Towards Pollination Accounts in Brazil

31st Meeting of the London Group on Environmental Accounting

22-25 September 2025
Tallinn, Estonia

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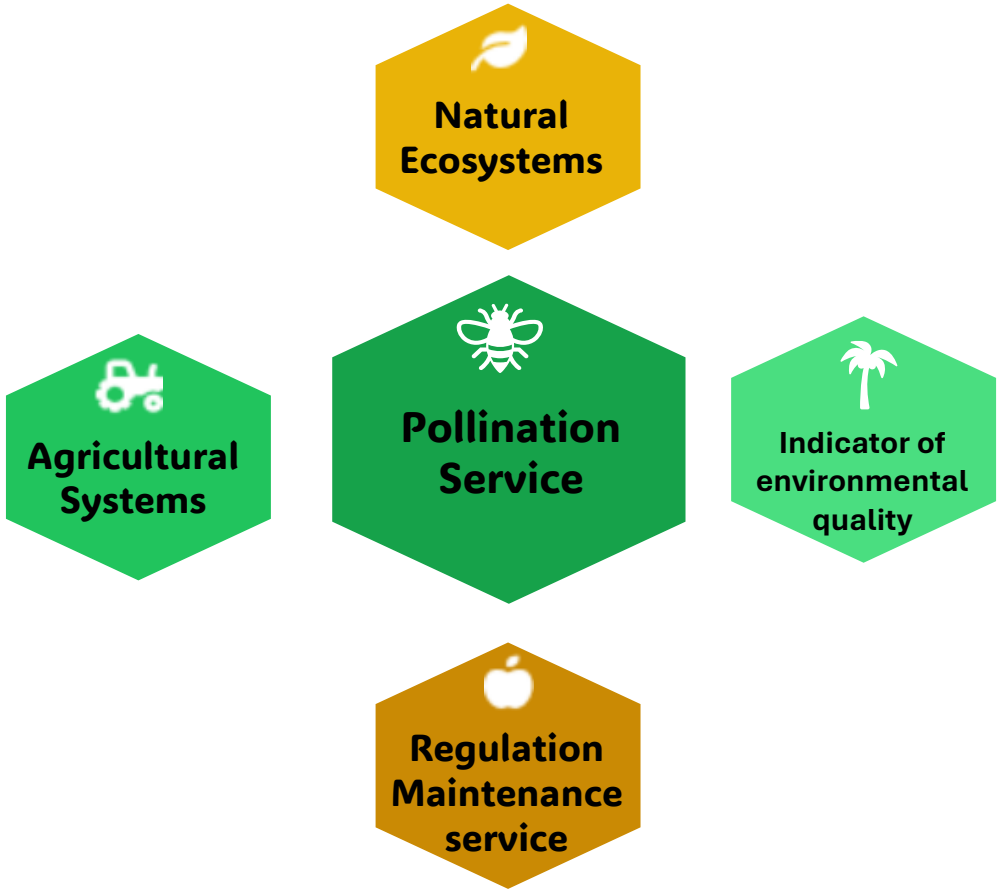
Introduction to Pollination as an Ecosystem Service

SEEA-EA Framework Classification



Ecosystem Stability

Pollination maintains plant populations, which form the base of most terrestrial food chains. It contributes significantly to **ecosystem stability and biodiversity**.

Biodiversity Maintenance

Pollinators are essential for **crossbreeding most flowering plants, maintaining genetic structure of plant populations**, and shaping ecosystem function.

Agricultural Sustainability

For commercially relevant plants, pollination is one of the most studied ecosystem services due to its **economic importance.**

Environmental Indicator

The presence of bees and other insects serves as a **crucial indicator of environmental quality**, reflecting ecosystem degradation impacts on maintenance capacity.

Pollination for the maintenance of biodiversity and for production

- Pollination is critical to ecosystems and the economy
- Accounting supports sustainable public policies

Objective:

- To analyze trends in the direct contribution of animal pollination to agricultural and extractive production in Brazil;
- Discusses the national progress in the development of pollination ecosystem accounts, highlighting both the advances and the challenges that still exist;
- Points out ways to overcome these gaps and comments on ongoing initiatives within the scope of the IBGE that will contribute to the development of Ecosystem Accounts on pollination services in Brazil.

Economic Dimensions of Pollination

Essential ecosystem service for maintaining biodiversity and ensuring the sustainability of food production.

Direct Contribution
Pollination directly increases final production of fruits and seeds directly dependent on biotic pollination.

Indirect Contribution
Pollination indirectly supports production of seedlings or seeds that serve as inputs for crops products like onions (bulb), flax (stem fibers), cassava (root), yerba mate (leaves).

Pollination is classified as a **regulation and maintenance service** within the SEEA-EA framework, linked to both natural ecosystems and agricultural systems.

Dependency Ratios in Valuation


Renata Kelly da Silva/EMBRAPA

Monetary Valuation

Estimating pollination's contribution requires calculating its impact on crop production, considering varying **dependency rates**.

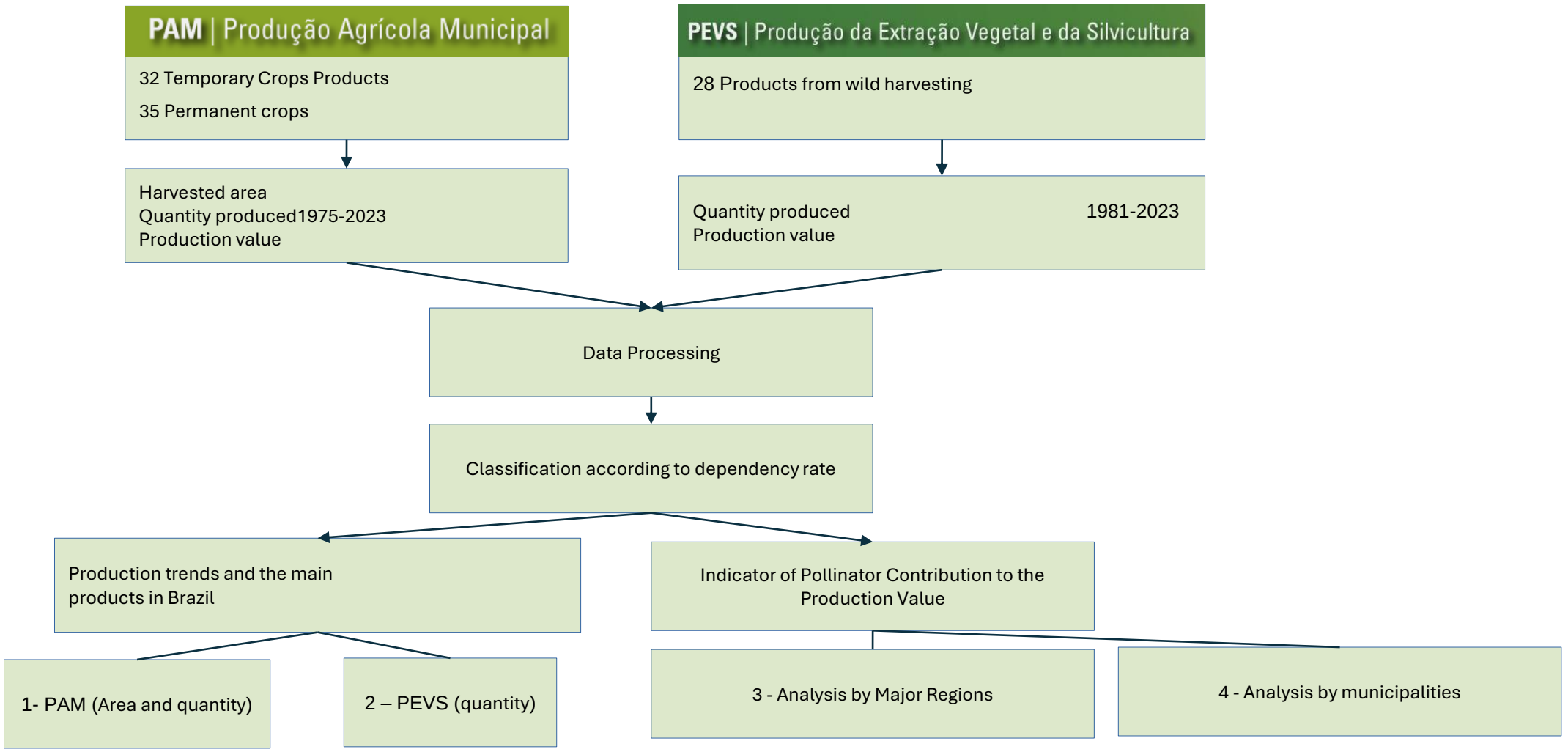
Production Loss Assessment

Dependency ratios help assess **potential production losses due to pollinator decline**.

Research Focus

Studies identify crop dependency rates and contribution of ecosystem services to each crop, **building references for potential demand for pollination**.

Economic Dimensons of Pollination



Indicator of Pollinator Contribution to Production Value

Products	Production Value	Dependency rate		
		Average	Minimum	Maximum
Soybean	R$1500	19%	0%	37%
Sunflower	R$100	54%	8%	93%
Orange	R$500	19%	6%	31%
Corn	R$1000	0%	0%	0%

Products	Production Value X Dependency rate		
	Average	Minimum	Maximum
Soybean	R$285	R$0	R$555
Sunflower	R$54	R$8	R$93
Orange	R$95	R$30	R$155
Corn	R$0	R$0	R$0

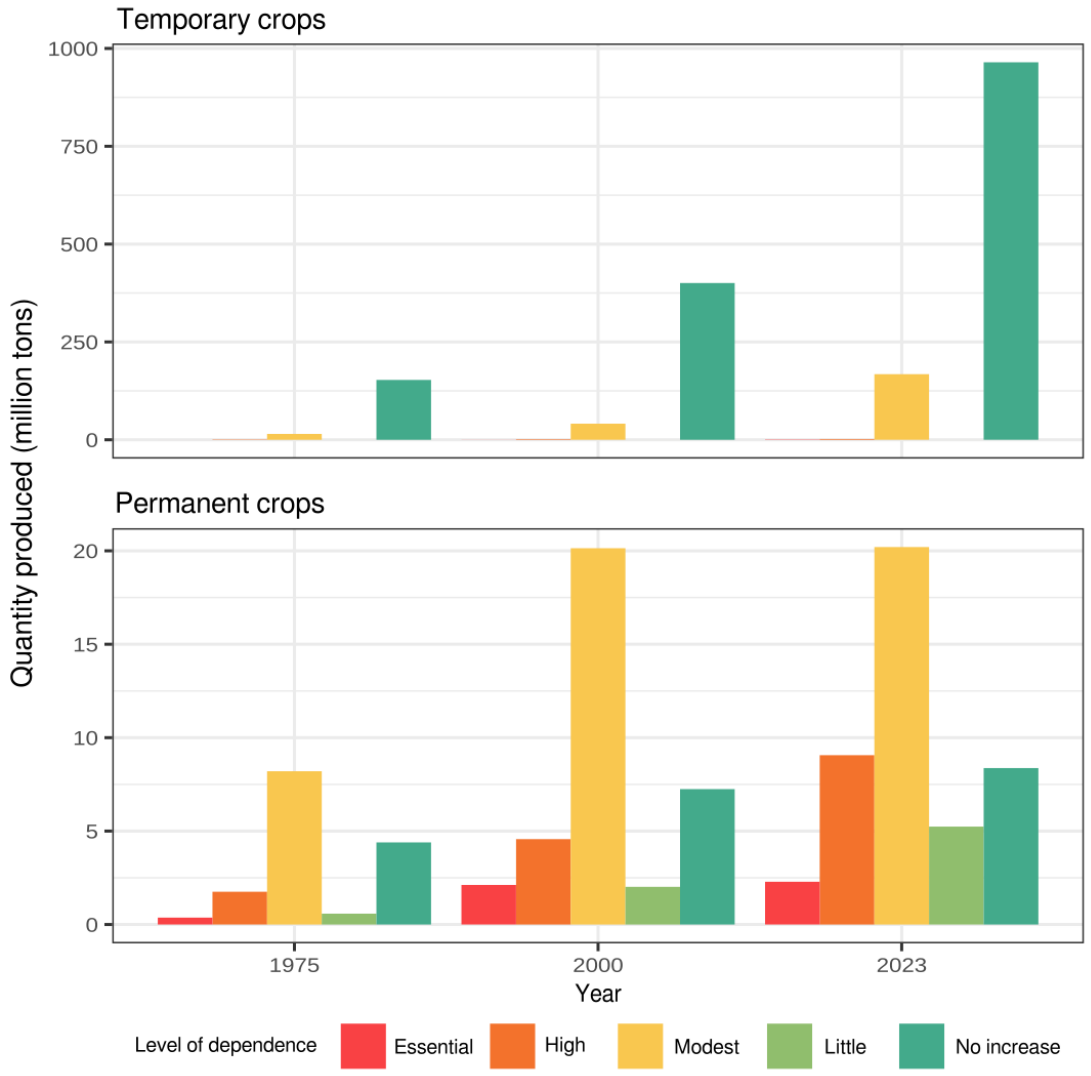
	Average	Minimum	Maximum
Indicator value	14%	1,2%	25,9%

Total production value **R$3100**

	Average	Minimum	Maximum
Total value associated with animal pollination	R$434	R$38	R$803

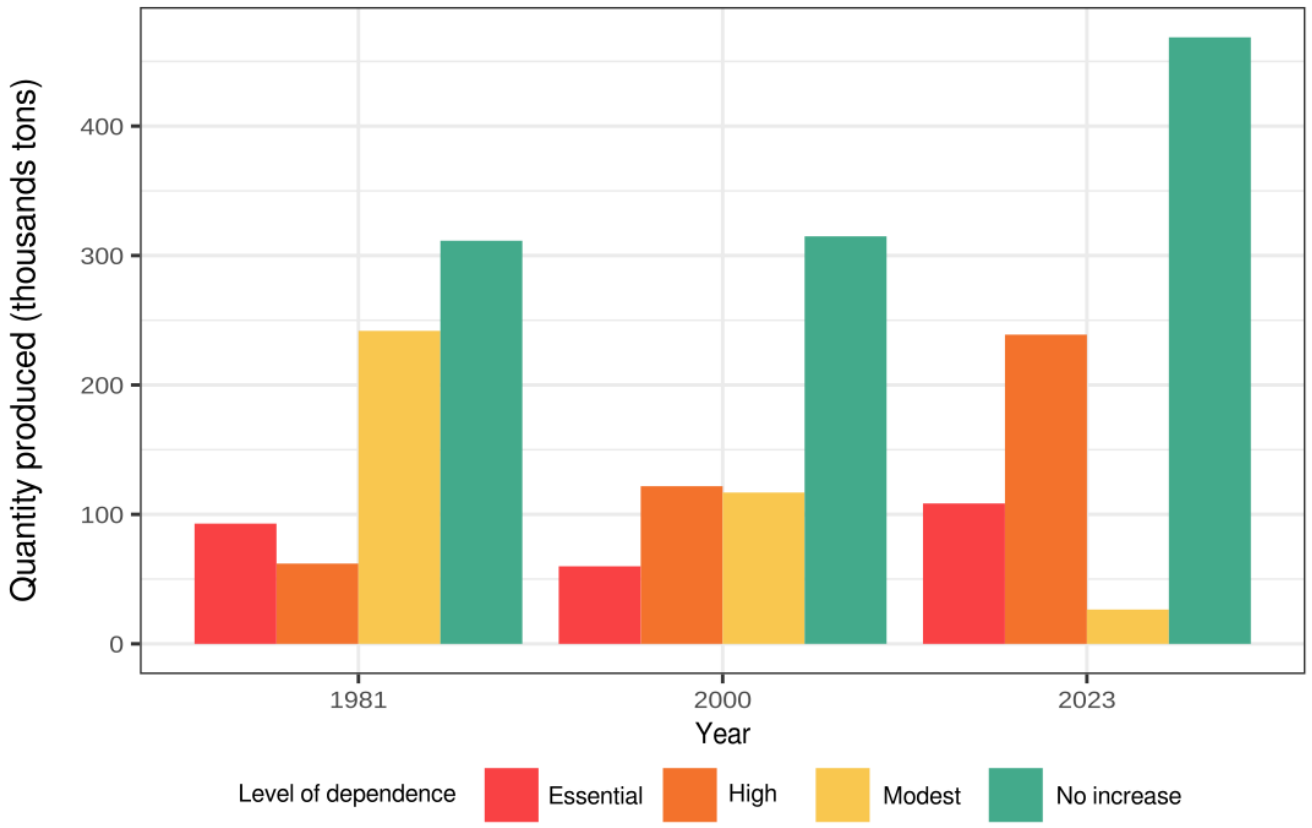
Results

Quantity produced by dependence class – Brazil - 1975-2023.

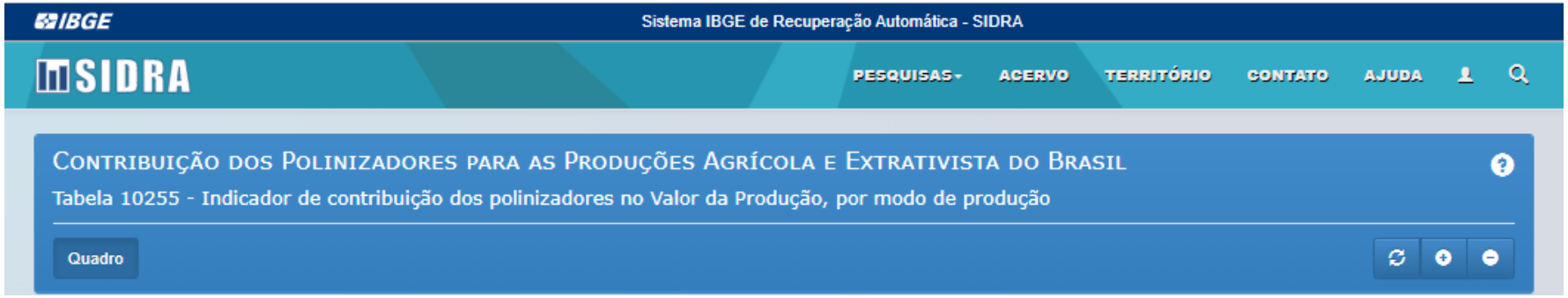


Results

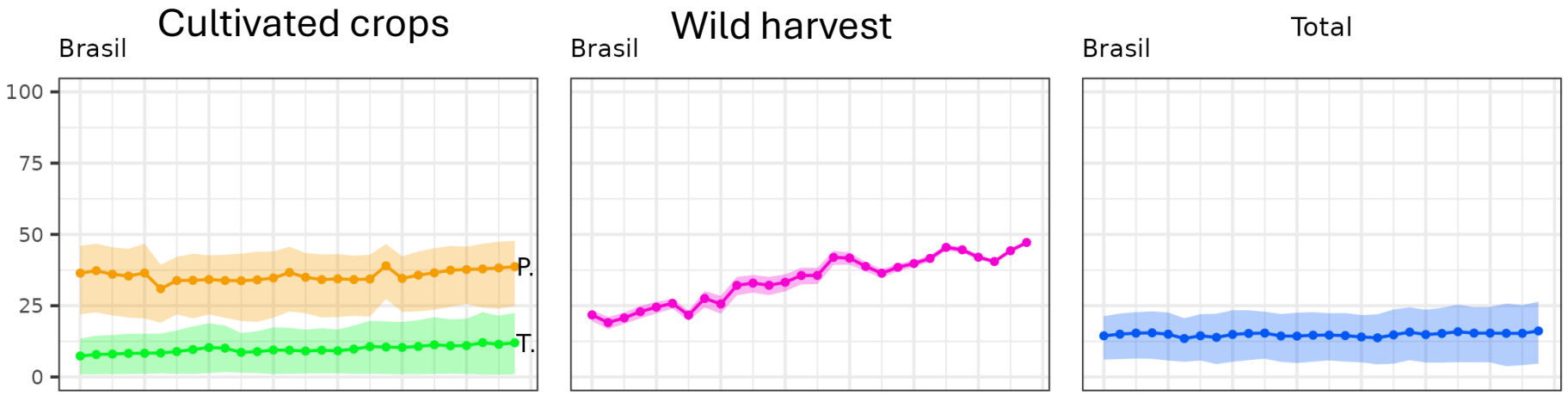
Quantity produced from extractivism by dependence class – Brazil- 1981/2000/2023



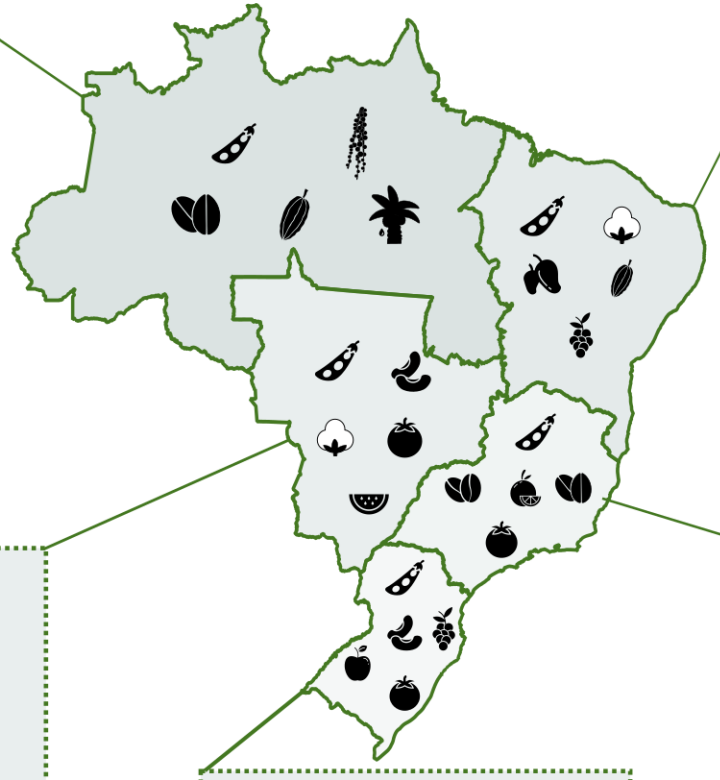
Results



Indicator of the contribution of pollinators to the value of agricultural and extractive production, average (solid line), maximum and minimum (shaded area) values, according to production modes and total



Highlighted products from each Major Region



North

Main products

1. Soybean
2. Açai berry
3. Canephora coffee
4. Cocoa
5. Dendê palm nuts

IVP*

1996: 18.03

2023: 27.62

Northeast

Main products

1. Soybean
2. Cotton
3. Mango
4. Cocoa
5. Grape

IVP*

1996: 18.02

2023: 21.84

Central-West

Main products

1. Soybean
2. Cotton
3. Bean
4. Tomato
5. Watermelon

IVP*

1996: 12.21

2023: 14.51

Products colors:

Temporary crops = green

Permanent crops = orange

Wild harvesting = magenta

***IVP = IIndicator of Pollinator Contribution to Production Value**

South

Main products

1. Soybean
2. Bean
3. Grape
4. Apple
5. Tomato

IVP*

1996: 10.32

2023: 12.44

Southeast

Main products

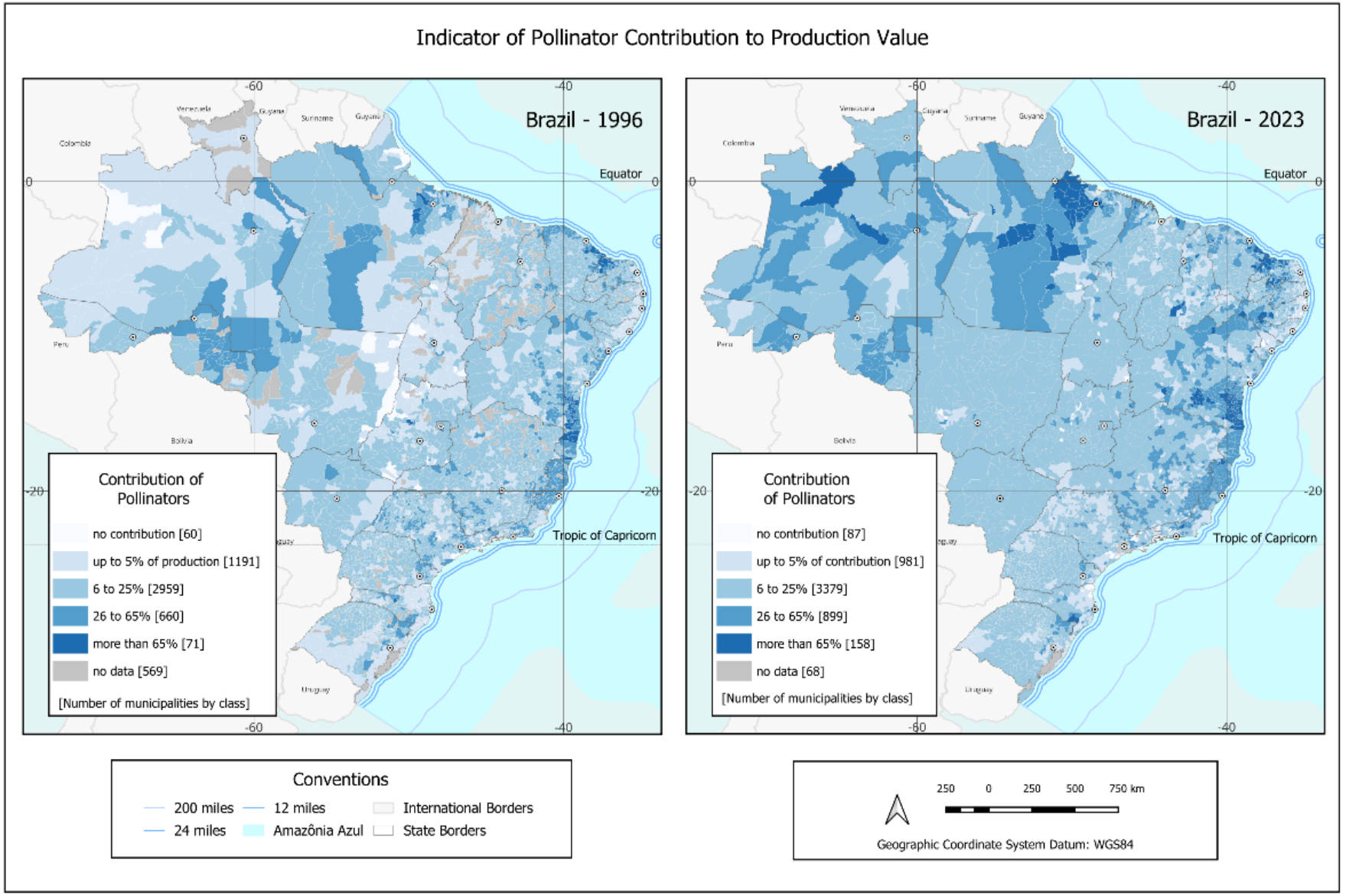
1. Soybean
2. Arabic coffee
3. Orange
4. Canephora coffee
5. Tomato

IVP*

1996: 16.61

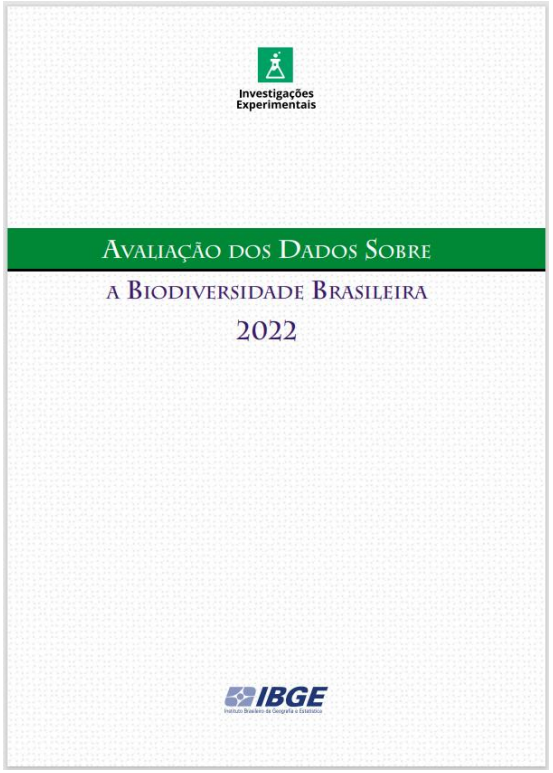
2023: 15.47

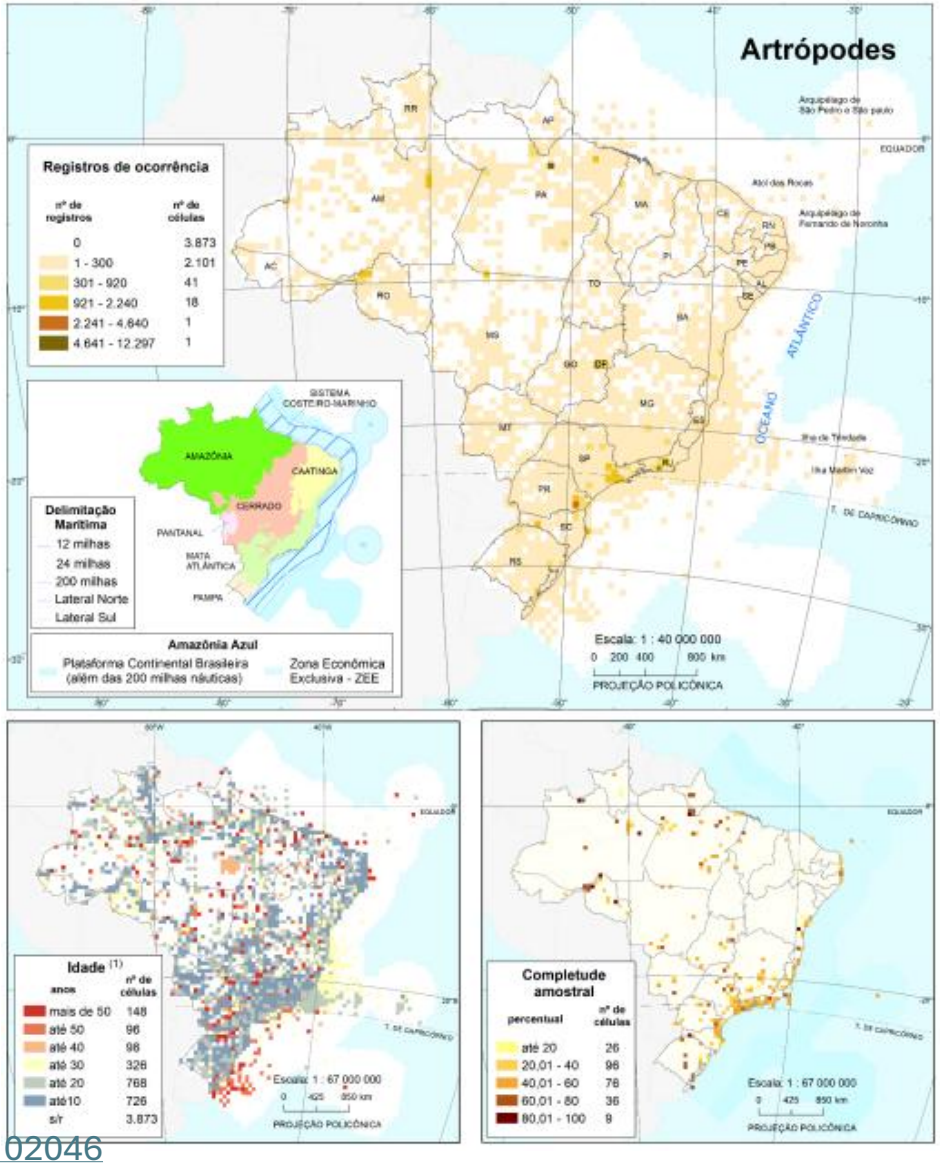
Results


Indicator of Pollinator Contribution to Production Value
Brazil - 1996
Equator
Tropic of Capricorn
Contribution of Pollinators
no contribution [60]
up to 5% of production [1191]
6 to 25% [2959]
26 to 65% [660]
more than 65% [71]
no data [569]
[Number of municipalities by class]
Brazil - 2023
Equator
Tropic of Capricorn
Contribution of Pollinators
no contribution [87]
up to 5% of contribution [981]
6 to 25% [3379]
26 to 65% [899]
more than 65% [158]
no data [68]
[Number of municipalities by class]
Conventions
200 miles
24 miles
12 miles
Amazônia Azul
International Borders
State Borders
250 0 250 500 750 km
Geographic Coordinate System Datum: WGS84

Next steps

Species occurrence records — potential distribution of pollinators from environmental and landscape variables

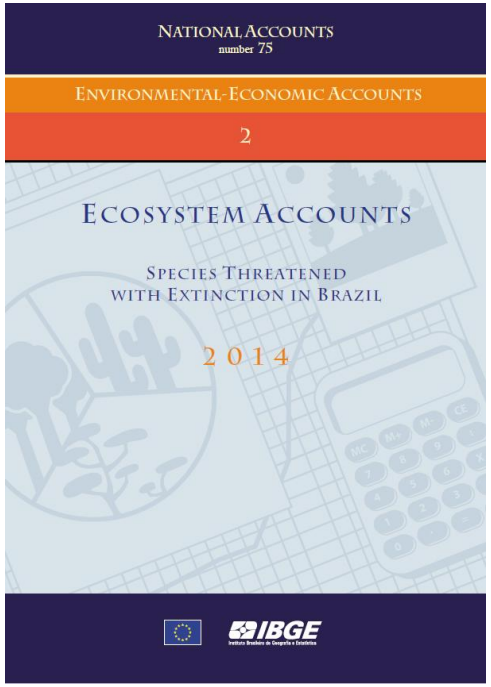




https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2102046

Next steps

Conservation status of threatened species of pollinators- ecosystem condition accounts linked to pollination service supply



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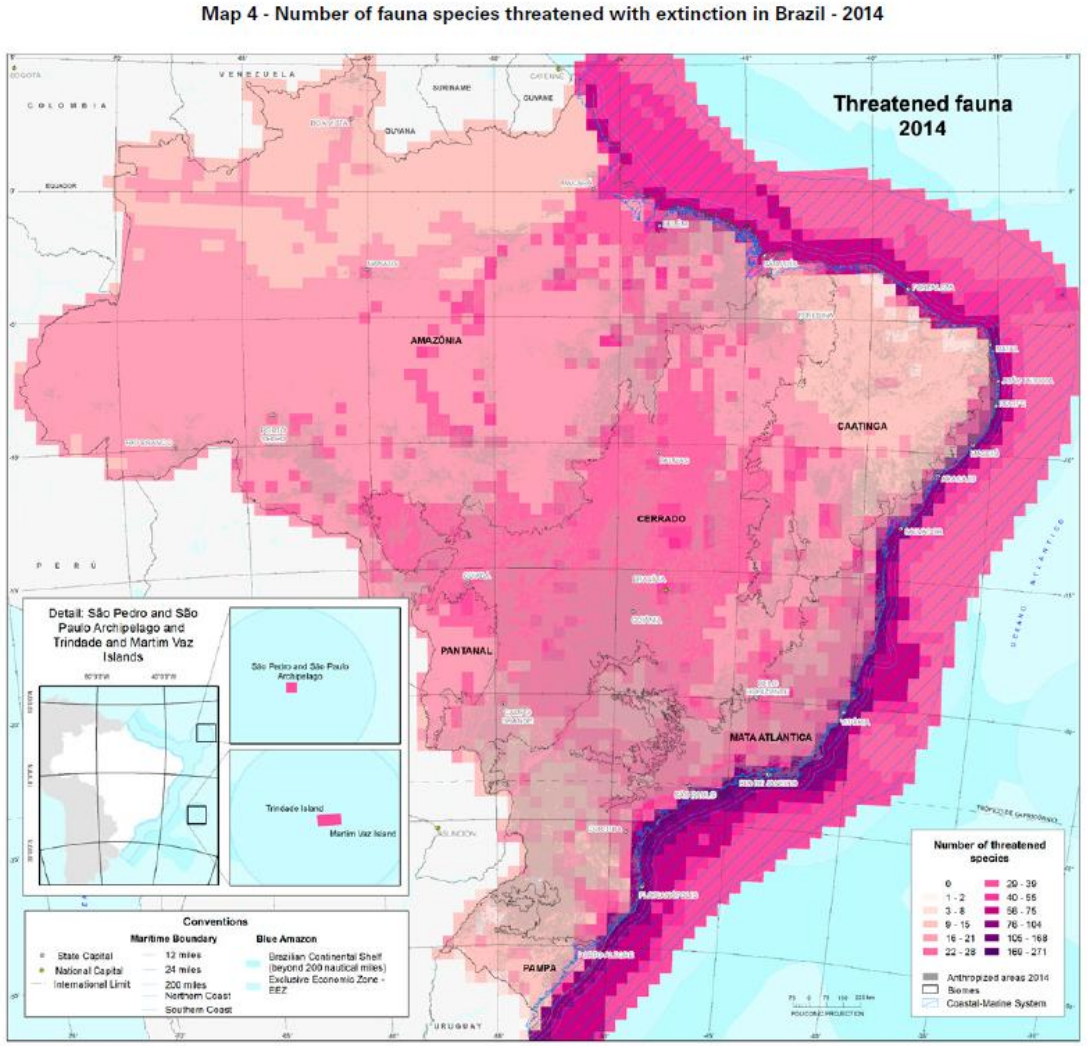


Next steps

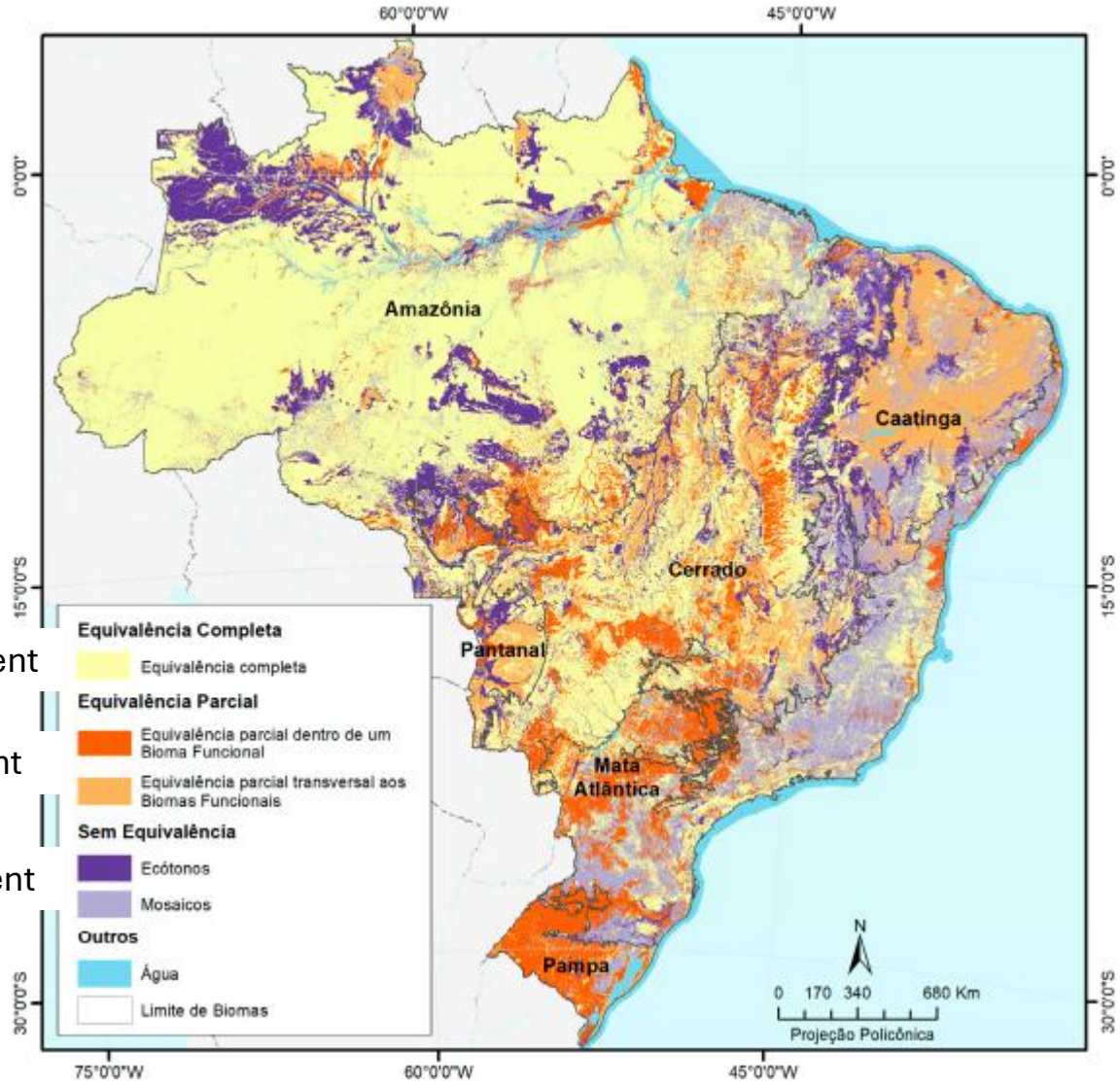
Ecosystem type mapping and LULC monitoring – extent accounts and service flow

https://biblioteca.ibge.gov.br/visualizacao/livros/liv101853.pdf

Fully equivalent

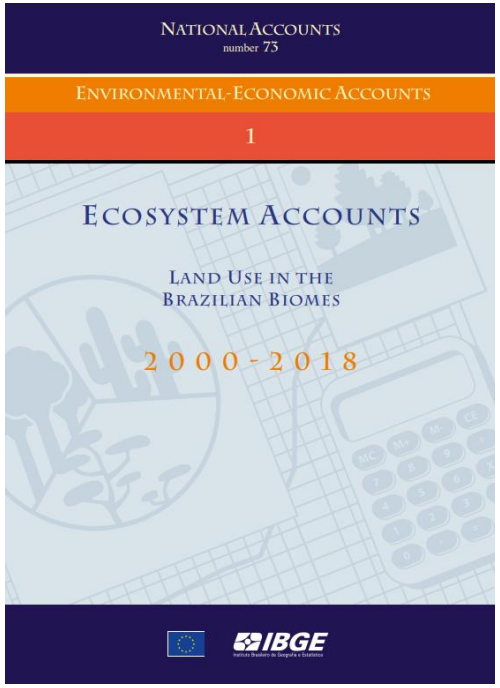
Partially equivalent

Not equivalent



Next steps

Ecosystem type mapping and LULC monitoring – extent accounts and service flow



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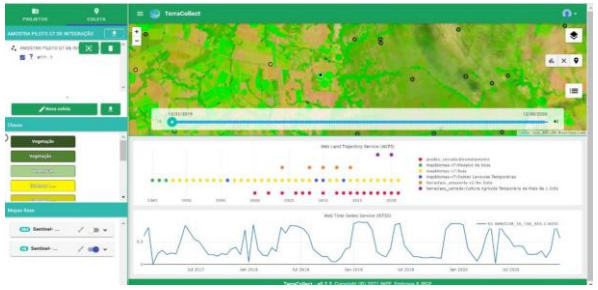
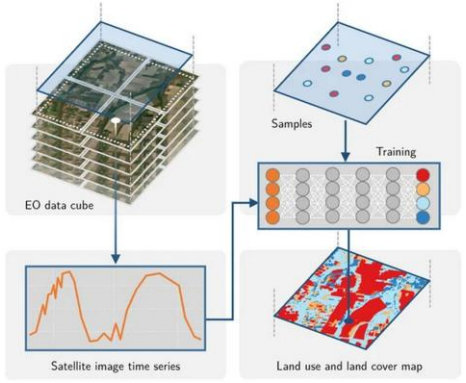
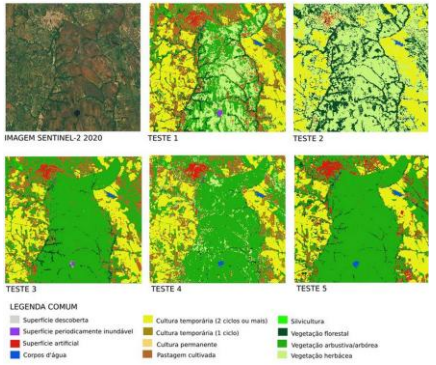
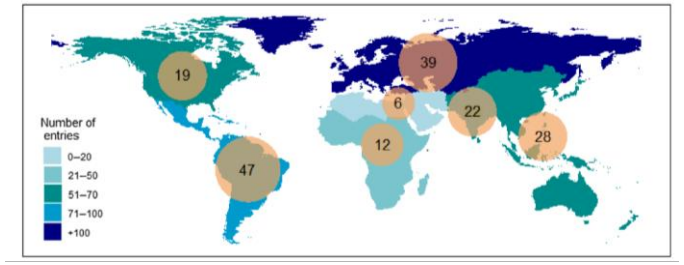






Next steps

Collaboration with the academic community – databases on pollinator dependence



Fonte:The pollination of cultivated plants: A compendium for practitioners. (https://www.fao.org/documents/card/en/c/i9201en)

Table S2. Pollinator dependence values of crops – compilation list. The overall mean, standard error (SE), minimum (min) and maximum (max) values of pollinator dependence are provided, along with the number of accessions with information and the number of entries for each crop. NA denotes no available information. Species highlighted in bold represent species not listed in previous compilations. **This compilation list will be subjected to regular updates that can be accessed via this link:** https://github.com/catarinasiopa/Animal-pollinated-crops-and-cultivars-levels

Species	Crop common name	Number of accessions with information	Pollinator dependence value				Number of entries
			mean	SE	min	max	
Abelmoschus esculentus	Okra	2	0.14	0.08	0.00	0.36	4
Acca sellowiana	Feijoa	7	0.95	0.03	0.79	1.00	7
Actinidia chinensis	Golden kiwifruit	3	0.74	0.12	0.47	1.00	4

Fonte: Siopa, C., Carvalheiro, L. G., Castro, H., Loureiro, J., & Castro, S. (2024). Animal-pollinated crops and cultivars—A quantitative assessment of pollinator dependence values and evaluation of methodological approaches. Journal of Applied Ecology, 61, 1279–1288. https://doi. org/10.1111/1365-2664.14634

INPol
INCT Polinização: Conhecimentos, Conservação e Uso Sustentável de Polinizadores

JARDIM BOTÂNICO RIO DE JANEIRO DESDE 1808

https://www.gov.br/jbrj/pt-br/assuntos/inpol

Next steps

12th Agricultural Census– data on crop location and pollinator uses by agricultural establishments

https://agenciadenoticias.ibge.gov.br/en/agencia-news/2184-news-agency/news/17022-census-of-agriculture-begins-today-and-will-visit-5-3-million-properties

Some final considerations

Methodological approaches

Spatial analysis of agricultural areas

Assessment of the different degrees of dependence on pollination of each crop

Monetary valuation analysis of agricultural and extractive production

Mapping of ecosystem types and assessment of habitat conservation conditions

→ Models integrate data on pollinators, ecosystems and crop dependence ratios.

Future analyses incorporating estimates of pollinator supply based on landscape characteristics will allow progress in estimating the value of this service within the framework of the System of Environmental Economic Accounts.

Some final considerations

Questions for the London Group

What is your country's experience with pollination accounts?

Which data sources are available, and which are not?

How to deal with and communicate uncertainties in estimates?

What kind of questions can be added to traditional statistical surveys to boost the compilation of pollination or other ecosystem accounts?


Obrigada!
Thanks!
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