.8% were PRONAF grants. Pesa-related amnesties corresponded to 6.1%.
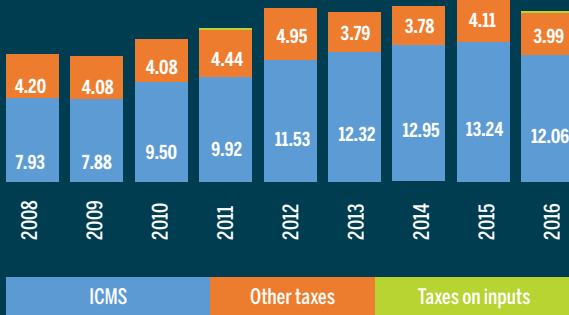
Subsidies and amnesties granted, and taxes forgone by the state and federal governments

21%
South
R$ 16,6 billion

11%
North
R$ 8,6 billion

24%
Northeast
R$ 18,6 billion

23%
Southeast
R$ 18,1 billion

20%
Midwest
R$ 15,8 billion

Total credit subsidies, price subsidies and amnesties granted by the federal government

17.6%

29.8%

6.1%

46.4%

| PRONAF | Constituticional Development Funds | Amnesties | Other subsidies |
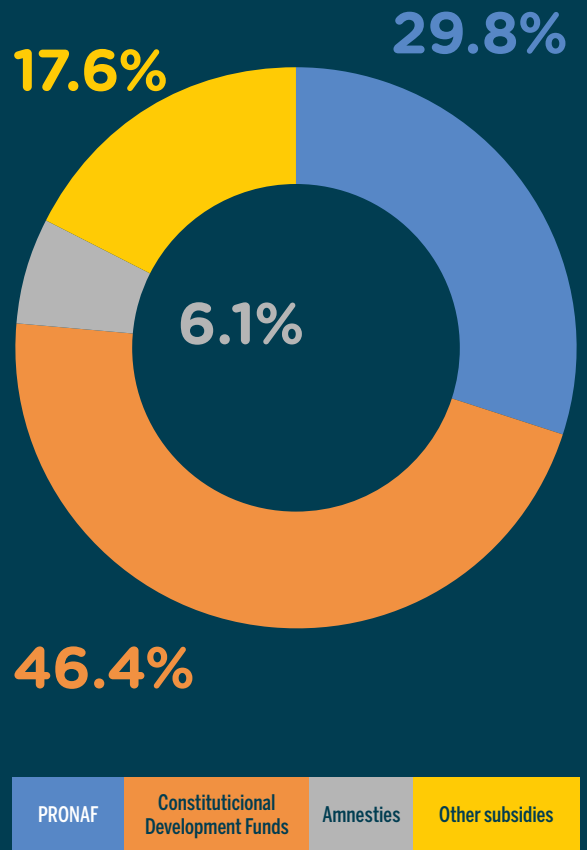
The volume of taxes collected by the state and federal governments in the beef chain averaged R$15.1 billion annually between 2008 and 2016*, during which time tax volume grew from R$ 12.2 billion to R$ 16.2 billion a year.
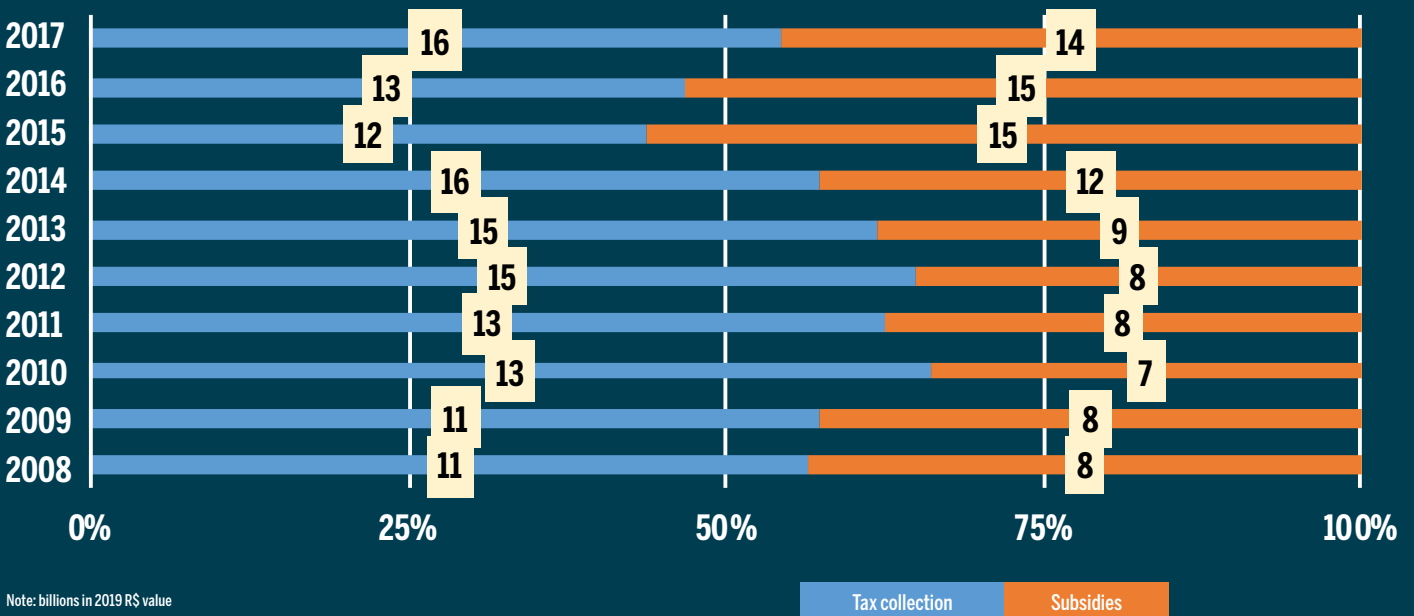
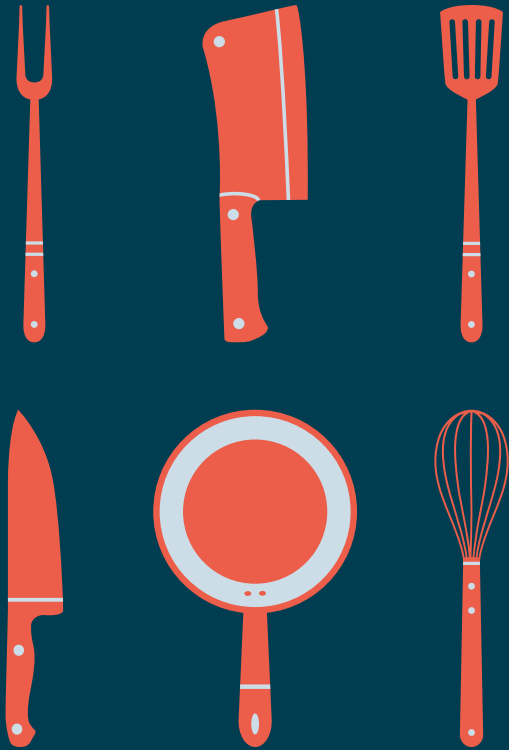## Volume of taxes collected by the state and federal governments

in 2019 Brazilian reais

Year	Other taxes / Taxes on inputs	ICMS
2008	4.20	7.93
2009	4.08	7.88
2010	4.08	9.50
2011	4.44	9.92
2012	4.95	11.53
2013	3.79	12.32
2014	3.78	12.95
2015	4.11	13.24
2016	3.99	12.06

Legend: ICMS · Other taxes · Taxes on inputs

Sources: The tax authority Receita Federal do Brasil (2019a, 2019c)
Note: federal, state and municipal taxes.

In 2015 and 2016, the percentage of subsidies is larger than 100% of what was collected through taxes, in other words, the subsidies granted in the beef chain exceeded the taxes collected.

The subsidies correspond to 79% of the amount of taxes collected throughout the beef chain by the state and federal governments.

Collection of taxes and concession of subsidies in the beef chain

Year	Tax collection	Subsidies
2017	16	14
2016	13	15
2015	12	15
2014	16	12
2013	15	9
2012	15	8
2011	13	8
2010	13	7
2009	11	8
2008	11	8

0%   25%   50%   75%   100%

Legend: Tax collection · Subsidies

Note: billions in 2019 R$ value

* Sources: Calculations based on Sefel-MF (2019), IBGE (2017), Bacen (2019), BNDES (2019) and Sefaz-MT (2019)
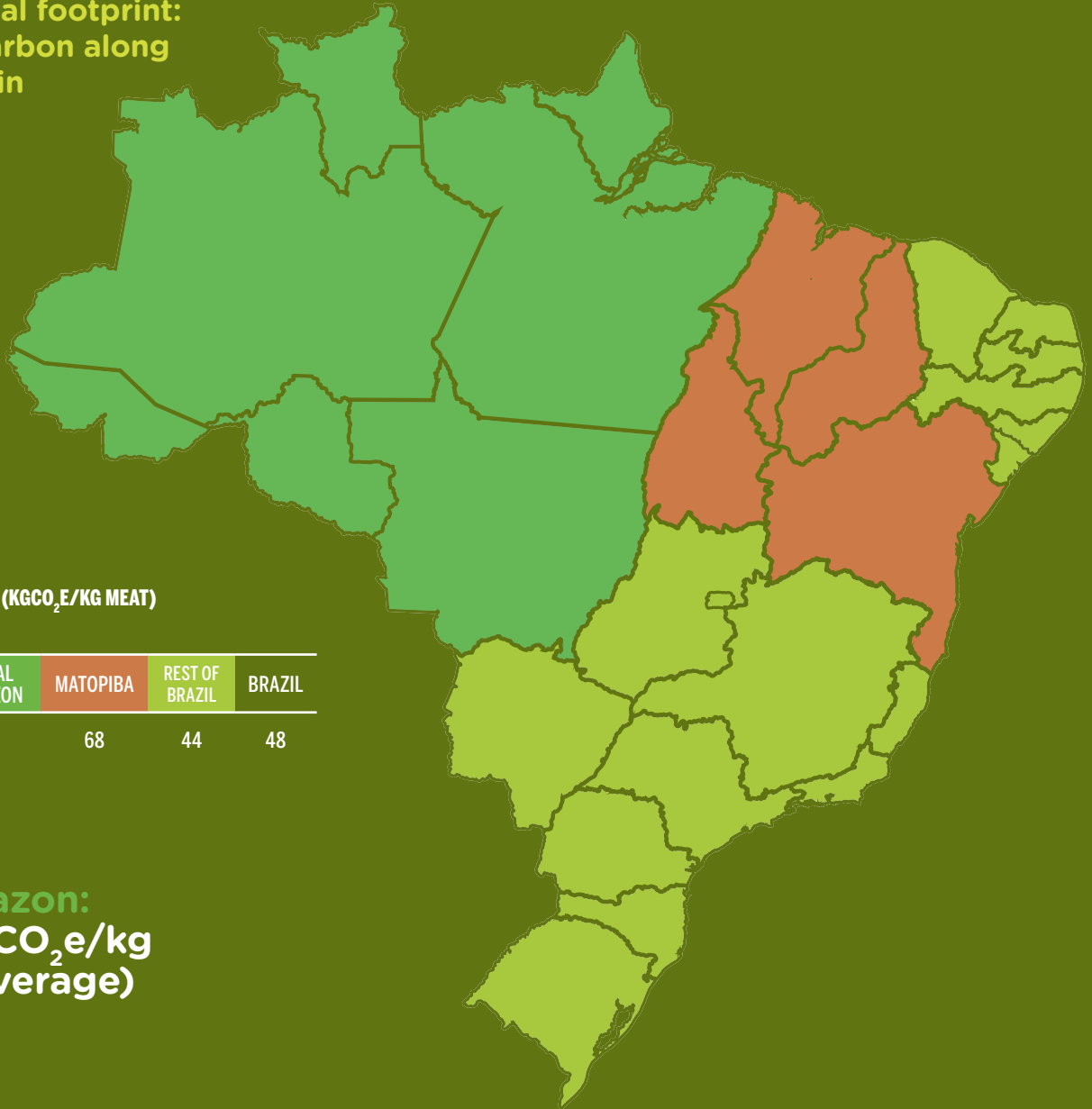
ENVIRONMENTAL IMPACTS

Environmental footprint: water and carbon along the beef chain

EMISSIONS FOOTPRINT (KGCO$_2$E/KG MEAT) (AVERAGE 2008-2017)

	LEGAL AMAZON	MATOPIBA	REST OF BRAZIL	BRAZIL
Cattle and grazing	17	85	19	25

EMISSIONS FOOTPRINT (KGCO$_2$E/KG MEAT) (AVERAGE 2008-2017)

	LEGAL AMAZON	MATOPIBA	REST OF BRAZIL	BRAZIL
Cattle	51	68	44	48

Legal Amazon:
145 kg of CO$_2$e/kg of beef (average)

Matopiba:
183 kg of CO$_2$e/kg of beef (average)

All the other states:
23 kg of CO$_2$e/kg of beef (average)

EMISSIONS FOOTPRINT (KGCO$_2$E/KG MEAT) (AVERAGE 2008-2017)

	LEGAL AMAZON	MATOPIBA	REST OF BRAZIL	BRAZIL
Cattle, grazing and deforestation	145	183	23	78

CO$_2$e or equivalent is the sum of all the greenhouse gases in a single unit. The national average is 78 tons of CO$_2$e between 2008 and 2017. This is calculated considering all the production systems, the emissions from deforestation, emissions and removals of pastures, all the emissions from transportation and meat packers.
Note: In this summary, the total area of the states of Maranhão, Tocantins, Piauí and Bahia was adopted for calculating the environmental footprint

CARBON FOOTPRINT - The carbon footprint per kilogram of beef represents the balance of GHG[13] emissions and removals for the beef produced in Brazilian territory between 2008 and 2017. In this case, three geographical regions were used: the Legal Amazon, Matopiba[14] (region comprehending the states of Tocantins, Maranhão, Piauí and Bahia) with the remainder of the states in a single block. The study accounted for the emissions from the herd and the emissions from the fraction of the deforested lands converted into pasture in the Legal Amazon and Matopiba regions. It also accounted for emissions and removals in pasture, as well as estimating emissions throughout the logistics chain down to the consumer and emissions from processing beef. For managed pastures, the emissions from the production and application of urea were estimated. The study also analysed the impact of the footprint of different types of pastures and management systems: extensive grazing (degraded, stable and well managed); integrated systems (integration of crops and livestock and integration of crops-livestock-forest); and confinement. Moreover, direct land use change was included, in particular in the biomes in which the native vegetation is substituted to promote other types of land use, including rearing livestock, which is significant in the Amazon and Cerrado biomes.

Pasture Area	AMZ	MAT	OTH	TOTAL
Degraded pasture	8%	48%	14%	19%
Stable pasture	54%	42%	53%	51%
Well managed pasture	35%	7%	23%	24%
Integrated system	4%	3%	9%	6%
Total area	44.526	27.852	64.977	137.355

Million of hectares, average over the period from 2008 to 2017

WATER FOOTPRINT[15] – This is defined as the quantity of fresh water used directly by a consumer or product and is divided into: blue, which is the entire consumption of surface and ground water in a water basin in the production process, considering as consumption loss by evaporation, dislocation to other basins or the sea, or use in a product; green, which is the consumption of rainwater; and grey[16], related to pollution, which is the volume of fresh water used to dissolve the load of pollutants. The most representative production systems were considered in association with data on water capacity and availability in the different producing regions.

GHG emission and removal factors by type of pasture

Systems	Emission	Removal
	$tCO_2eq/ha/year$	
Degraded pasture	1,83	
Stable pasture	0	0
Managed pasture		-4,63
Integrated system		-6,23

Source: Reference numbers from the GHG Protocol - Agriculture Protocol 3.8 (2019). Available at https://www.ghgprotocolbrasil.com.br/

System	Green WF	Blue WF	TOTAL
	L kg⁻¹		
Pasture	20.170	51,00	20.220,65
Confinement	1.598	6,15	1.604,19
Total	21.768	57,15	21.825,15
Slaughter	-	6,60	-
Total with slaughter	21.768	63,75	-

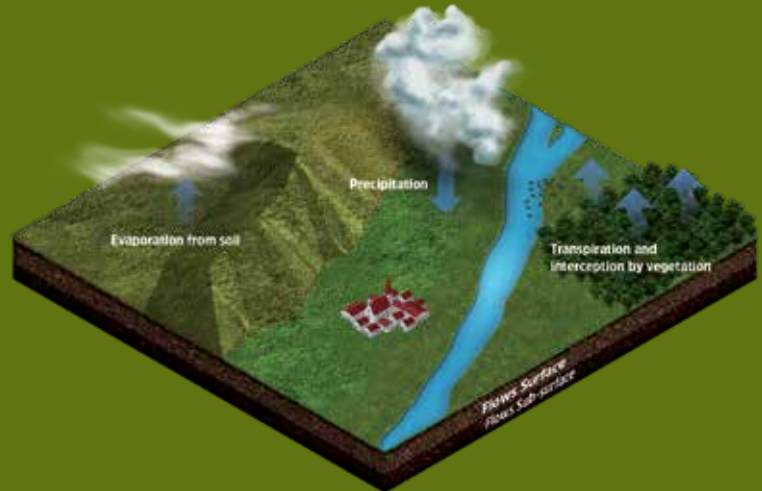Table: Blue and green water footprints of the cattle and slaughter production systems.

[13] The beef chains involve the following greenhouse gases (GHG): CO_2 (fossil and biogenic), CH_4 and N_2O.
[14] The Escolhas study "Qual o impacto do desmatamento zero no Brasil?" examined the economic and social impacts of eliminating deforestation in the Amazon. One of the results of the modeling showed that to maintain production at the level of the base year and to prevent small estimated losses in GDP, the productivity of the land (production per hectare) would need to increase in the Matopiba region and in some states in the Legal Amazon (Rondônia, Acre, Amazonas, Mato Grosso and Pará). The current work underscores this result showing that the quality of pasture directly impacts the beef chain's environmental footprint.

[15] The study recognizes the high variability of beef footprints in different routes and production regions. It is understood, as supported by the research consulted and the interviews undertaken, that the data base for portraying the water footprint of beef produced under the different systems is limited.
[16] The gray footprint was not considered in the calculation because it is diffuse and concentrations are low in extensive livestock rearing, the effluent from large meat packers is treated (legal obligation) and availability of the industry's consumption data is limited and confidential.

BLUE FOOTPRINT
fresh water, from surface or ground sources

GREEN FOOTPRINT
água proveniente
Green Footprint
water from rainfall or soil humidity

Precipitation

Evaporation from soil

Transpiration and interception by vegetation

Flows Surface
Flows Sub-surface

Footprints measured in the study

Extensive production

1	2	3	4
Grazing	**Quenching thirst of animals and services**	**Confinement**	**Slaughter and processing**

1 Grazing

🟢 **Green footprint**

⚪ Grey footprint

🔵 Blue footprint

2 Quenching thirst of animals and services

🔵 **Blue footprint**
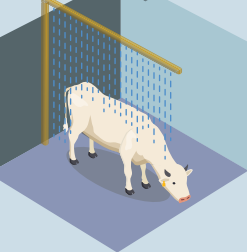
⚪ Grey footprint

🟢 Green footprint

3 Confinement

🟢 **Green footprint**
feed production without irrigation

🔵 **Blue footprint**
thirst quenching, services and feed with irrigation

⚪ Grey footprint

4 Slaughter and processing

🔵 **Blue footprint**
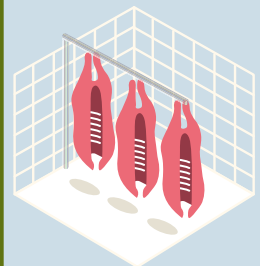
⚪ Grey footprint

🟢 Green footprint

Footprints not measured in the study

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