OP-194 [Beekeeping for Rural Development]

Temporal Trends in the Brazilian State of São Paulo Meliponiculture: Woman participation, Shifting Geographies, and the Decline of Non-Native Species

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Background/Purpose
Meliponiculture (stingless beekeeping) in São Paulo, Brazil, is a critical practice for biodiversity conservation and sustainable livelihoods. This study analyzes its evolution from 2016 to 2022, focusing on shifts in beekeeper demographics, spatial expansion, and management practices to identify trends, challenges, and opportunities for growth.

Problem Description
Despite increased participation, meliponiculture faces challenges: lack of knowledge about the activity's regulation, limited market, and tensions between conservation goals and the use of non-native species. Additionally, spatial imbalances persist, with uneven activity distribution across mesoregions, and novice beekeepers lack long-term engagement strategies.

Methodology
Surveys were conducted with 255 (2016) and 330 (2022) meliponists across São Paulo's 15 mesoregions. Data included demographic profiles, colony numbers, species preferences, motivations, knowledge sources, and economic outcomes.

Results and CONCLUSION: Male dominance persisted (78.48% in 2022), but female participation rose by 8.58%. Practitioners aged significantly (average age: 41 to 51), with a 9% increase in those aged 60+. Education levels remained high (50% undergraduates; 10.62% postgraduates by 2022). Geographically, Vale do Paraíba doubled participation (15.76% in 2022), surpassing Ribeirão Preto, while rural meliponaries increased by 4.6%. Colony numbers grew from 5,185 to 7,419, though 60% kept ≤10 colonies. Native species predominated: Tetragonisca angustula (41.41%) and Melipona quadrifasciata (21.88%) thrived, while allochthonous M. scutellaris fell to <1%. M. mondury rose 9.29%, reflecting preference for productive natives. Conservation remained the primary motivation (90.3%), but commercial interests grew to 22.12%. Over 36% were beginners in 2022, with women disproportionately represented among novices (49.3% had ≤1 year experience). Knowledge acquisition shifted toward supervised learning (e.g., courses), matching self-guided methods (70% combined). Profitability stagnated: 70.61% reported no profit, despite modest commercial growth (<10%).

Practical Implications for Beekeepers
Despite increased participation, meliponiculture faces challenges such as limited market reach, and tensions between conservation goals and the use of non-native species. To address these issues, actionable strategies include prioritizing native species like M. mondury for their ecological compatibility and productivity. Concurrently, advocating for policy incentives to support native species conservation and equitable value chains is essential.

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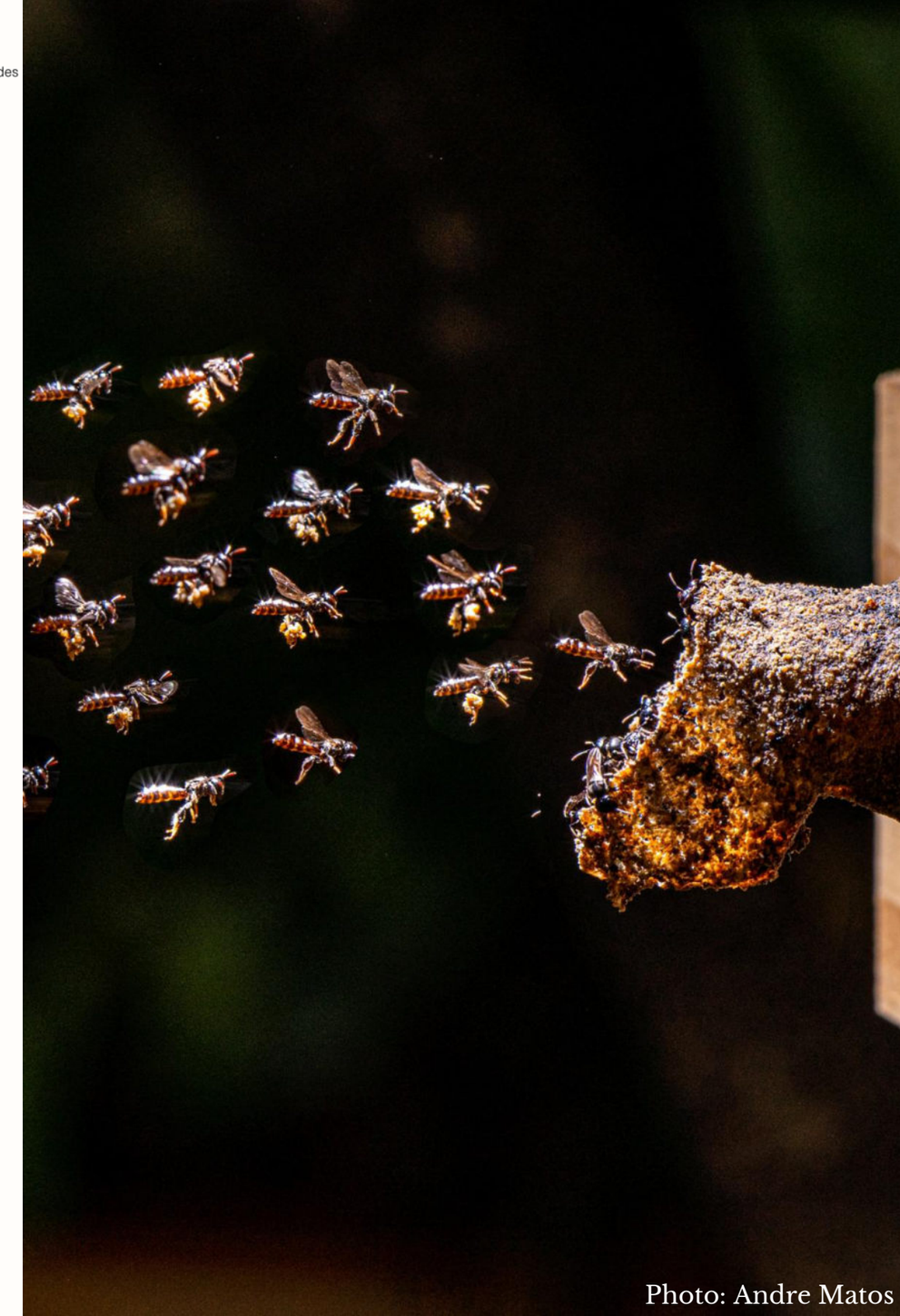

Photo: Andre Matos

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Research Context

Meliponiculture in Brazil has deep historical roots, practiced by indigenous peoples before colonization.

Pre-Colonial Period

Meliponiculture practiced by indigenous peoples.

1839

Introduction of *Apis mellifera* in Brazil and decline of meliponiculture.

1956

Beginning of the Africanized bees period. Meliponiculture almost extinguished.

2000s

Rebirth of meliponiculture.

Why This Research Matters

Triple Impact

Meliponiculture uniquely blends biodiversity conservation, environmental education, and sustainable income generation for rural and urban communities across Brazil.

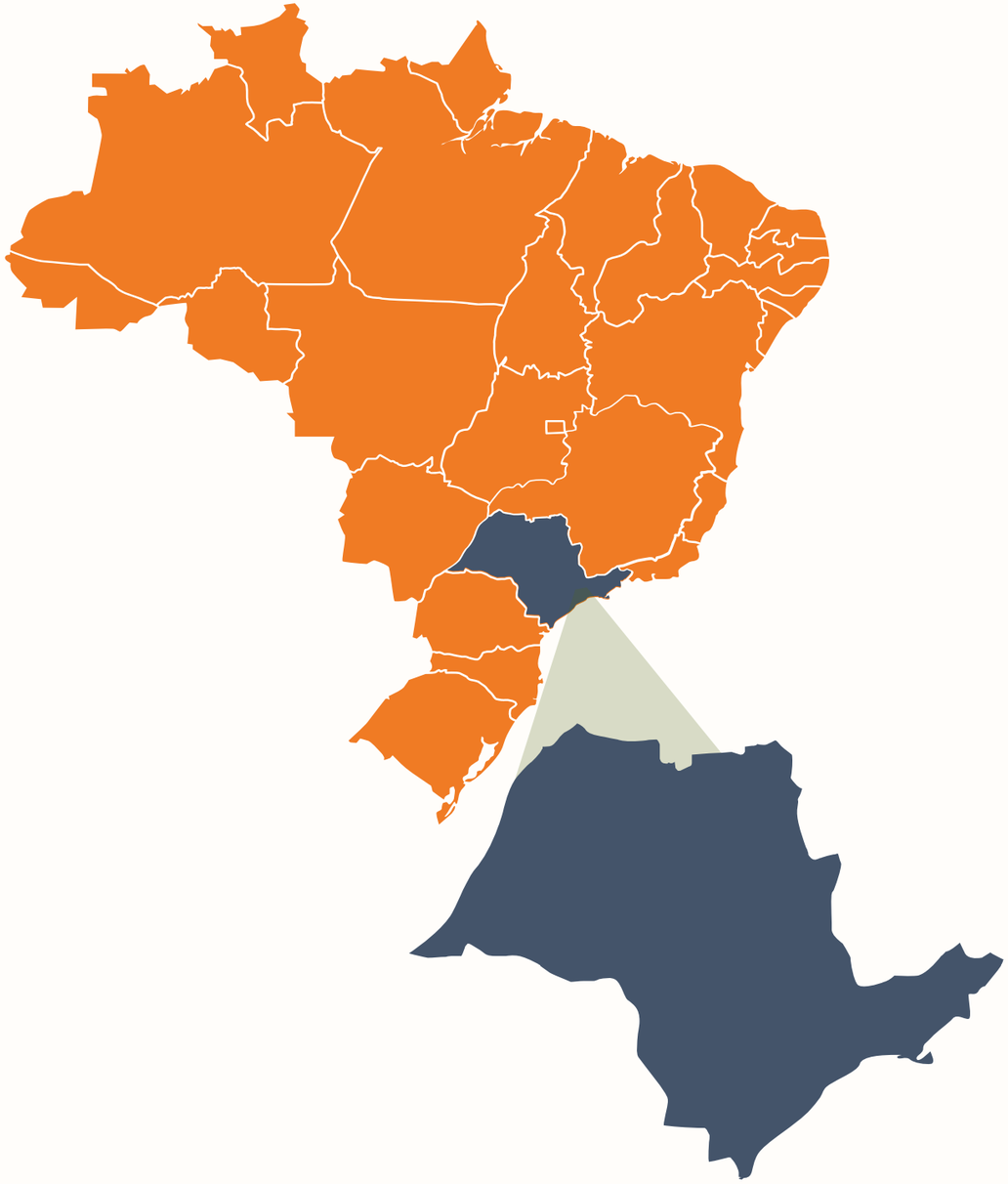
Critical Question

How did sociodemographic profiles of meliponists, management practices, and underlying motivations evolve from 2016 to 2022 during this period of accelerated development?

Photo: Tiago Francoy

Why São Paulo?

The state of São Paulo exemplifies the transformative potential of meliponiculture when there is collaboration among academia, civil society and public authorities. Since 2014, the region has experienced substantial growth in meliponiculture.



Growth Factors

- Specialized online forums
- Training programs
- Specialized events
- Advances in environmental legislation

Research Questions & Objectives

01

Comparative Analysis

Compare 2016 versus 2022 data on practitioner profiles, management practices, and motivational drivers across São Paulo state.

02

Sustainability Trends

Identify emerging trends toward more sustainable practices and increased professionalization within the meliponiculture sector.

03

Predictive Relationships

Test associations among operational scale, species diversity, learning modes, and economic profitability outcomes.

Photo: Celso Barbieri

This longitudinal study addresses critical knowledge gaps in understanding the rapid evolution of Brazilian meliponiculture practices and their implications for conservation and sustainable development.

Demographic Profile: Who Answered?

255
Respondents in 2016

330
Respondents in 2022

78.5%
Male Participants
87.1% in 2016

51
Average Age
Years (increased from 41)

80%
Higher Education
University-level qualification

Broad Geographic Distribution

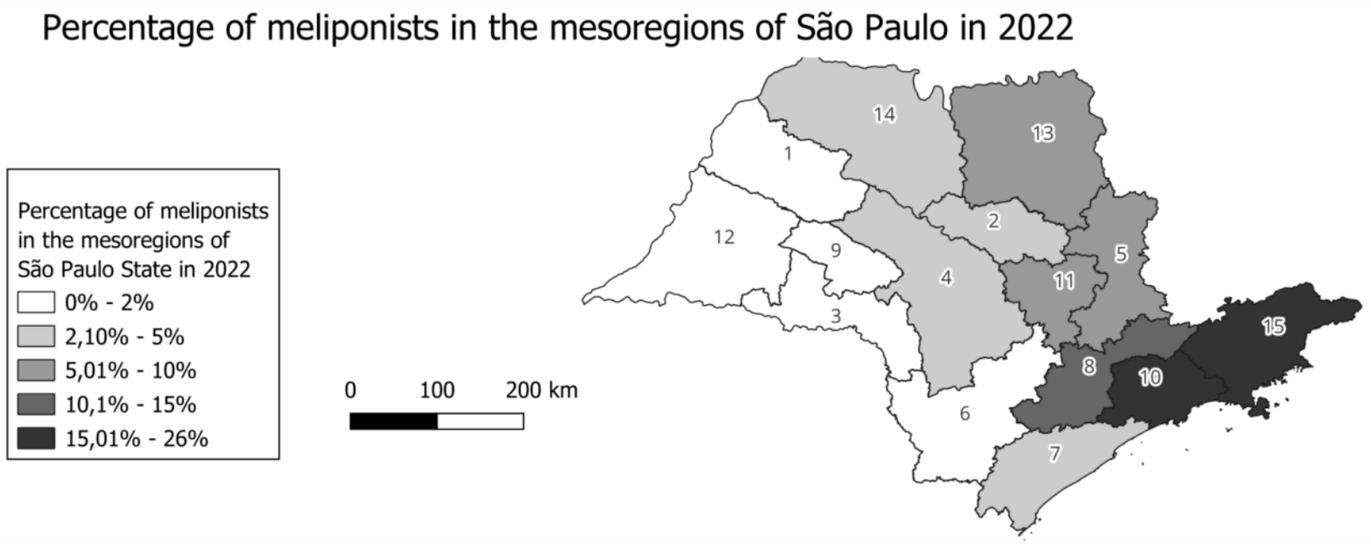


Photo: Cayo Scot

Growing Female Participation

Photo: Celso Barbieri

Characteristics of Women in Meliponiculture

- Almost 10% growth in 6 years
- 49% have up to 1 year of experience
- Only 7% have more than 6 years of practice
- Associated with supervised learning

The growth in female participation indicates potential for economic autonomy and expansion of the activity, especially in family farming contexts.

Photo: Andre Matos

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Species Composition: Shifting Preferences

1

Tetragonisca angustula

Remains the most commonly kept species, valued for its adaptability to urban environments and consistent honey production characteristics.

2

Melipona quadrifasciata

Experienced significant increase in adoption, reflecting growing appreciation for this robust species' management characteristics and honey quality.

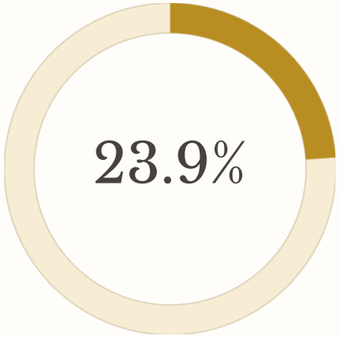
3

Melipona mondury

Dramatic growth from approximately 1.4% to 10.7% of operations, indicating rapid adoption of this specialized species among experienced practitioners.

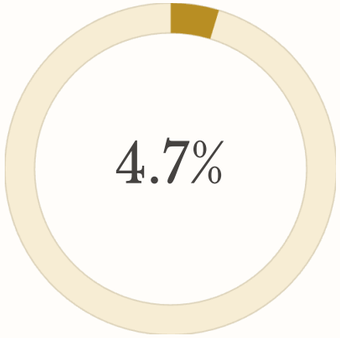
These compositional shifts reflect both evolving market preferences and increased technical knowledge among meliponiculturists, enabling management of more demanding but potentially rewarding species.

Positive Environmental Trends



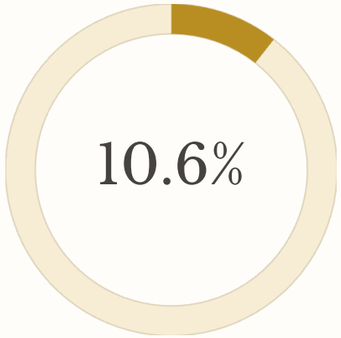
2016 Non-Endemic

Percentage keeping non-native species



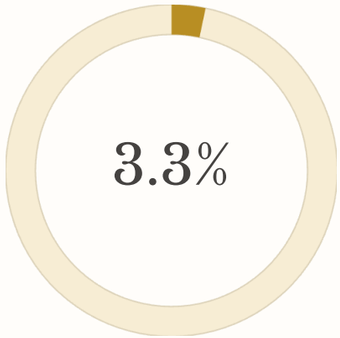
2016 Illegal Removal

Nest removal from natural environments



2022 Non-Endemic

Significant reduction in non-native species management



2022 Illegal Removal

Further decline in extractive practices

The data reveals encouraging sustainability trends: non-endemic species keeping dropped by more than half (23.9% to 10.6%), illegal nest removal became increasingly rare (4.7% to 3.3%), and co-keeping with *Apis mellifera* slightly decreased (16.9% to 14%). These changes suggest growing environmental awareness and improved regulatory compliance.

Learning Methods

Supervised Learning

Grew significantly, reaching 70.3% in 2022. Includes training courses, guidance from other breeders, and formal education.

Associated with more sustainable and structured practices.

Self-Taught Learning

Remained stable at 71.2%. Includes learning via the internet and individual practice.

More common among urban practitioners focused on the hobby.

Motivations for Meliponiculture

Environmental Education And Conservation

90.3% of participants in 2022 (increase of 4%)

Hobby

76.4% practice as a recreational activity (4% growth)

Commercialization

22.1% with commercial focus (6% growth)

Environmental conservation and education remain predominant motivations, even with commercial expansion.

Photo: Maria Cecília S. Ortiz

Photo: Aline Negromonte

Operational Scale Expansion
Scale Is Up

Total Colony Growth

5,185 colonies (2016) expanded to **7,419 colonies (2022)**

Representing a 43% increase in total managed stingless bee colonies across São Paulo state during the six-year study period.

Individual Scale

Mean colonies per meliponist: 20 → 30

A 50% increase in average colony ownership per practitioner, indicating both individual capacity growth and operational sophistication.

Large-Scale Operations

Keepers with >100 colonies doubled to 14

Commercial-scale operations are emerging, with the largest operations managing several hundred colonies each.

More profit

Increase of the number of meliponists reporting profit

A larger number of individuals reporting that stopped losing money or started getting profit from the activity.

Predictors of Profitability: A Fundamental Shift

2016 Profit Model

Profitability was primarily linked to **apiculture experience** with *Apis mellifera* (Africanized honeybees), suggesting that traditional beekeeping skills provided the foundation for economic success.

2022 Profit Model

Profitability became associated with **colony abundance, species richness, multiplication techniques, and rescue operations** - indicating a shift toward sophisticated native bee management.

Professionalization occurs without compromising ecological principles, suggesting a hybrid model that combines technical sophistication with sustainable commitment.

Photo: Celso Barbieri

Conclusions

Meliponiculture in São Paulo between 2016 and 2022 reveals a sector in transformation, characterized by the growth of the activity and a strong professionalization.

Sustainable Expansion

Growth aligned with conservation objectives

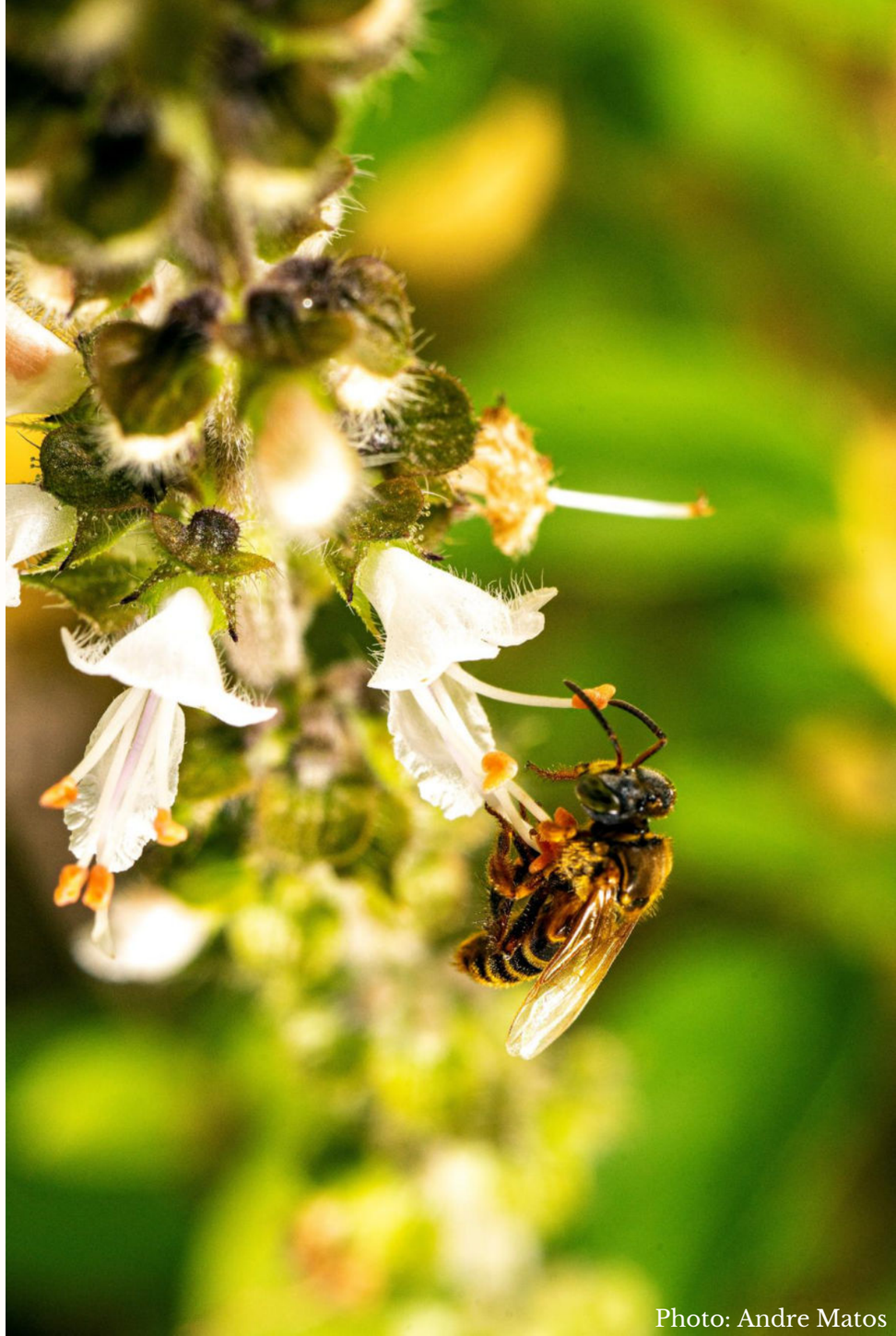
Diversity of Profiles

From urban hobbyist to professional producer

Transformative Potential

Environmentally, socially, and economically relevant activity

The results highlight the importance of Academia, Civil Society and Public Policies working together to promote technical growth without compromising the ecological principles of meliponiculture and a sustainable development of the activity.



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Article

Temporal changes towards a more sustainable meliponiculture in Brazil. A case study.

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Acknowledgments & Contacts

Gratitude

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