Sustainable Agricultural Production: alternatives proposed by Brazil to meet the growing demand for food on a global scale

Júlio César dos Reis
PhD - Sustainable Development
Researcher - Embrapa Cerrados

09 th May, 2024

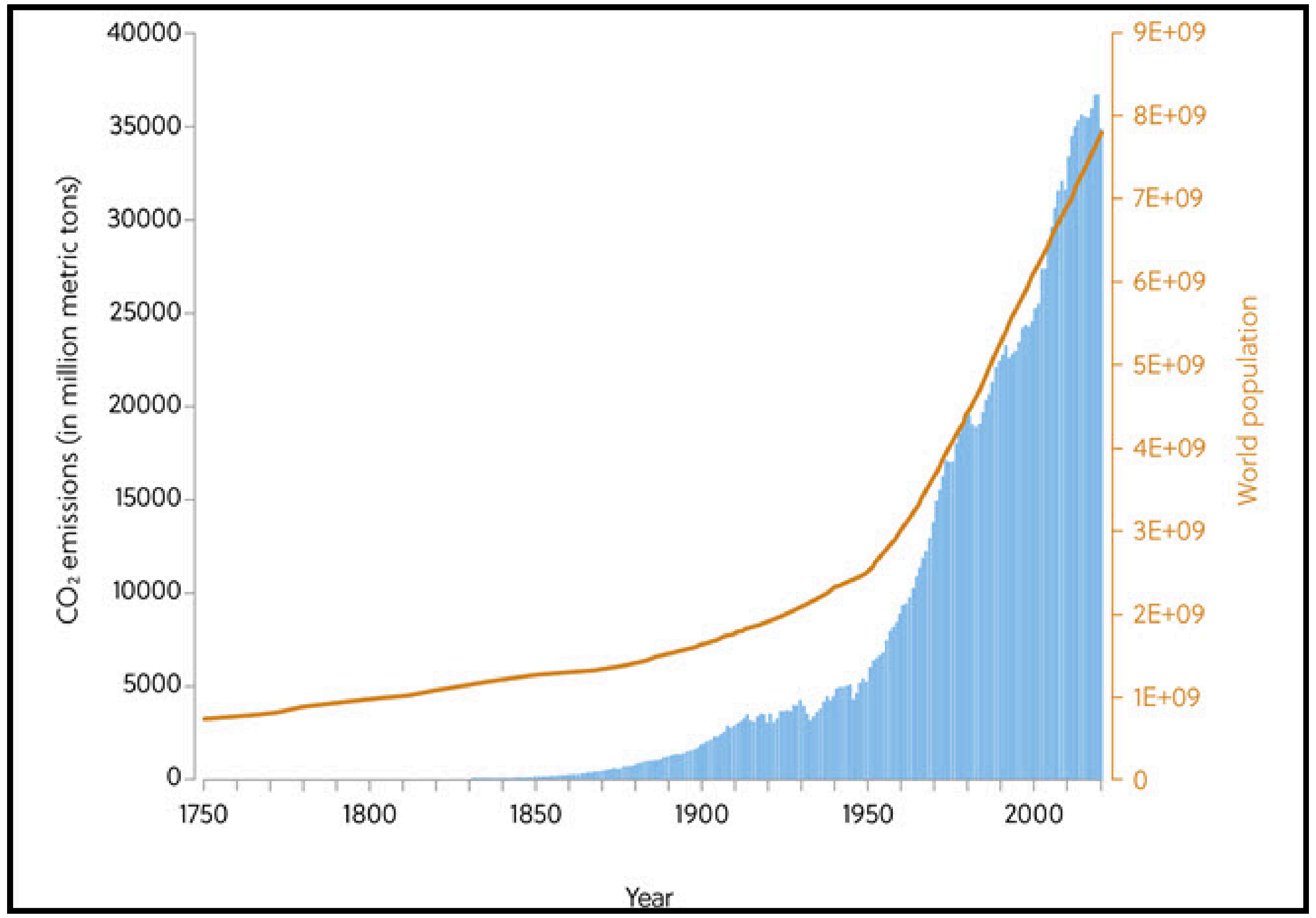
Overview

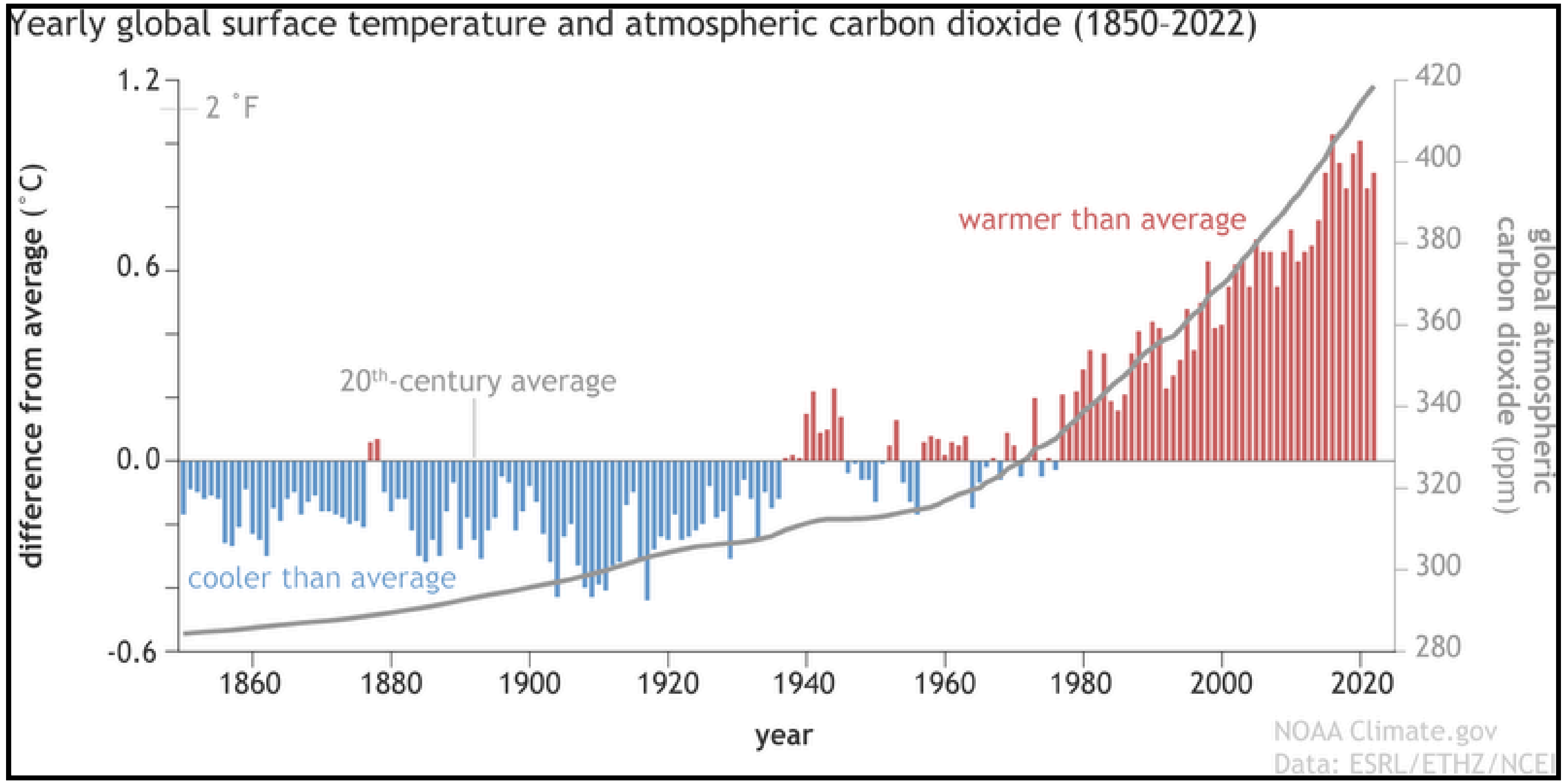
- Climate Change
- Climate Change in Brazil: Livestock and Degraded Pastures
- Brazilian alternatives: Integrated Crop-Livestock-Forest Systems and Agroforestry Systems
- Case Studies
  - Environmental Performance
  - Sustainability Assessment
  - Economic and Environmental Impacts
  - Dayri Small Farm

General Context: Increasing concens about climate change

- Anthropocene:
  - It is a new division in the geological time scale, which is defined by the immense changes in nature and in the functioning of Earth system by human activity.
  - *"The human dominance of biological, chemical and geological processes on Earth is already and undeaniable reality"*

(Paul Crutzen and Eugene Stoermer)





Source: (Global Carbon Budget 2023)

General Context: Increasing concens about climate change

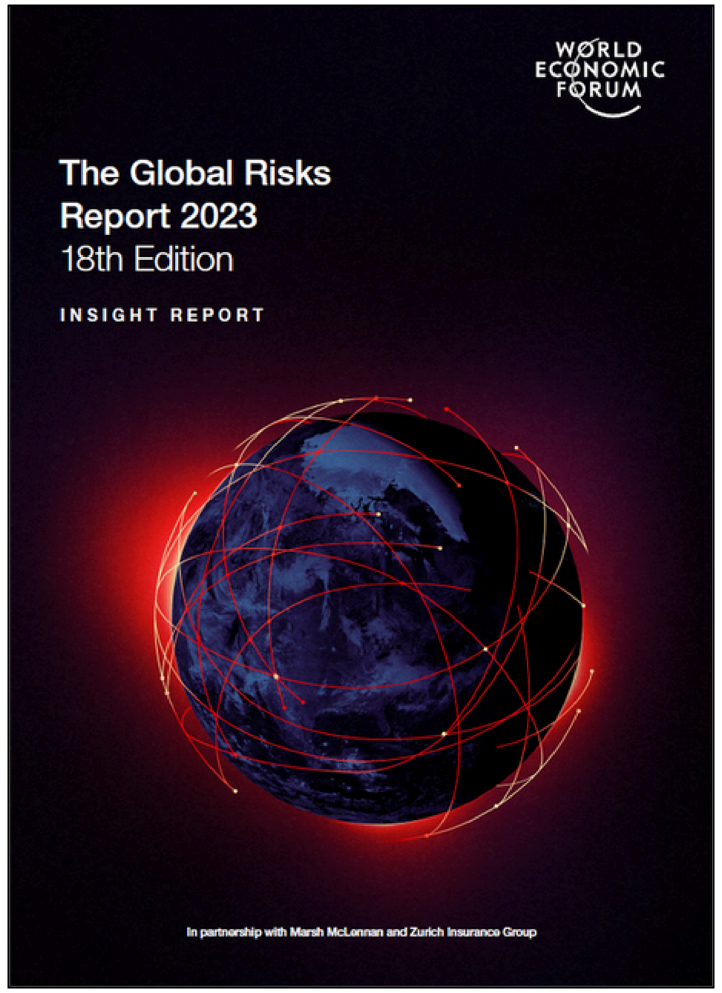


FIGURE A

Global risks ranked by severity over the short and long term

"Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period"

	2 years	10 years
1	Cost-of-living crisis	Failure to mitigate climate change
2	Natural disasters and extreme weather events	Failure of climate-change adaptation
3	Geoeconomic confrontation	Natural disasters and extreme weather events
4	Failure to mitigate climate change	Biodiversity loss and ecosystem collapse
5	Erosion of social cohesion and societal polarization	Large-scale involuntary migration
6	Large-scale environmental damage incidents	Natural resource crises
7	Failure of climate change adaptation	Erosion of social cohesion and societal polarization
8	Widespread cybercrime and cyber insecurity	Widespread cybercrime and cyber insecurity
9	Natural resource crises	Geoeconomic confrontation
10	Large-scale involuntary migration	Large-scale environmental damage incidents

Risk categories: Economic | Environmental | Geopolitical | Societal | Technological

Source

World Economic Forum Global Risks Perception Survey 2022-2023.

General Context: Biocapacity and Ecological Footprint

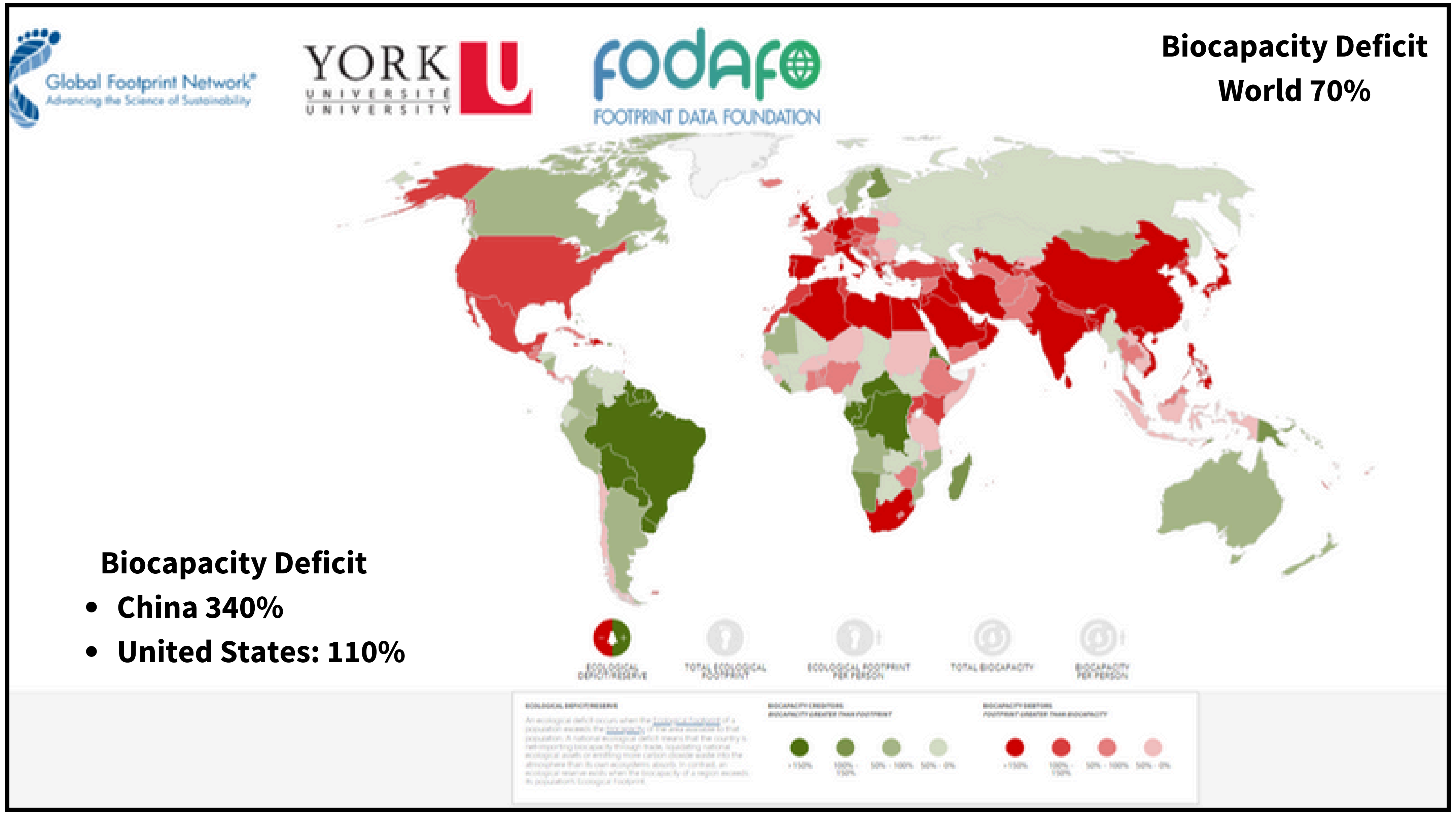
The Ecological Footprint

The Ecological Footprint measures how much demand human consumption places on the biosphere. It is measured in standard units called global hectares.

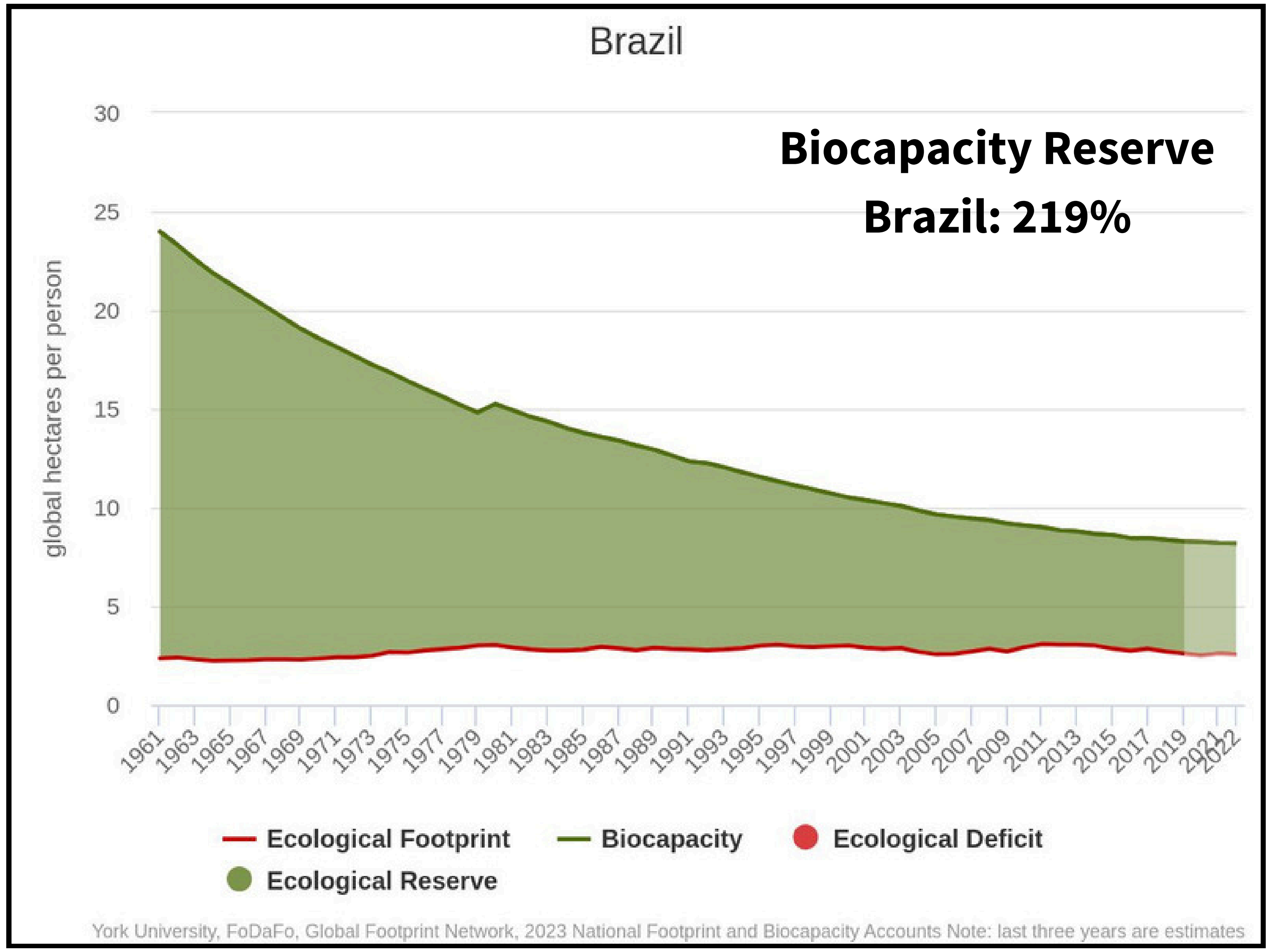
Biocapacity

Biocapacity is the area of biologically productive land and ocean area to provide food, fiber, and timber, accommodate urban infrastructure, and absorb excess CO_2. Biocapacity reflects current management practices and is measured in standard units called global hectares.

The average biocapacity per person for the entire world:
1.6 global hectares

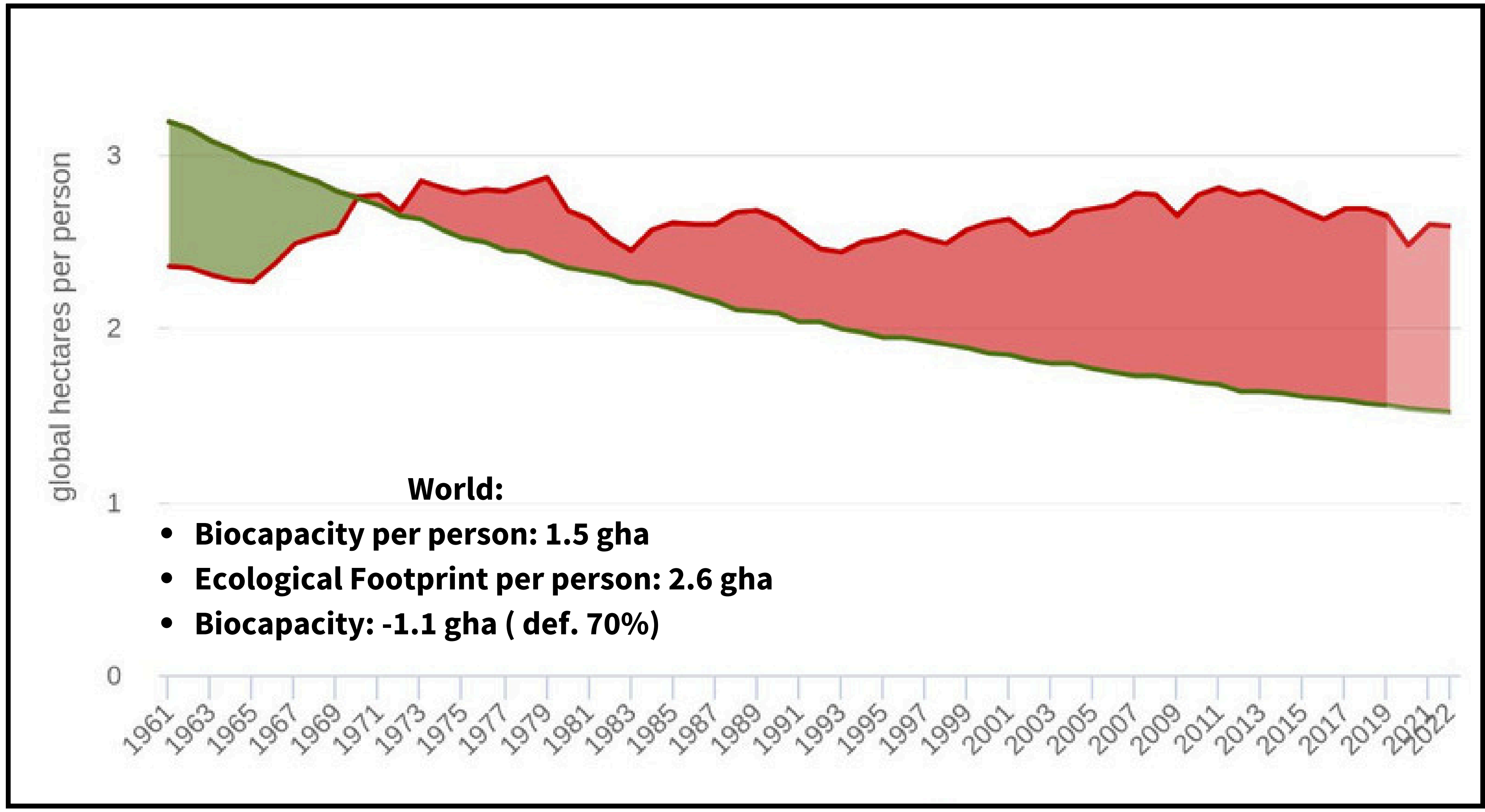


General Context: Biocapacity and Ecological Footprint

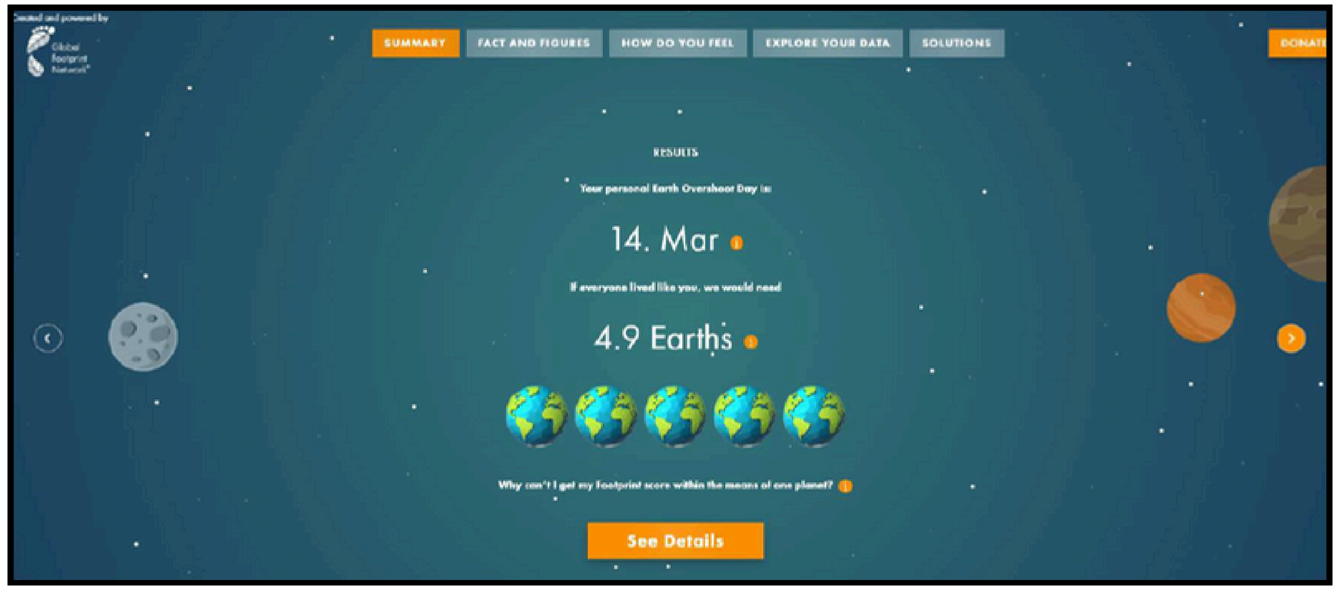


Brazil:

- **Biocapacity per person: 8.2 gha**
- **Ecological Footprint per person: 2.6 gha**
- **Biocapacity: 5.6 gha (Res. 315%)**

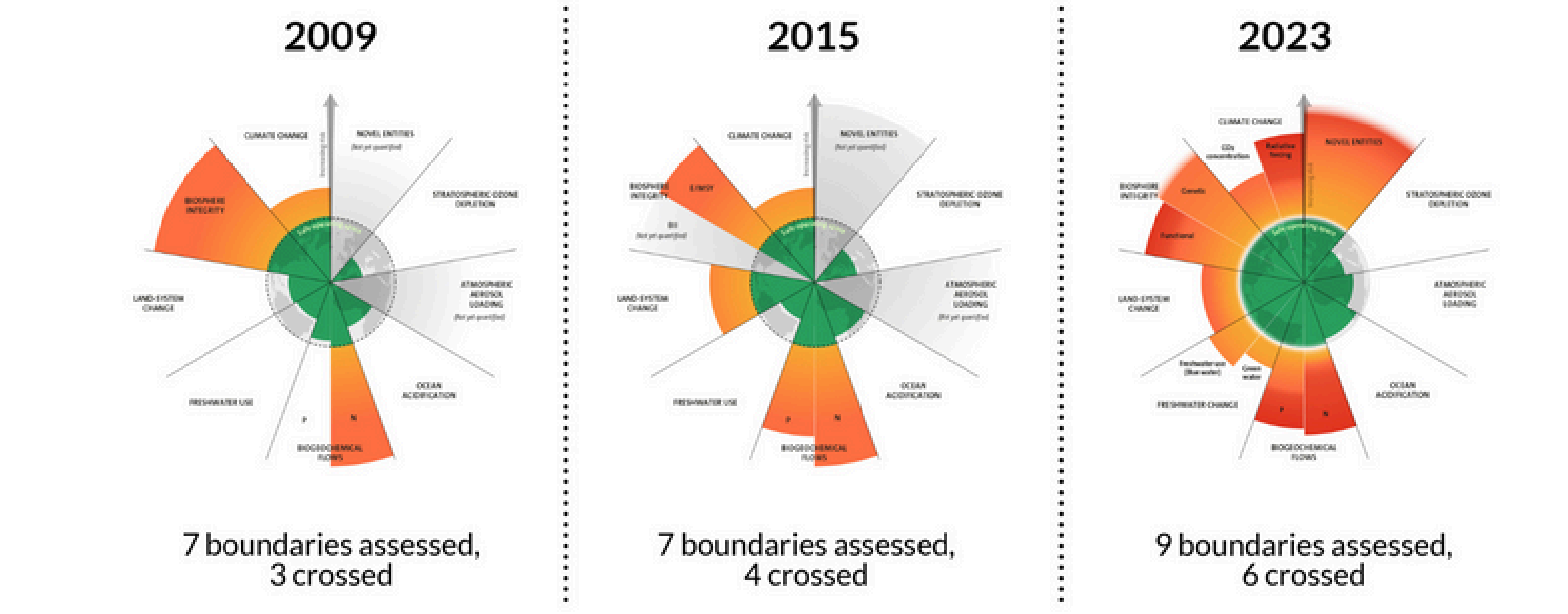


https://www.footprintcalculator.org/home/en



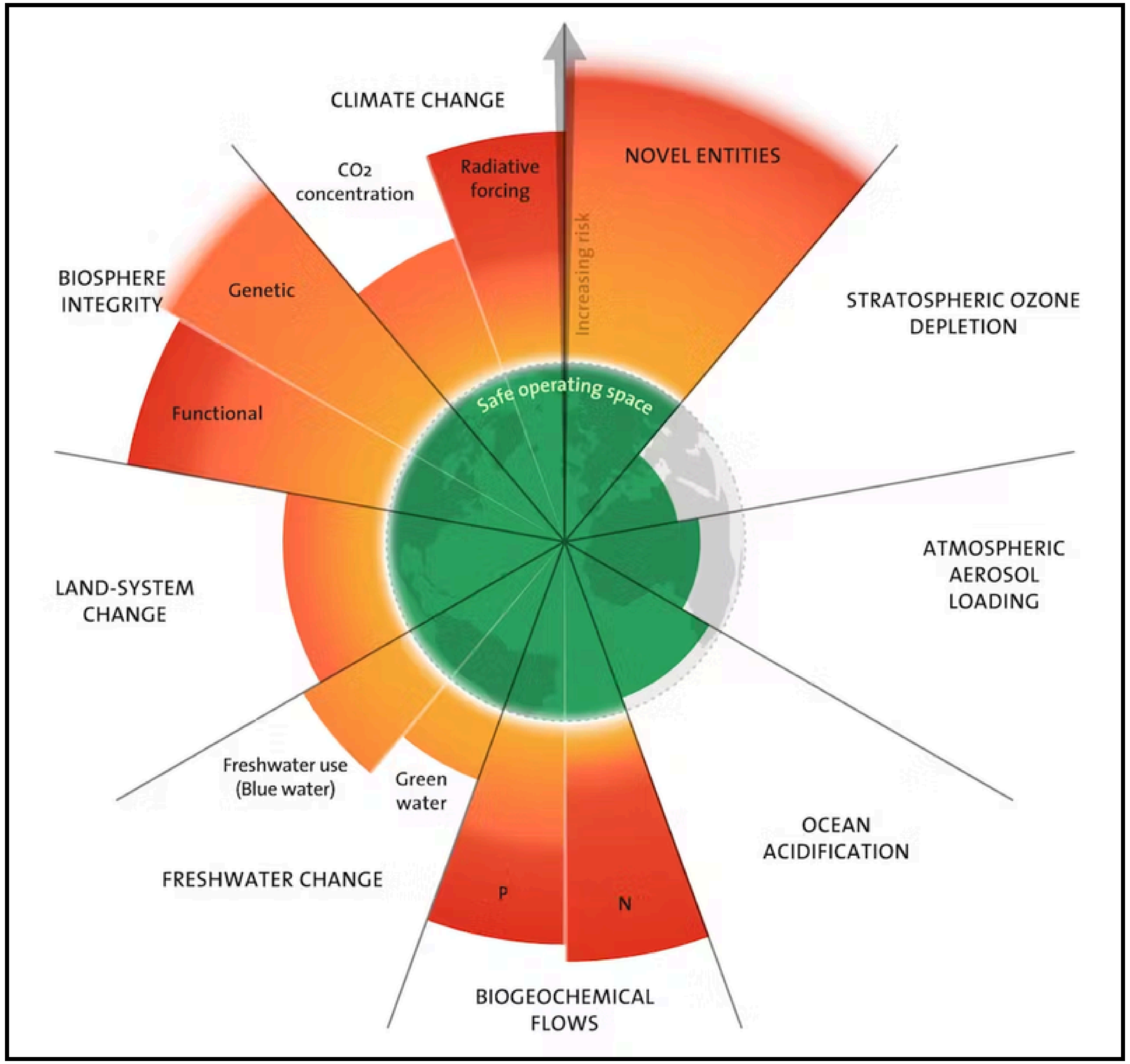
Embrapa

General Context: Planetary Bounderies

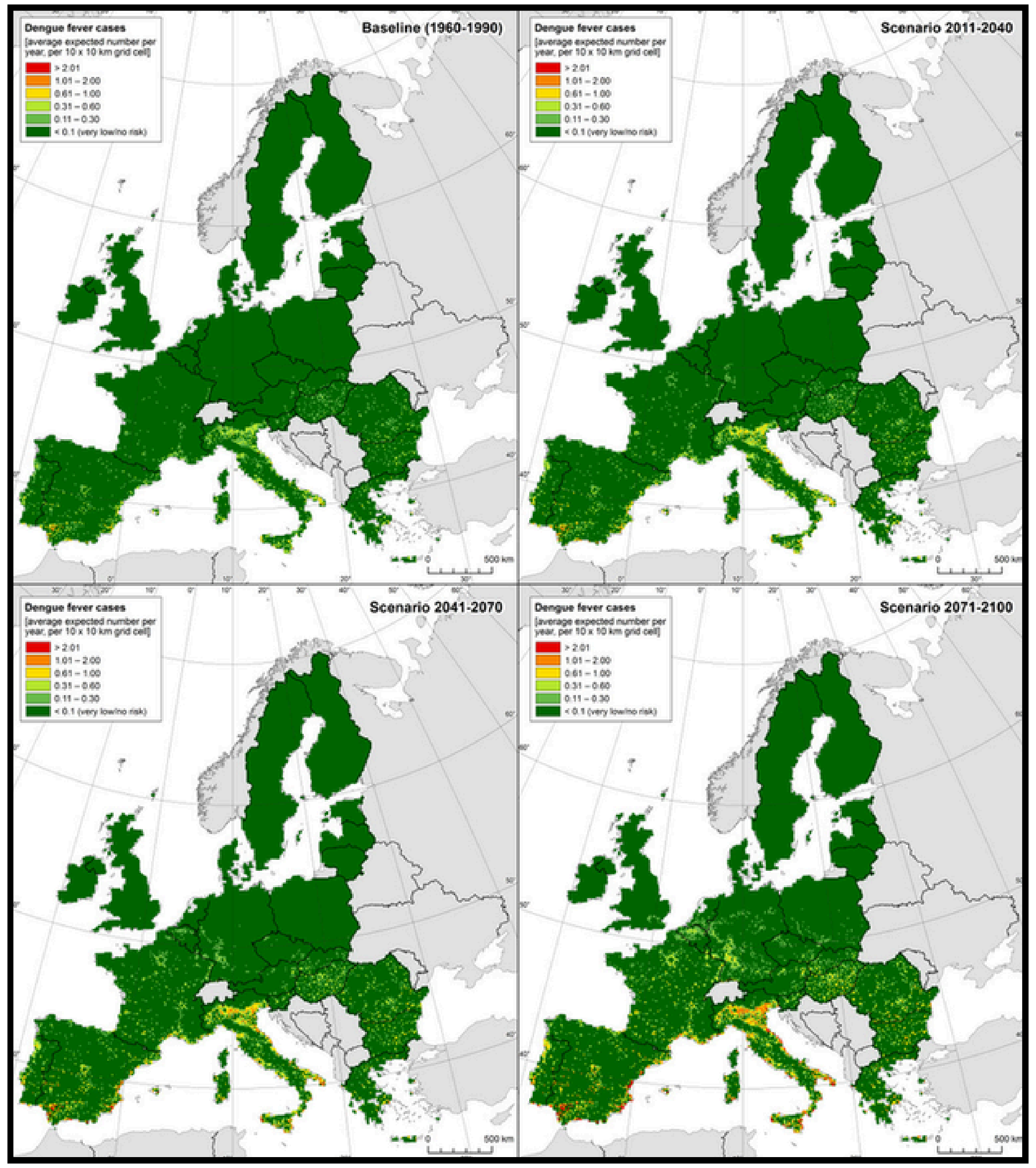


The evolution of the planetary boundaries framework. Licenced under CC BY-NC-ND 3.0 (Credit: Azote for Stockholm Resilience Centre, Stockholm University. Based on Richardson et al. 2023, Steffen et al. 2015, and Rockström et al. 2009) Click on the image to download.

2023



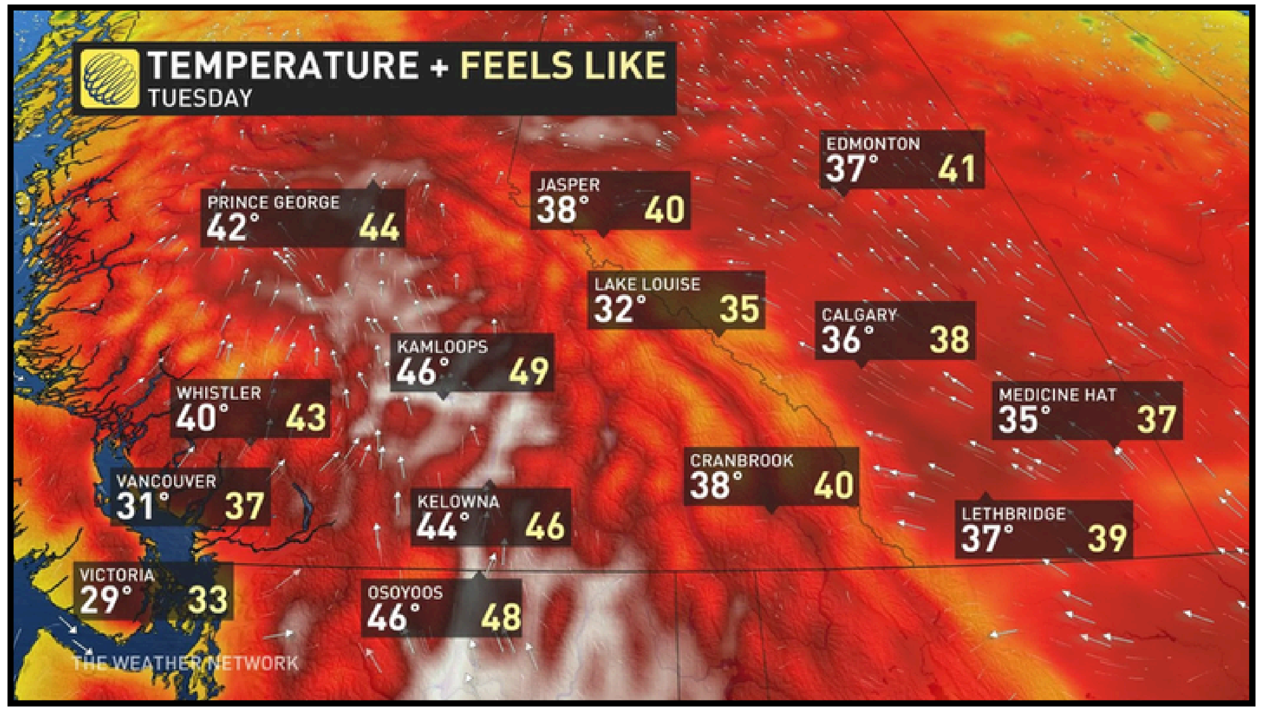
Increased intensity and frequency of extreme climatic events



Average expected number of **dengue cases in Europe**

The foreign minister of Tuvalu, speech to climate summit COP26: **We are sinking!**

Nov, 2021

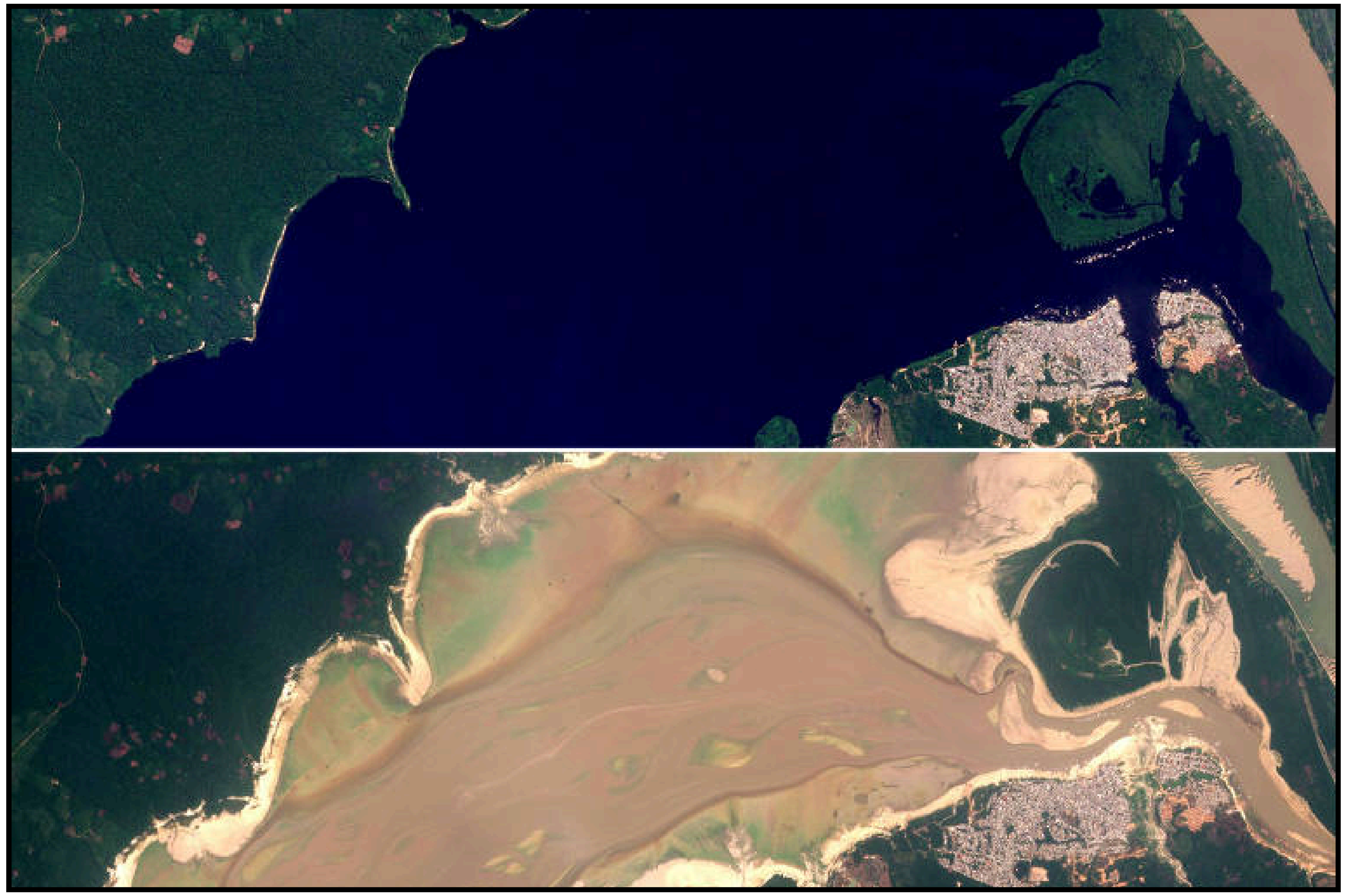


A 'Heat-dome' event Western Canada, with parts of B.C.

Jun, 2021

Increased intensity and frequency of extreme climatic events

Rio Negro - Amazon Oct, 2023



Increased intensity and frequency of extreme climatic events

Pantanal Jun, 2020

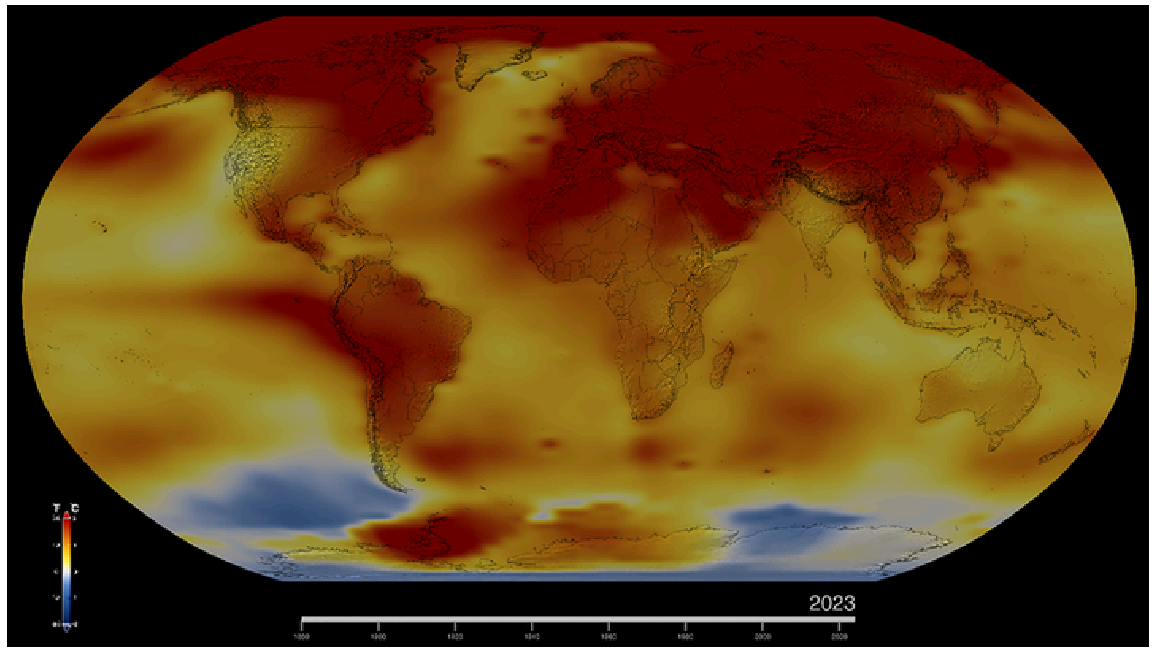
Embrapa

Increased intensity and frequency of extreme climatic events

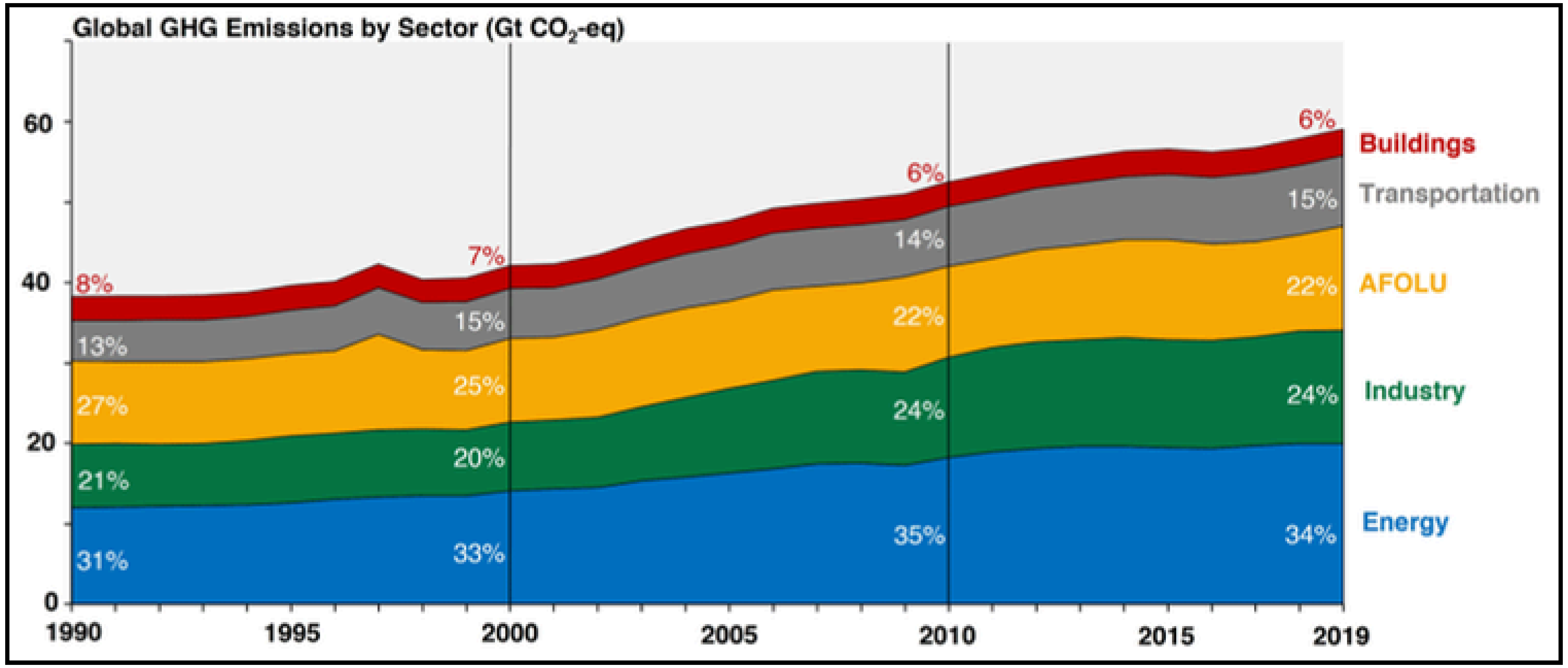
Flood - Rio Grande do Sul; **Apr, 2024**

Record feels like Rio de Janeiro, **Mar, 2024**

NASA Analysis Confirms 2023 as Warmest Year on Record

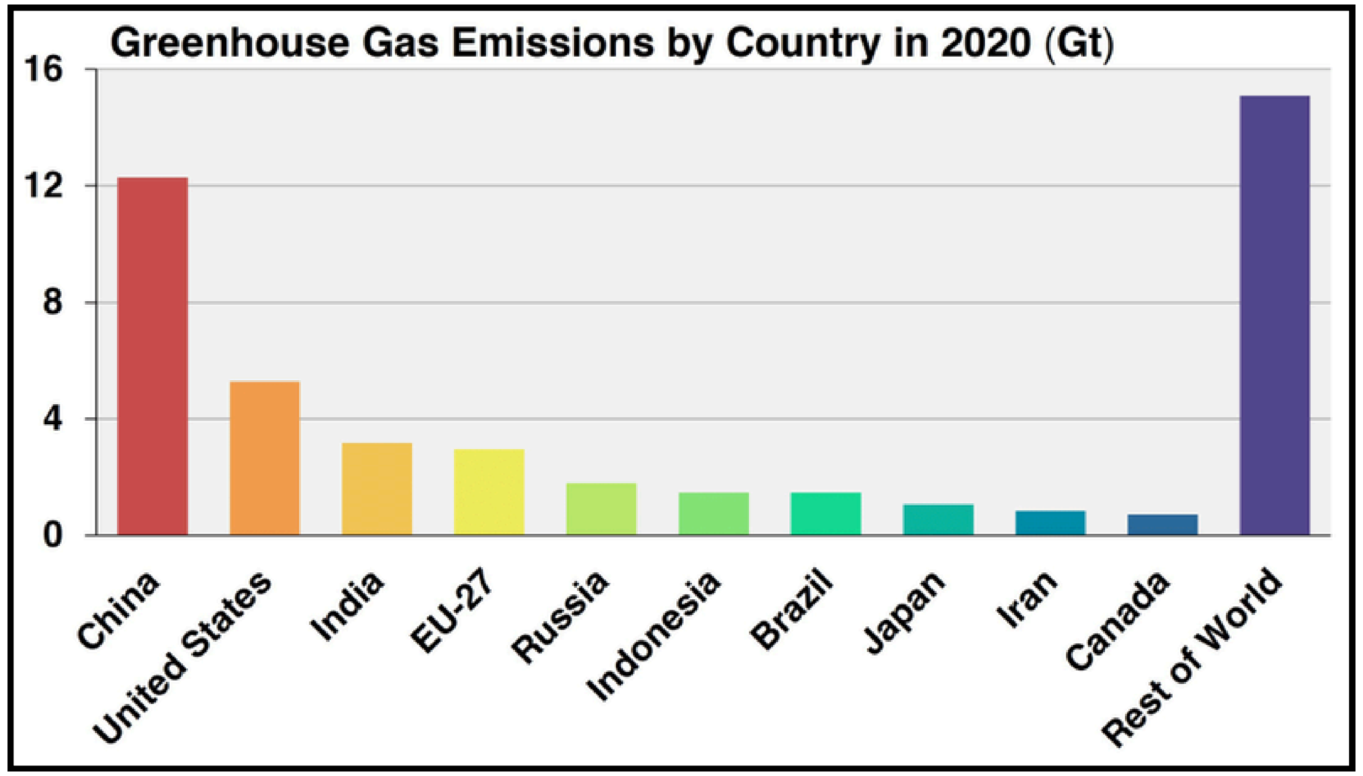


Global GHG Emissions by Economic Sector



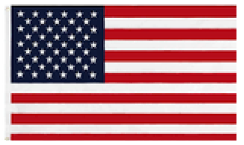
Source: https://www.epa.gov/ghgemissions/global-greenhouse-gas-overview

- **AFOLU: Agriculture, Forestry, and Other Land Uses**



Source: https://www.climatewatchdata.org/

- **1th largest emitter**
- **26% of global emission**
- **Emissions per Capita (tCO2e/person): 8.71**



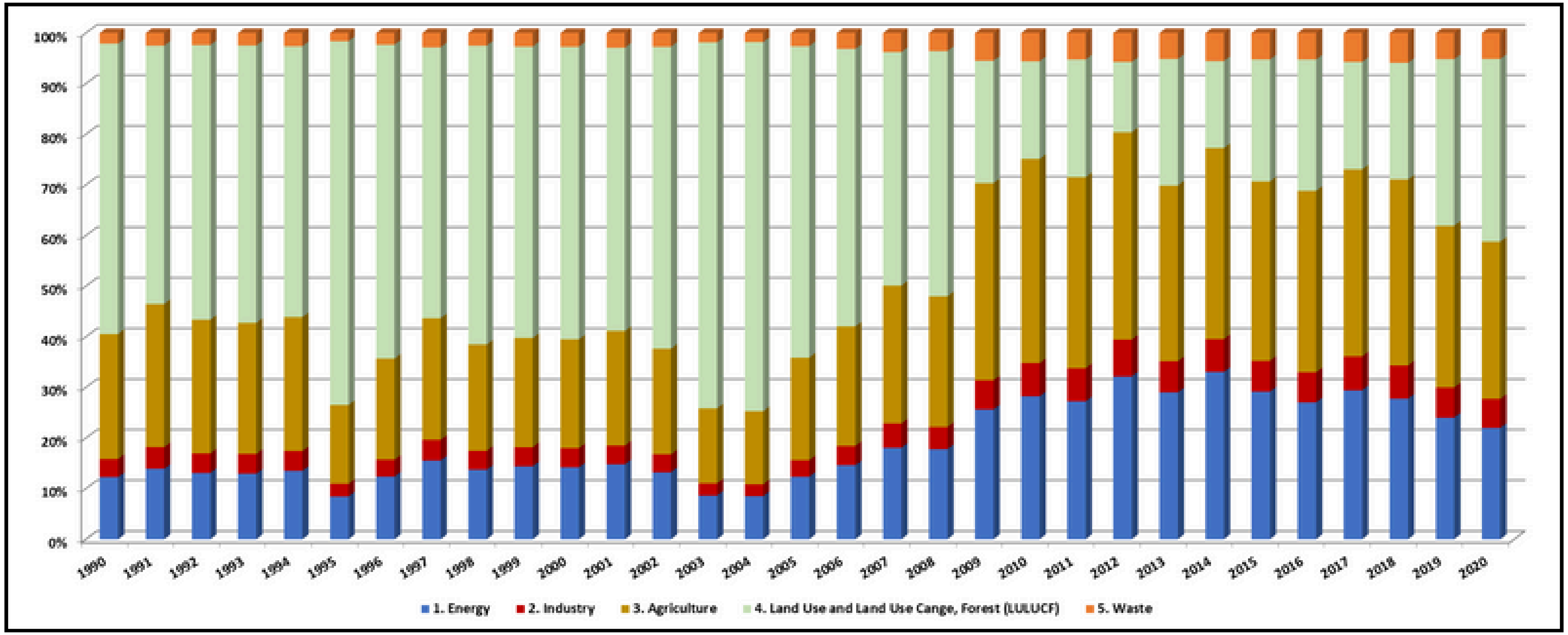
- **2º th largest emitter**
- **11% of global emission**
- **Emissions per Capita (tCO2e/person): 15.96**

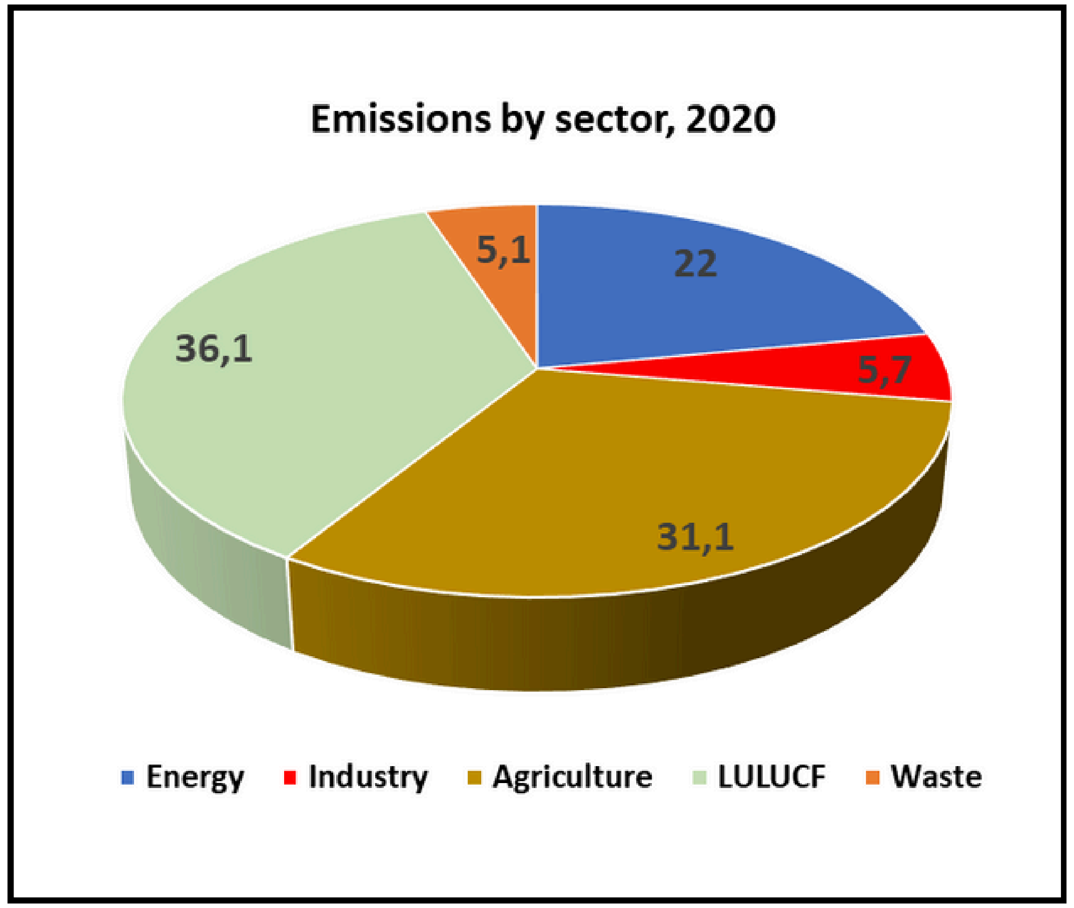
- **7 th largest emitter**
- **3% of global emissions**
- **Emissions per Capita (tCO2e/person): 6.91**

Embrapa

Agriculture: Problem or Solution?

Brazil GHG Emissions by Economic Sector



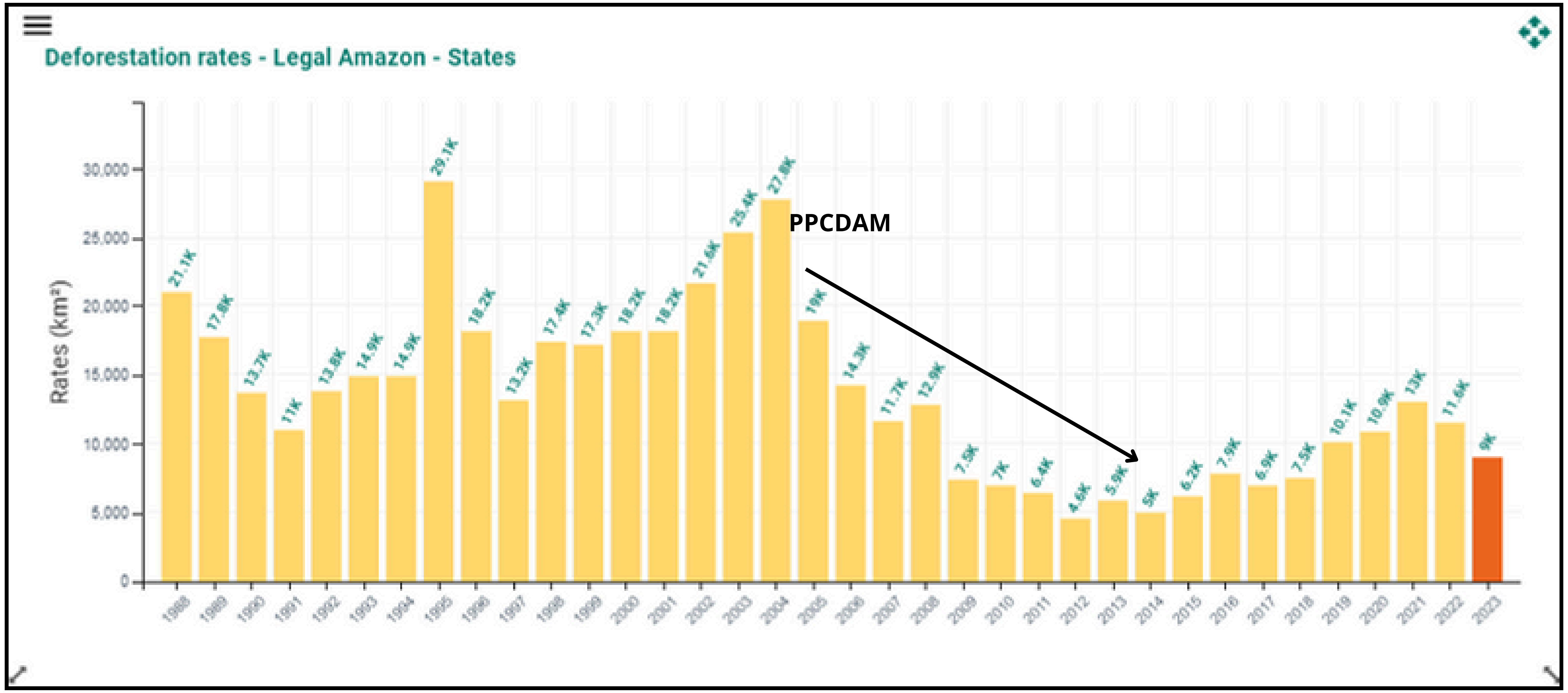


- **LULUCF: Land Use, Land-Use Change and Forestry**

Source: https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene

Agriculture: Problem or Solution?

Deforestation and Climate Change

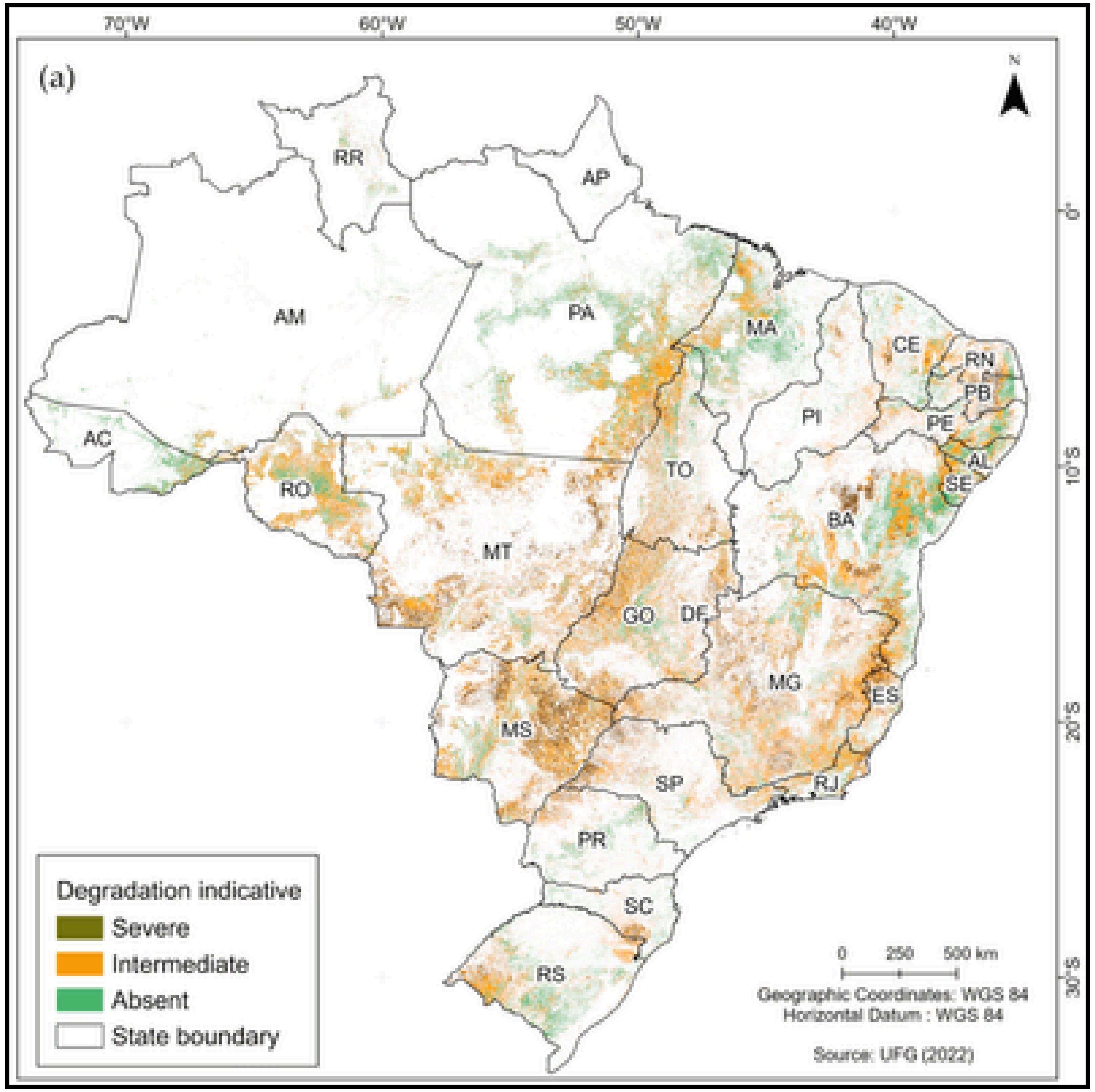


Brazilian Deforestation, by state

Source: Prodes, 2024

Embrapa

Agriculture: Problem or Solution?
Degraded Pastures



Source: LAPIG: Atlas das Pastagens, 2023

Pasture area by level of degradation (million ha)

Farm size (ha)	Total (intermediate + severe)(1)	Pastures in poor condition
0 - 50	12.02 (16%)	2.00 (12%)
50 - 100	7.41 (10%)	1.23 (9%)
100 - 500	21.05 (28%)	3.00 (25%)
500 - 1000	10.14 (14%)	1.38 (12%)
> 1000	26.91 (36%)	25 (42%)
Total	77.53 (100%)	11.86 (100%)

Source: Teeb Agriculture and Food Brasil (2023) and Brazilian Agricultural Census (2017)

Embrapa

Agriculture: Problem or Solution?
Ecosystems Services

Provisioning Services

Products (material or energy) obained from ecosytems:

- **Food**
- **Fresh water**
- **Fuelwood**
- **Fiber**
- **Biochemicals**
- **Genetic resources**

Regullating Services

Benefits obtained from regulation of ecosystem process:

- **Climate regulation (local climate and air quality)**
- **Carbon sequestration**
- **Moderation of extreme events**
- **Disease regulation**
- **Water purification**
- **Pollination**

Cultural Services

Nonmaterial benefits obtained from ecosystems:

- **Spiritual and religuous**
- **Recreation and ecotourism**
- **Aesthetic**
- **Inspirational**
- **Educational**
- **Cultural heritage**

Supporting Services

Services necessary for the production of all other ecosystem services

- **Soil formation**
- **Nutrient cycling**
- **Primary production**
- **Habitats for species**
- **Maintanance of genetic diversity**

Source: TEEB. http://www.teebweb.org/resources/

Brazilian Proposal: Sustainable Agricultural Systems


Foto: Gabriel Faria, jornalista
Embrapa Agrossilvipastoril

Main agricultural challenge: increase productivity + environmental conservation to meet population growth and the increasing food demand: 10 billion in 2050

- Brazilian main proposals: **Integrated Crop-Livestock-Forest Systems (ICLFs) and Agroforest Systems (SAFs)**

- Technologies in the Brazilian Low Carbon Agriculture Plan - ABC Plan (2012 and 2021)

- Target internationally assumed by the Brazilian Government:
  - 4 million ha until 2020 (already achieved - REDE ILPF survey: 11.5 million ha 2015/2016)
  - Paris Agreement (2016) increase of 5 million by 2030

- The current area, roughly 13 million ha, is about 3.2% of the agricultural area in Brazil

Embrapa

Integrated Crop - Livestock - Forest Systems


Foto: Gabriel Faria, jornalista
Embrapa Agrossilvipastoril


Foto: Gabriel Faria, jornalista
Embrapa Agrossilvipastoril

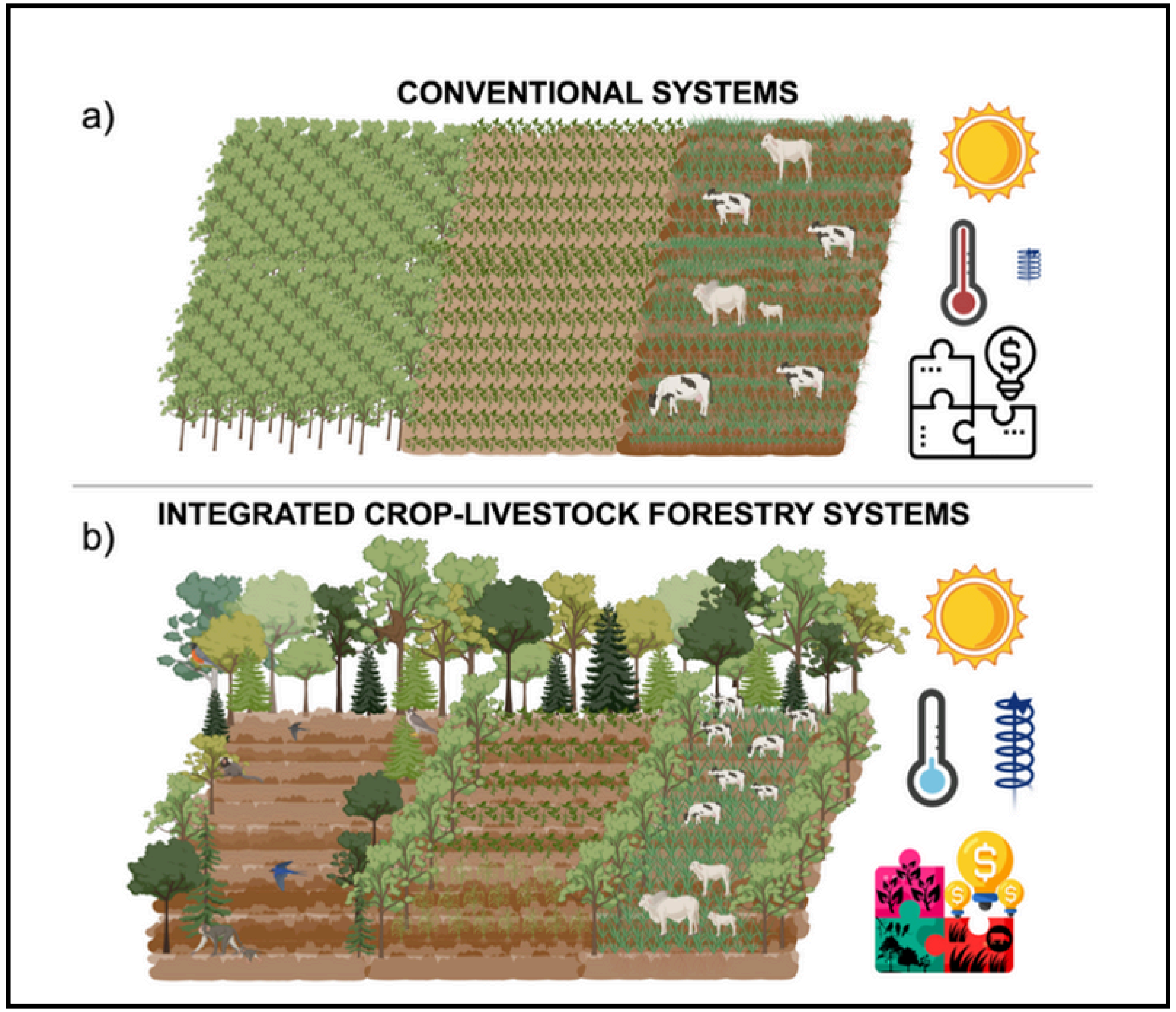
- **Brazilian technology** developed at the beginning of the 1990s to boost the sustainable intensification of agriculture and to increase the efficiency in productive resource use in agricultural systems in Cerrado and the Amazon regions, particularly environmental resources (Balbino et al., 2011; Kluthcouski et al., 2003; Macedo, 2009).
- The main objective of ICLF systems is to improve agricultural sustainability through the integration of various production activities in the same area by intercropping and rotations that aim to obtain synergies among agroecosystem components (Balbino et al., 2011; Nair, 1991; Wilkins, 2008).
- Sustainable agricultural strategies to reduce both direct emissions and emissions from deforestation by increasing land productivity and diversifying production.

Crop - Livestock - Forest Systems

ICLF systems

- Is a strategy to intensify resource uses: labor, land and capital, to increase productivity
- Diversifying production and reducing market risk
- Sparing land for conservation or other uses
- A key feature of integrated systems, mainly ICL, is that they can be used to recover degraded pastures by using residual fertility from the crop rotation to restore soil quality and finance further system improvements.
- Improvements in soil quality
- Water conservation
- Increase of animal performance
- Reduction in GHGs per unit of food produced

The conventional system **a** is characterized by large areas of monoculture production with intensive management of the land, whereas the integrated system **b** offers more diversity.



Crop - Livestock - Forest Systems

Source: Embrapa Image Database

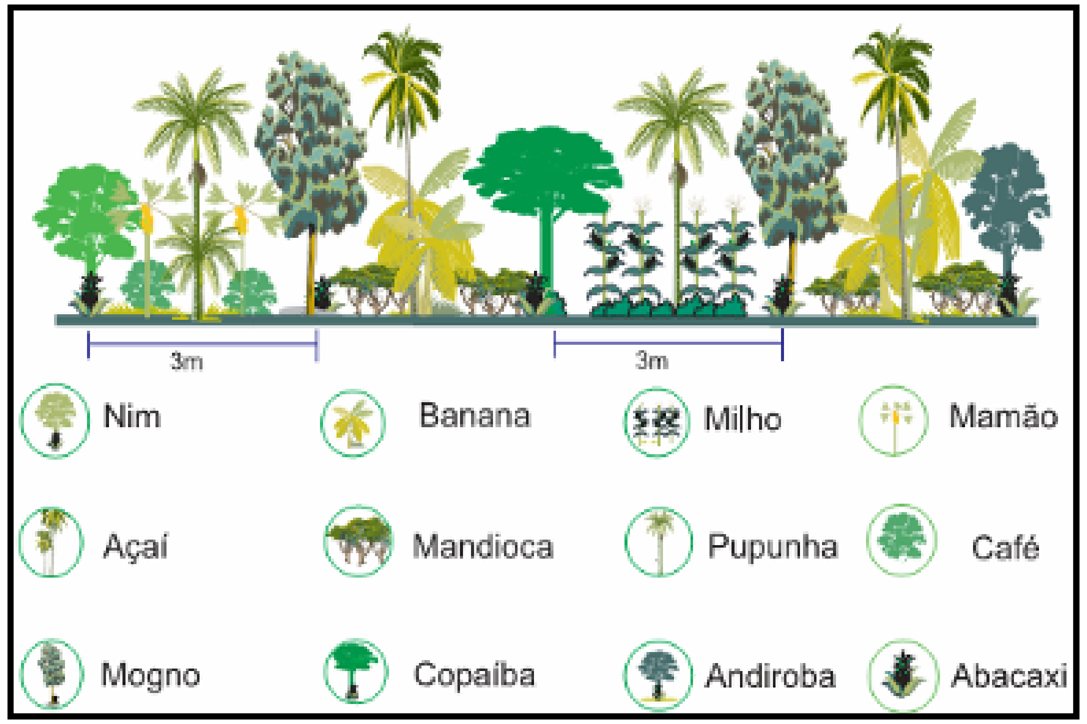
Agroforestry Systems


Foto: Ronaldo Rosa
Embrapa Amazônia Oriental


Foto: José Souza
Embrapa Cocais

- It is a land use strategy that associates, in the same area at a given time, the cultivation of **perennial component**, such as tree or shrub species, fruit trees, timber trees, or green fertilizers, with semi-perennial component, such as banana, pineapple, cassava or some pasture species, planted at the beginning of the system implementation, and that it remains there for two to three years. Finally, the short-cycle component, such as crops, provides initial cash flow. In some situations, animal component, particularly small animals such as hens, pigs and goats, are raised to self-consume and to improve income diversification. The SAFs are suitable for small farming since they are labor-intensive (Nair, 1991).

Agroforestry Systems



7

Figura 2. Arranjo agroflorestal (agrossilvicultural) com os componentes perenes (castanha, andiroba, taperebá, cupuaçu, açaí) e componentes semiperenes (banana, maracujá, mamão), plantio de ingá nas entrelinhas para produção de biomassa e matéria orgânica no solo.

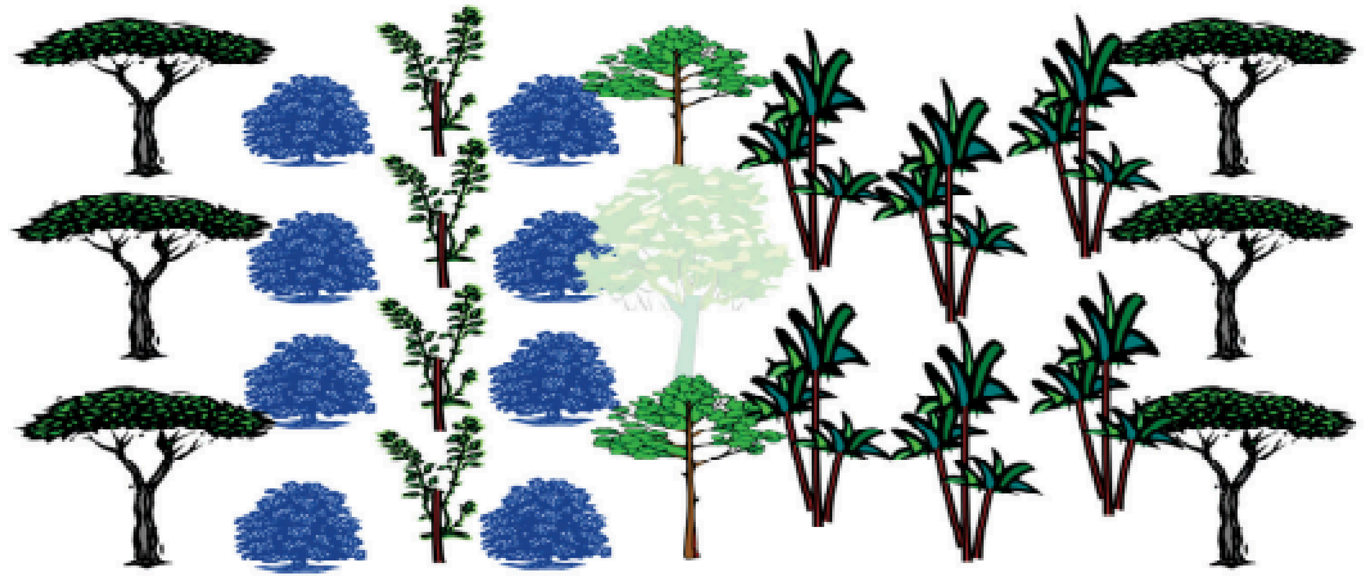


Figura 3. Arranjo agroflorestal (agrossilvicultural) com os componentes perenes agrícolas (cupuaçu, pimenta-do-reino, açaí e taperebá) e componentes florestais (castanha e andiroba).

Source: Embrapa Image Database

Agroforestry Systems

Source: Embrapa Image Database

Case Study: Agricultural Environmental Performance in Mato Grosso, Brazil

Integrated Crop-Livestock System: a sustainable land use alternative for food production in the Brazilian Cerrado and Amazon

dos Reis JC, Rodrigues GS, de Barros I et al (2021) Integrated crop livestock systems: a sustainable land-use alternative for food production in the Brazilian Cerrado and Amazon. **Journal of Cleaner Production** 283:124580. **https://doi.org/10.1016/j.jclepro.2020.124580**

Main objective: Evaluate and compare three different agricultural production systems in Mato Grosso considering the energy flow provided by renewable and non-renewable resources used in these systems.

Method:

- Emergy synthesis (Odum, 1996)
  - Identify the inputs used
  - Emergy Flow Diagrams
  - Determine the respective UEVs
  - Elaborate the emergy tables

Emergy Analysis

- Emergy is defined as the available energy (exergy) of one kind, usually the equivalent solar energy (expressed in solar emjoules - sej), required directly or indirectly to make a product or service (Odum, 1996)

- A significant advantage of emergy synthesis is to evaluate contributions from nature and people in common units. Moreover, since the economic subsystem pays only people for their services and not the environment for its work , the traditional economic evaluation provides incomplete results about the potential of activities to generate real wealth (Brown and Ulgiati, 2004; Odum, 1996)

- The baseline used was 12.1 E + 24 sej.year (Brown et al., 2016)

Case Study: Agricultural Environmental Performance in Mato Grosso, Brazil

EMERGY ANALYSIS - SYSTEMS DESCRIPTION

ICL Farm

Area: 2,678 ha

Crop (Soybean)
Productivity:
70.1 sc ha^{-1}
(4,206 kg ha^{-1})

Livestock
Productivity:
9.35 @ ha^{-1}
(280,71 kg ha^{-1})

Typical Crop System

Area: 1,200 ha

Crop (Soybean)
Productivity:
60.0 sc ha^{-1}
(3,600 kg ha^{-1})

Crop (Corn)
Productivity:
112 sc ha^{-1}
(6720 kg ha^{-1})

Typical Livestock System

Area: 2,200 ha

Livestock
Productivity:
5.33 @ ha^{-1}
(159,95 kg ha^{-1})

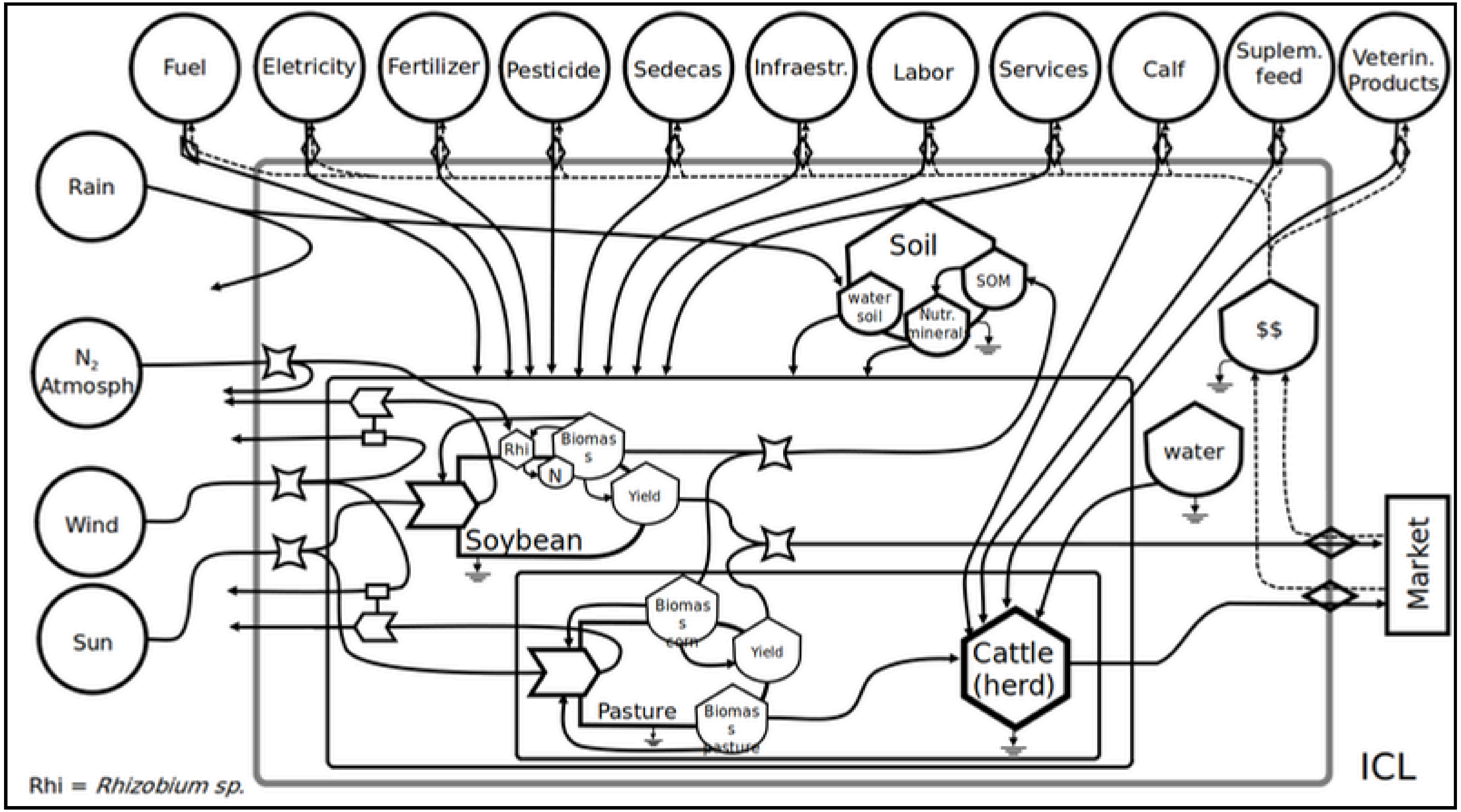
Photo: Gabriel Faria
Journalist - Embrapa Agrossilvipastoril

Embrapa

Case Study: Agricultural Environmental Performance in Mato Grosso, Brazil

Photo: Gabriel Faria
Journalist - Embrapa Agrossilvipastoril

Emergy Analysis



EMERGY INDICATORS

Index	Formulas	ICL	Crop	Livestock
% Renewable	R/(R+N+F)	0.31	0.25	0.66
Environmental Loading Rate	(F+N)/R	2.21	2.97	0.52
Emergy Sustainability Index	EYR/ELR	0.67	0.46	5.62
EmF (factor m)	-	3.21	3.97	1.52
Carbon-emergy output intensity (Ceml)	tonCO2eq/Y (J)	-2.71 E-11	3.70 E-11	7.98 E-09

ECONOMIC RESULTS

Index	ICL	Crop	Livestock
Net Revenue (A)	USD 812.70	USD 1456.83	USD 186.08
Total Cost (B)	USD 503.19	USD 997.77	USD 165.93
Gross Profit (A-B)	USD 309.51	USD 459.06	USD 20.15
Net Profit	USD 235.69	USD 295.00	USD -0.58

Net Profit = Gross Profit - (Administrative and Financial expenses)

R$/USD (2018): 3.65
Source: IPEADATA

Embrapa

Main Results

The carbon-emergy indicator highlighted the integrated system performance in increasing food production and, simultaneously, reducing $CO_{2\text{-eq}}$ emissions

The crop system is highly profitable, but its high private economic performance relies on an intensive use of external inputs. Hence, continuous cropping imposes high stress on the environment, making it unsustainable in the long-run

The extensive livestock system is shown to be unsustainable in even more dimensions - low productivity, low profits, and high GHG emissions

The integrated system displayed more balanced economic and environmental performances achieving high profitability, while dramatically reducing environmental impacts

Sustainability Assessment

Fuzzy logic indicators for the assessment of farming sustainability strategies in a tropical agricultural frontier

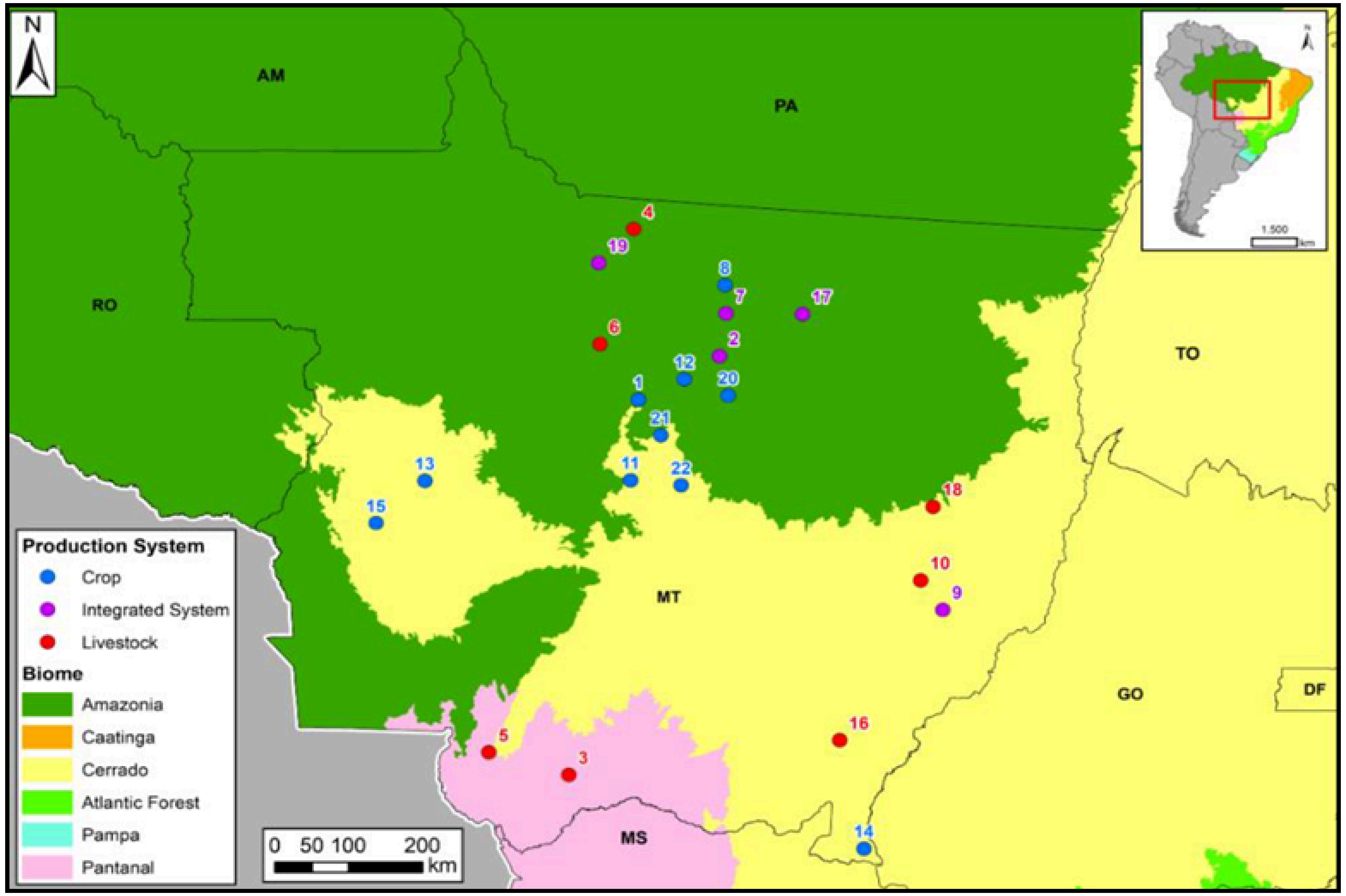
dos Reis, J.C., Rodrigues, G.S., de Barros, I. et al. Fuzzy logic indicators for the assessment of farming sustainability strategies in a tropical agricultural frontier. **Agronomy for Sustainable Development** 43, 8 (2023). **https://doi.org/10.1007/s13593-022-00858-5**

Main objective: To develop a model for evaluating the sustainability of agricultural production systems based on the construction of economic, environmental and social indicators using fuzzy logic and to apply it to different farms located in the state of Mato Grosso.

Method:

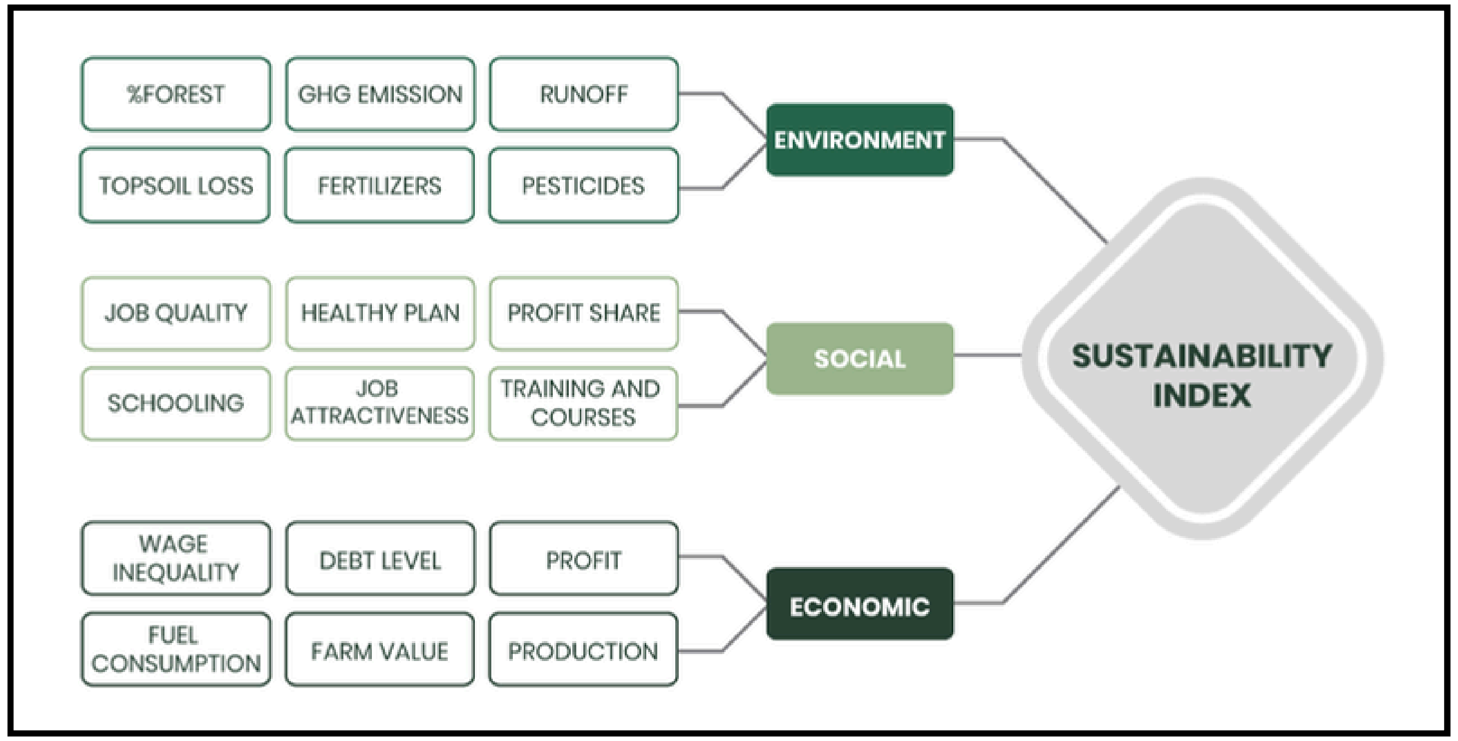
- Fuzzy Set Approach
  - Definition od input variables
  - Constrution of partial indicadotors (EES)
  - Construction of sustainability indicators (SI)

Farms Location



Sustainability Assessment

Fuzzy Inference System



Partial Indicators contribution to SI

Variable	Dimension	Expected effect	Variable	Dimension	Expected effect	Variable	Dimension	Expected effect
Profit (P)	Economic	$If\ (P)\ \uparrow \Rightarrow (SI) \uparrow$	Schooling (S)	Social	$If\ (S)\ \uparrow \Rightarrow (SI) \uparrow$	Topsoil loss (TL)	Environment	$If\ (TL)\ \uparrow \Rightarrow (SI) \downarrow$
Debt level (DL)	Economic	$If\ (DL)\ \uparrow \Rightarrow (SI) \downarrow$	Job Attractiveness (JA)	Social	$If\ (JA)\ \uparrow \Rightarrow (SI) \downarrow$	Fertilizers (Fe)	Environment	$If\ (Fe)\ \uparrow \Rightarrow (SI) \downarrow$
Wage Inequality (WI)	Economic	$If\ (WI)\ \uparrow \Rightarrow (SI) \uparrow$	Training and Courses (TC)	Social	$If\ (TC)\ \uparrow \Rightarrow (SI) \uparrow$	Pesticides (Pe)	Environment	$If\ (Pe)\ \uparrow \Rightarrow (SI) \downarrow$
Production (Pr)	Economic	$If\ (Pr)\ \uparrow \Rightarrow (SI) \uparrow$	Job Quality (JC)	Social	$If\ (JC)\ \uparrow \Rightarrow (SI) \uparrow$	% Forest cover (Fo)	Environment	$If\ (Fo)\ \uparrow \Rightarrow (SI) \uparrow$
Farm Value (FV)	Economic	$If\ (FV)\ \uparrow \Rightarrow (SI) \uparrow$	Health Plan (HP)	Social	$If\ (HP)\ \uparrow \Rightarrow (SI) \uparrow$	GHG emission (GHG)	Environment	$If\ (GHG)\ \uparrow \Rightarrow (SI) \downarrow$
Fuel Comsuption (Fu)	Economic	$If\ (Fu)\ \uparrow \Rightarrow (SI) \downarrow$	Profit Share (PS)	Social	$If\ (PS)\ \uparrow \Rightarrow (SI) \uparrow$	Runoff (R)	Environment	$If\ (R)\ \uparrow \Rightarrow (SI) \downarrow$

Table 2. Property performance in the three Dimensions of Sustainability, Sustainability Index (SI), and categorization according to the SI.

Farm	System of production	Economic	Social	Environmental	Sustainability Index	Group	Subgroup
19	ILF[1]	70,33	70,28	79,59	91,87	High-performance farms(A)	A
17	ICL[2]	70,48	70,08	70,33	91,78		
2		97,16	39,70	70,18	67,98		
22	Grain crop	76,50	70,08	39,70	67,97	Average-performance farms(B)	B 1
7	ICL[2]	85,51	17,81	70,60	21,81		
21	Grain crop	70,23	39,70	39,70	42,94		
14		70,43	39,70	39,70	42,94		
13		43,97	70,41	39,70	42,94		
12		56,42	18,07	39,70	21,91		B 2
1		31,27	39,70	39,70	33,31		
8		17,23	39,70	39,70	21,56		
20		39,70	39,70	39,70	42,94		
9	ICL[2]	70,50	23,60	39,70	23,25		
16	Livestock	17,39	39,70	17,83	21,65	Low-performance farms(C)	C 1
15	Grain crop	57,50	18,07	17,38	21,66		
4	Livestock	39,70	18,26	17,23	21,61		
3		2,62	18,07	39,70	16,94		
18		17,41	39,70	31,27	21,69		
11	Grain crop	70,25	17,95	17,23	21,60		
10	Livestock	2,01	18,06	18,15	16,88		
6		2,55	18,07	17,83	16,93		C 2
5		2,19	18,26	17,23	16,92		

[1] Integrated livestock-forestry system.
[2] Integrated crop-livestock system.

Embrapa

Main Results

ICLF systems showed better overall performance (higher SI)

Livestock systems showed the worst performance for all dimensions, even for very intensive and highly technified systems (feedlot - Farm #4)

ICLF systems showed extremelly higher results for environmental indicators (soil loss, fertilizer use, pesticide use and GHG emissions)

The crop systems showed high economic results (profit, production and salary levels), but poor environmental results

Sustainability as a balance across the three dimensions

Embrapa

Economic and Environmental Impacts

Economic and environmental impacts of integrated systems adoption in Brazilian agriculture-forest frontier

dos Reis JC, kamoi, Mariana Y. T., Michetti, M., Wruck, F. J., Rodrigues, R. A. R., Neto, A. L. F. Economic and environmental impacts of integrated systems adoption in Brazilian agriculture-forest frontier. **Agroforest Systems,** 97, pages 847–863 (2023) **doi: 10.1007/s10457-023-00831-5**

Main objective: evaluate and estimate the economic and environmental impacts of large-scale adoption of ILPF systems in Mato Grosso, considering the 2020-2021 crop year.

Production System	Location (MT)	Area	Period	Investment USD
ICPF	Northesat	600	2010 - 2017	1,037.18
ICL	Northwest	600	2007 - 2012	905,49
Crop	Mid-North	1,500	2015 - 2021	880.71
Livestock	Mato Grosso	1,000	2016 - 2021	374.15

R$/USD 2020

Embrapa

Economic and Environmental Impacts

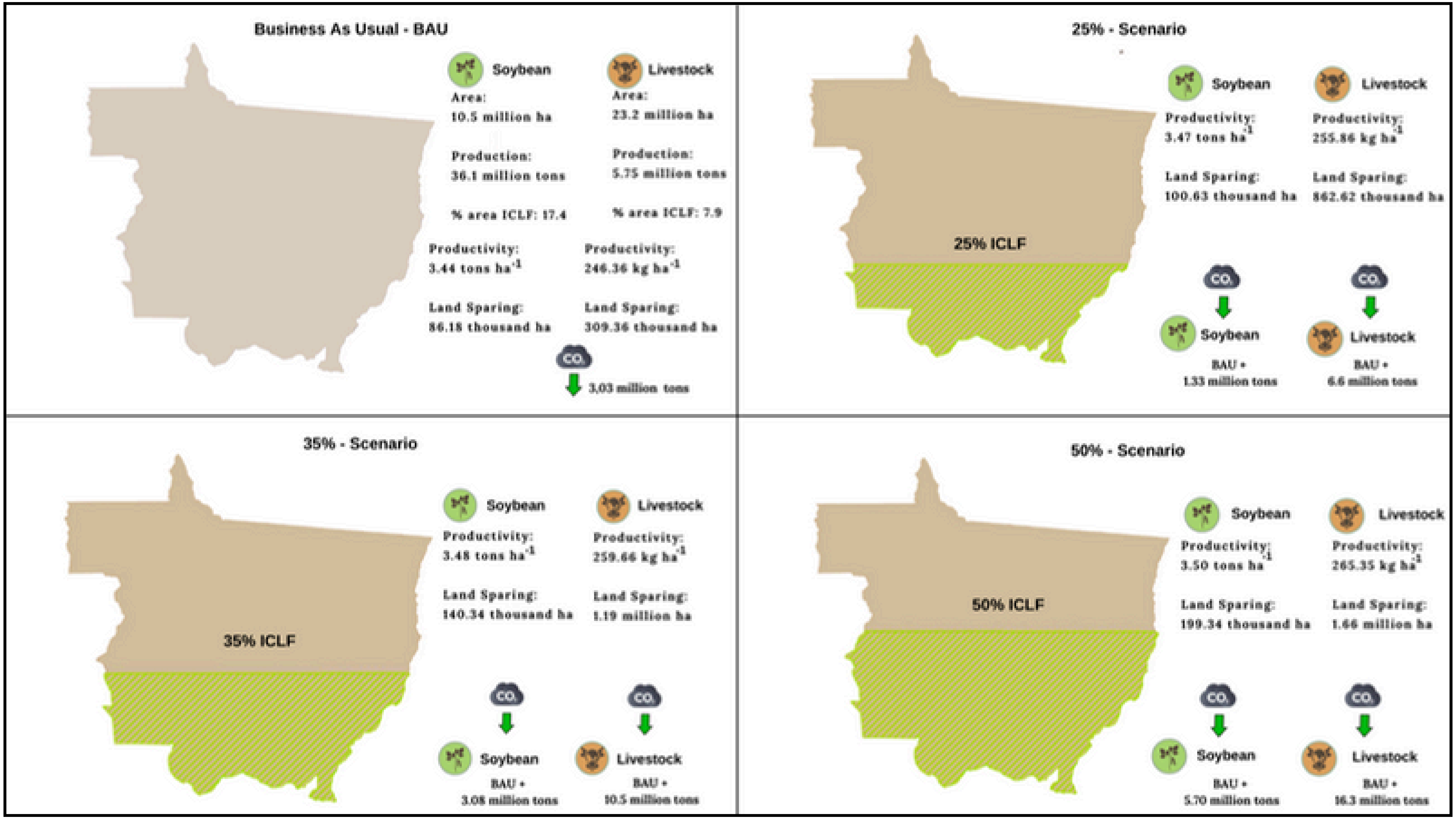
Economic viability indicators

Indicator	ICLF	ICL	Crop	Livestock
WACC	8.02%	8.14%	8.15%	8.15%
NPV	72.75	30.99	27.73	1.40
IRR	15.78%	12.16	11.90%	8.74%
ROI	12.93%	11.35%	10.62	8.62%
Profit Index	1,36	1.16	1.14	1.01
Payback (years)	7	5	6	5

R$/USD 2020

Embrapa

Economic and Environmental Impacts



RJ (city):
120 thousand ha

Embrapa

Economic and Environmental Impacts

Beef cattle Productivity (Kg produced. ha^{-1})

BR: 71.4 → **ILPF: 95.08** **+ 33%**

76% area below this value

Stoking rate

BR: 1,32 AU ↓ **ILPF: 3.2 AU** **<u>2.46 x</u>**

2022/2023 - harvest season

Source: Associação Brasileira das Industrias Exportadoras de Carne

Economic and Environmental Impacts

Credit Carbon Simulation

Production System	Ton CO2 eq ha year	Area	CC Revenue (USD ha)
ICLF	9.9	1000	33,66

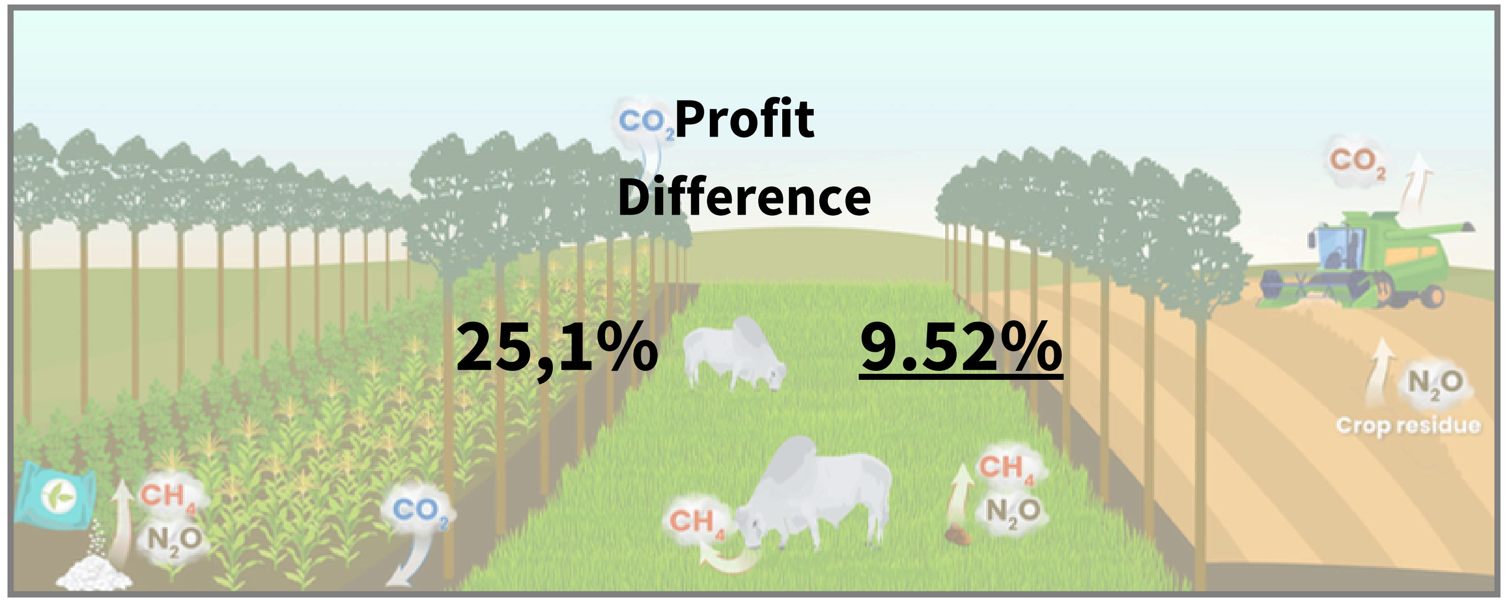
Carbon Credit = USD 3.40

ECONOMIC RESULTS

Index	ICL	Crop	Livestock
Net Profit	USD 235.69	USD 295.00	USD -0.58

+ USD 33.66

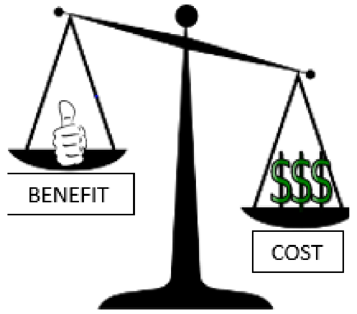
USD 269.35



Monteiro, Alyce, et al. "Crop-livestock-forestry systems as a strategy for mitigating greenhouse gas emissions and enhancing the sustainability of forage-based livestock systems in the Amazon biome." **Science of the Total Environment** 906 (2024): 167396. **https://doi.org/10.1016/j.scitotenv.2023.167396**

Main Results

ICLF systems showed better results in situations where the macroeconomic situation was adverse (high interest rates, low prices)



Even with a higher initial investment, ICLF systems perform better economically: shorter payback time and higher IL

The economic performance of large-scale agriculture is more dependent on the exchange rate and commodity prices on the international market

Extensive livestock farming has very low profitability; its economic performance only allows the activity to be maintained, generating no profit for the producer

The impact analysis demonstrated the potential of integration systems to increase production and, at the same time, intensify the use of already open areas (land-saving effect)

Case Study: Dairy Small Farm - Estância Vanda (Paranaíta - MT)

- Small farm, located in Paranaíta, in the northern region of Mato Grosso
- It spans a total area of 101 hectares, of which 25 hectares are dedicated to ICLF for milk production
- The climatic conditions of 25.4°C, elevated relative humidity, and an annual precipitation average of 2,298 mm
- The principal challenge: production of milk in adverse climate conditions: cattle of Taurine genetic origin, specifically through crossbreeding Jersey and Holstein breeds, while circumventing the phenomenon known as "tropical degeneration"
- The primary objectives: thermal comfort for the livestock and reclain degraded pasture areas

Embrapa

Case Study: Dairy Small Farm - Estância Vanda (Paranaíta - MT)

Case Study: Dairy Small Farm - Estância Vanda (Paranaíta - MT)

Foto: Miqueias Michetti, Consultor IMEA

Foto: Miqueias Michetti, Consultor IMEA

Background:

- Implementation in 2014
- Single rows of Eucalyptus (Eucalyptus urograndis - clones H13 e I144), African Mahogany (Kaya Ivorensis) and Teak (Tectona grandis), in rows spaced 30 meters apart, alternating or interspersing the species
- Initial invesment: R$ 7.106,48 por hectare
- land use strategy: corn for livestock feed (silage) and as a strategy to reduce the cost of recovering degraded pasture (taking advantage of the fertilization and soil corrections carried out in the agricultural stage)

Embrapa

Case Study: Dairy Small Farm - Estância Vanda (Paranaíta - MT)

Foto: Miqueias Michetti,
Consultor IMEA

Foto: Miqueias Michetti,
Consultor IMEA

Foto: Miqueias Michetti,
Consultor IMEA

Foto: Miqueias Michetti,
Consultor IMEA

Case Study: Dairy Small Farm - Estância Vanda (Paranaíta - MT)

Zootechnical Indices	
Cow herd	65 heads
Dairy production (day)	890 liters
Dairy production (cow - day)	16,7 liters
Calving interval	14 monthss

Dairy production by cow (Brazil)
8 liters

Economic Results 2022 (R$ ha^{-1})	
Net Revenue	6.704,51
Production Cost	3.142,07
Gross Profit	3.562,44
Net Profit	2.037,72
Profitability	30 %

Daily Production difference
+ 108%

Estância Vanda - 2022

Embrapa

Final Remarks

- The ICLF systems demonstrated economic competitiveness, even in a region highly specialized in large-scale crop production

- The emergy analysis highlighted the main contradictions of the large-scale crop system: the social benefits are lower than the social costs.

- ICLF systems have proved to be an efficient alternative for increasing livestock production while simultaneously reducing GHG emissions and the pressure to open up new native forest areas

- Reducing deforestation and recover degraded pasture is crucial to Brazil acheive its GHG emission target.

- However, it is fundamental that the Brazilian Government defines the destination (use) of the land recovered.

Embrapa Cerrados - Experimental Field
Foto: Embrapa Image Database

Thank you

FONE

+55 66 98121-1011

EMAIL

julio.reis@embrapa.br

Embrapa