

OP-277 [Pollination and Bee Flora]

Enhancing agricultural productivity through applied pollination: a large-scale study in tropical crops

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Pollination is a fundamental ecosystem service that underpins global food production and biodiversity. More than 75% of the world's major crops depend, at least partially, on pollinators, yet their populations are declining due to habitat loss, pesticide exposure, and climate change. This decline poses a direct threat to agricultural productivity, making pollination management a key strategy for sustainable food systems. Despite this urgency, Applied Pollination (AP) remains underutilized in large-scale tropical agriculture. This study evaluates the impact of AP on three major tropical crops, Arabica coffee (*Coffea arabica*), soybean (*Glycine max*), and orange (*Citrus sinensis*), through an extensive and multi-season field experiment. Between 2018/19 and 2023/24, we conducted 149 experimental trials across major Brazilian agricultural regions, introducing managed honeybee (*Apis mellifera*) colonies into selected field plots during flowering, while control plots remained unmanaged. Productivity was assessed based on fruit set, revealing significant yield increases, 20.1% in Arabica coffee ($n = 121$; $t = 8.56$, $df = 120$, $p < 0.001$), 13.0% in soybean ($n = 23$; $t = 5.05$, $df = 22$, $p < 0.001$), and 28.2% in orange ($n = 5$; $t = 3.72$, $df = 4$, $p < 0.05$). The economic impact of AP is substantial, with a projected annual revenue increase of US\$ 12 billion for the Brazilian agribusiness sector. Additionally, this study highlights the synergy between AP and biological pest control, demonstrating that integrating pollinator-friendly practices can enhance productivity while reducing reliance on chemical pesticides. These findings provide strong evidence supporting the widespread adoption of AP as a sustainable, high-impact agricultural practice. Expanding AP in tropical crops could play a crucial role in mitigating pollinator decline, promoting biodiversity, and ensuring food security for a growing global population.



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C O P E N H A G E N

Enhancing Agricultural Productivity through Applied Pollination: A Large-Scale Study in Tropical Crops



Daniel Malusá Gonçalves

AgroBee Pollination and Sustainability Solutions

AgroBee – Assisted and Intelligence Pollination

First integrated pollination service network with national coverage in Brazil



More than 8,000 hectares served of coffee, orange, canola, soybeans

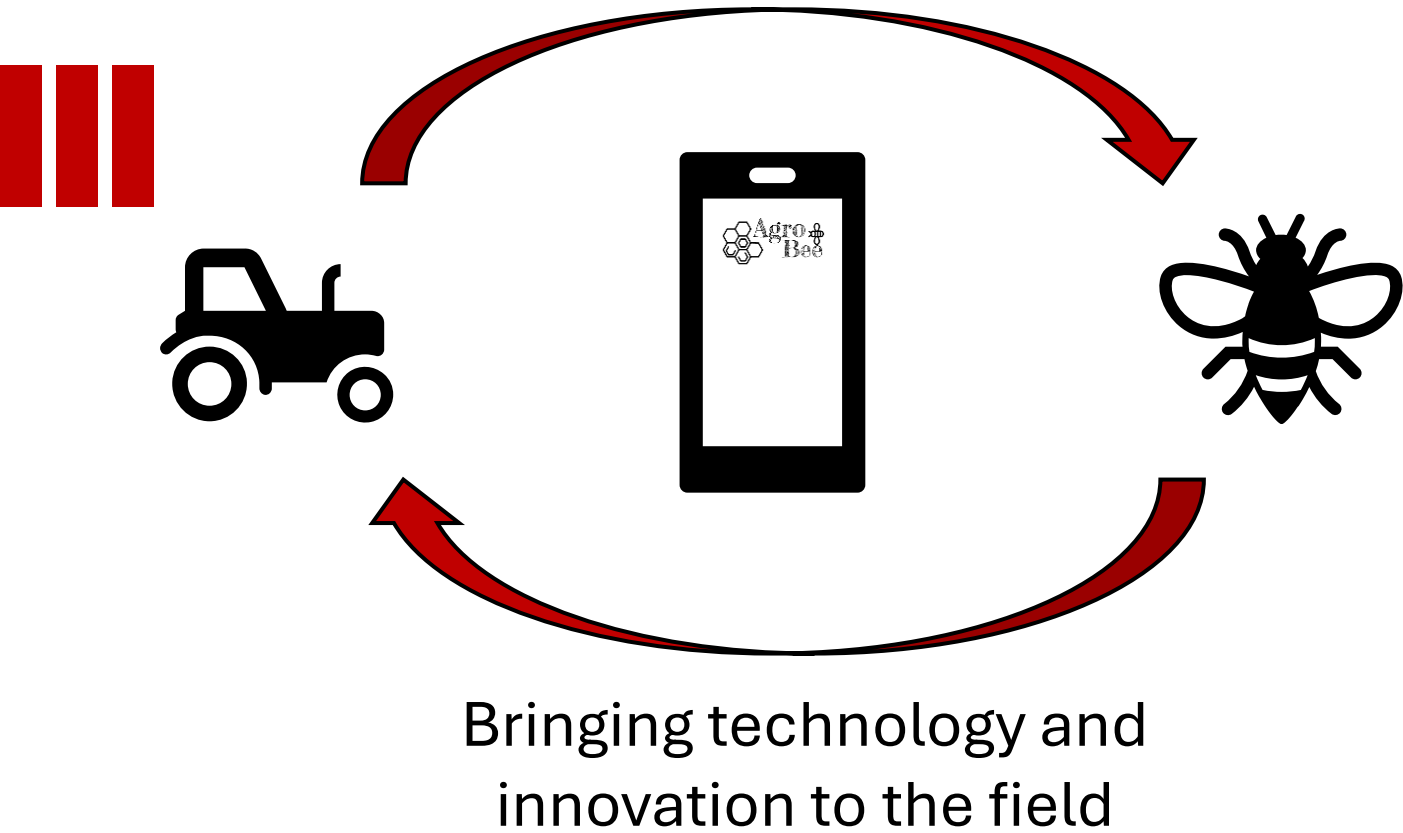


Objective: to feed the world sustainably, harmonizing and enhancing the relationship between pollinators and the agricultural production chain



AgroBee – Assisted and Intelligence Pollination

Connecting farmers
with beekeepers



AgroBee – Assisted and Intelligence Pollination

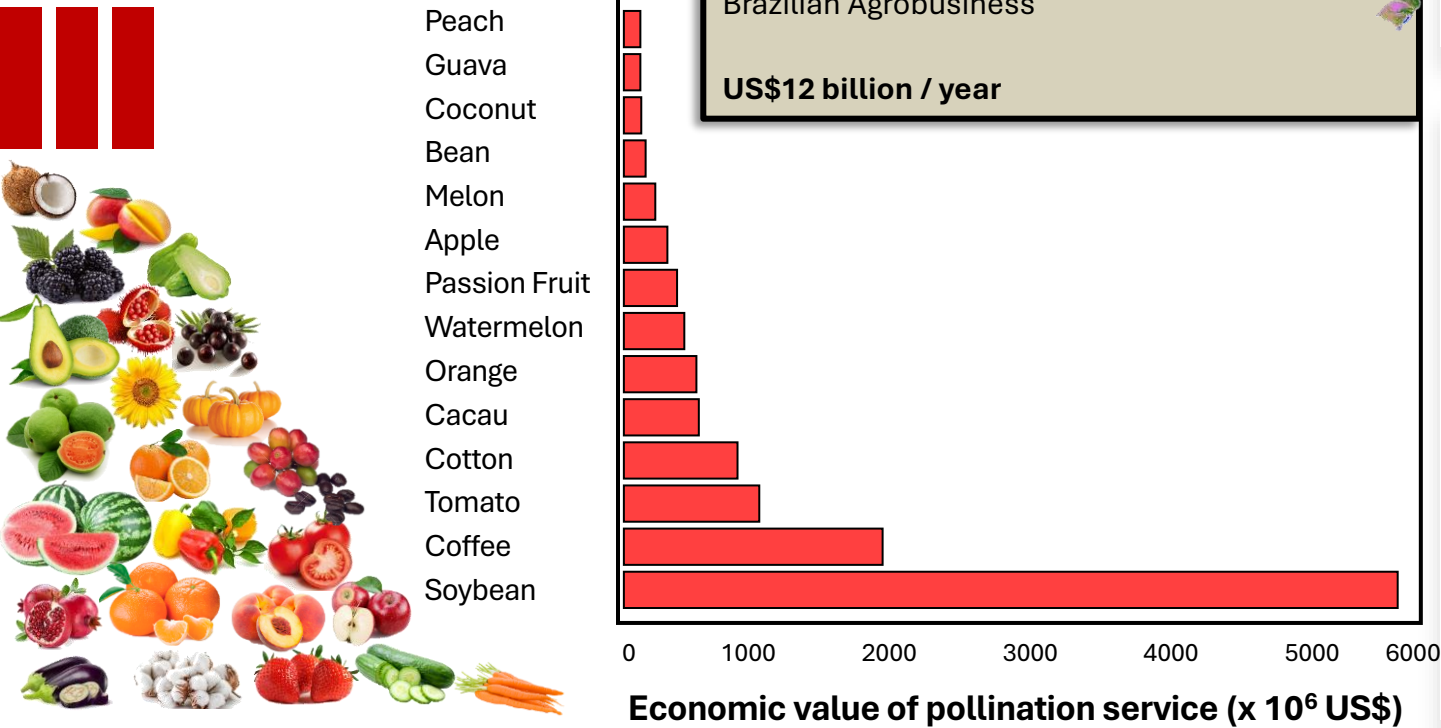
AgroBee Pollination Operation

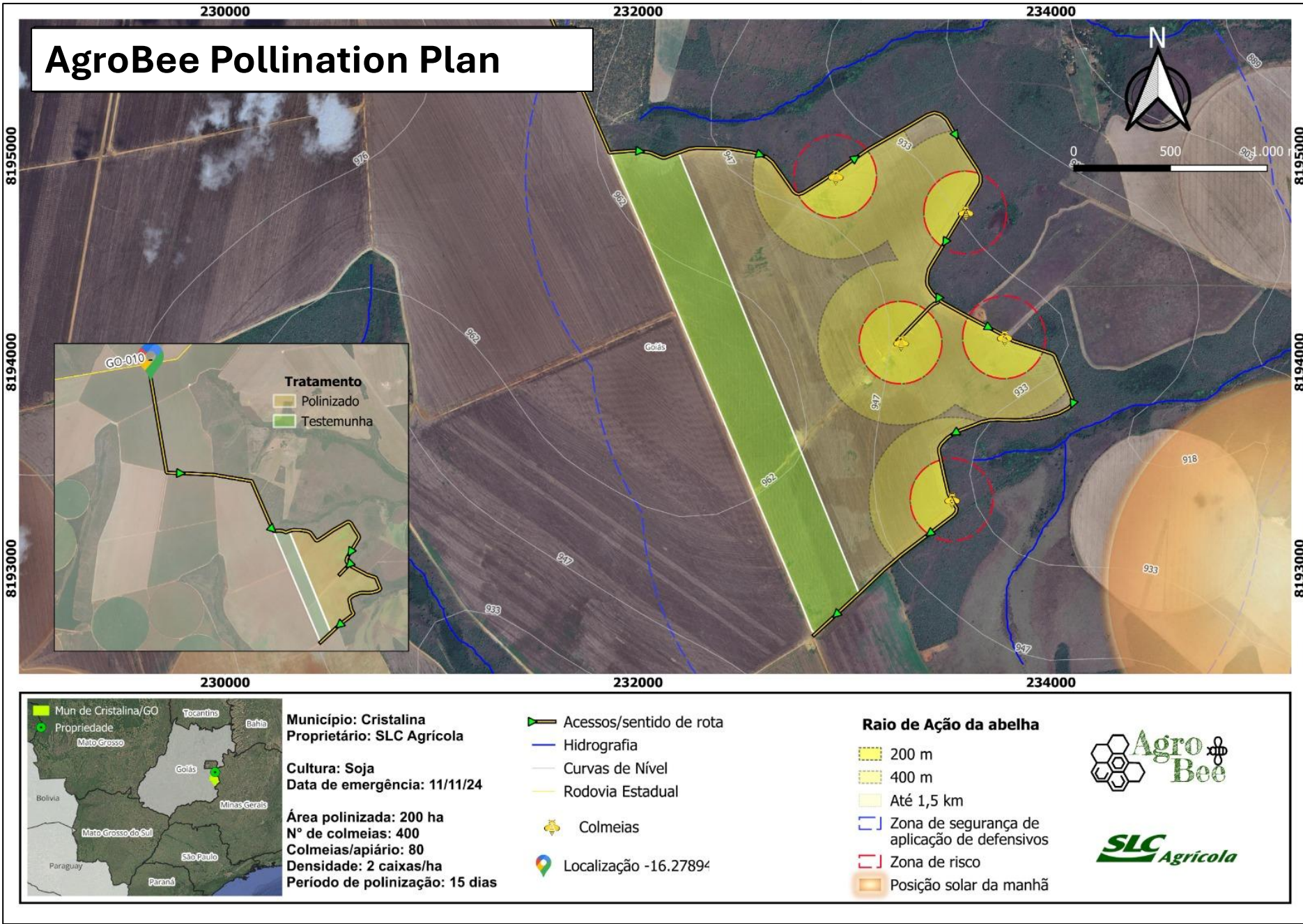


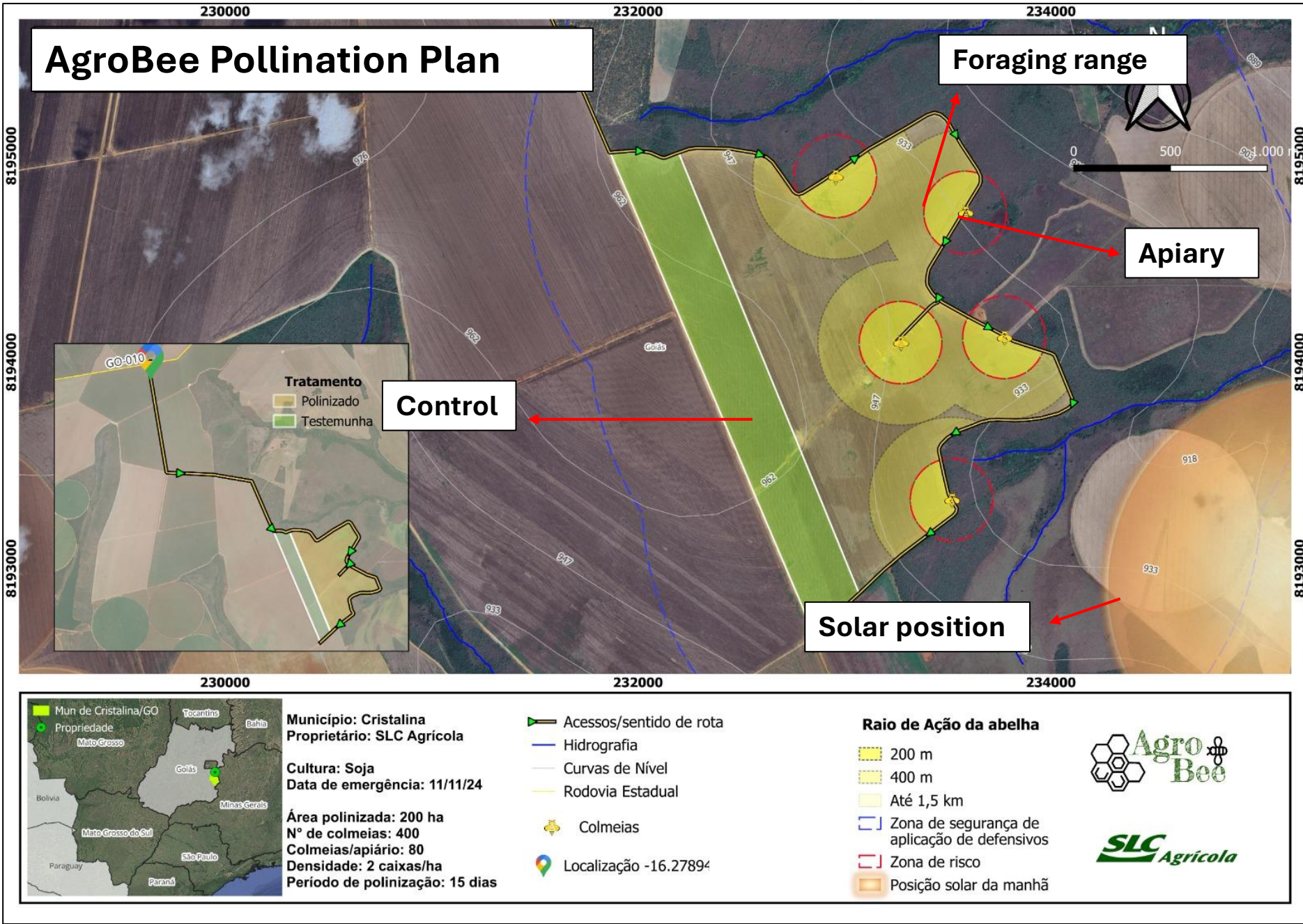
Pollination As A Service

Brazil

91/141 (64%) Brazilian crops depend on **bee pollination** to produce fruits and seeds







Pollination As A Service



Travel Screens



Safe Transportation

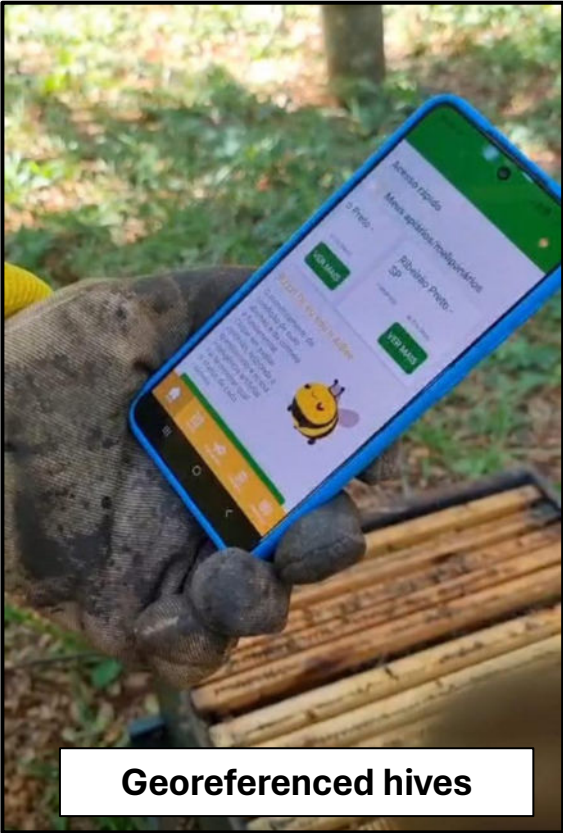


Safety Signage

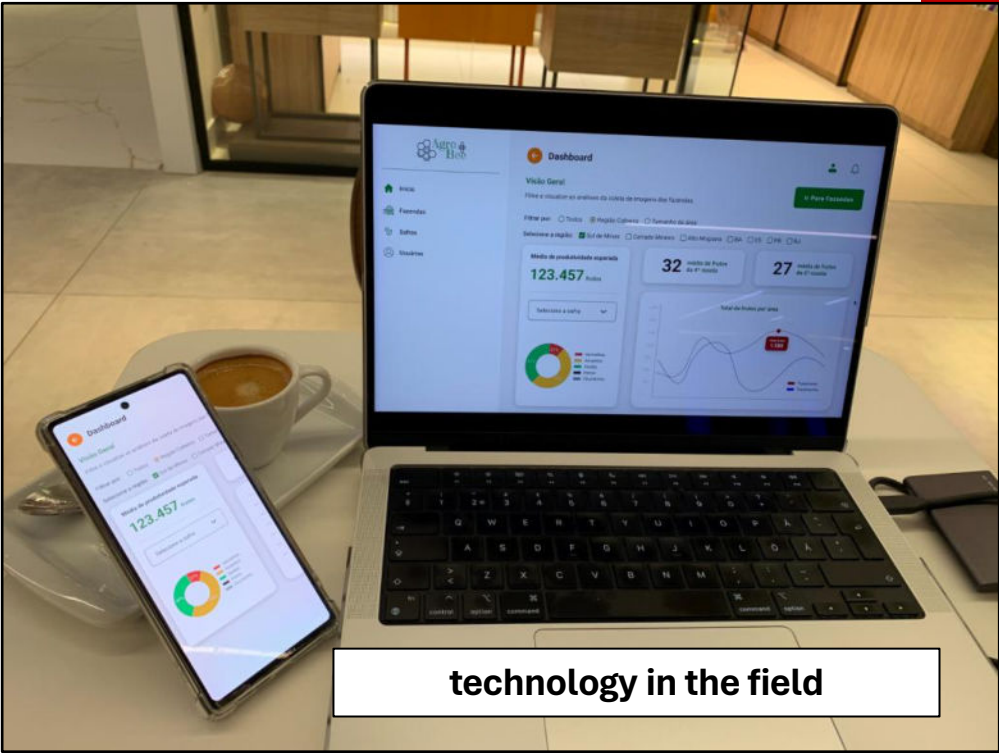
Pollination As A Service



Field Technical Assistance



Georeferenced hives



technology in the field

Objective from the Proposed study

- Large-scale studies on tropical crops
 - Arabica Coffee: + 1,500 hectares
 - Soybean: +2.000 hectares
 - Orange: +1,500 hectares
- Period: 2018 to 2024
- Pollinators: +15,500 Honeybee hives and + 3,000 stingless bee colonies



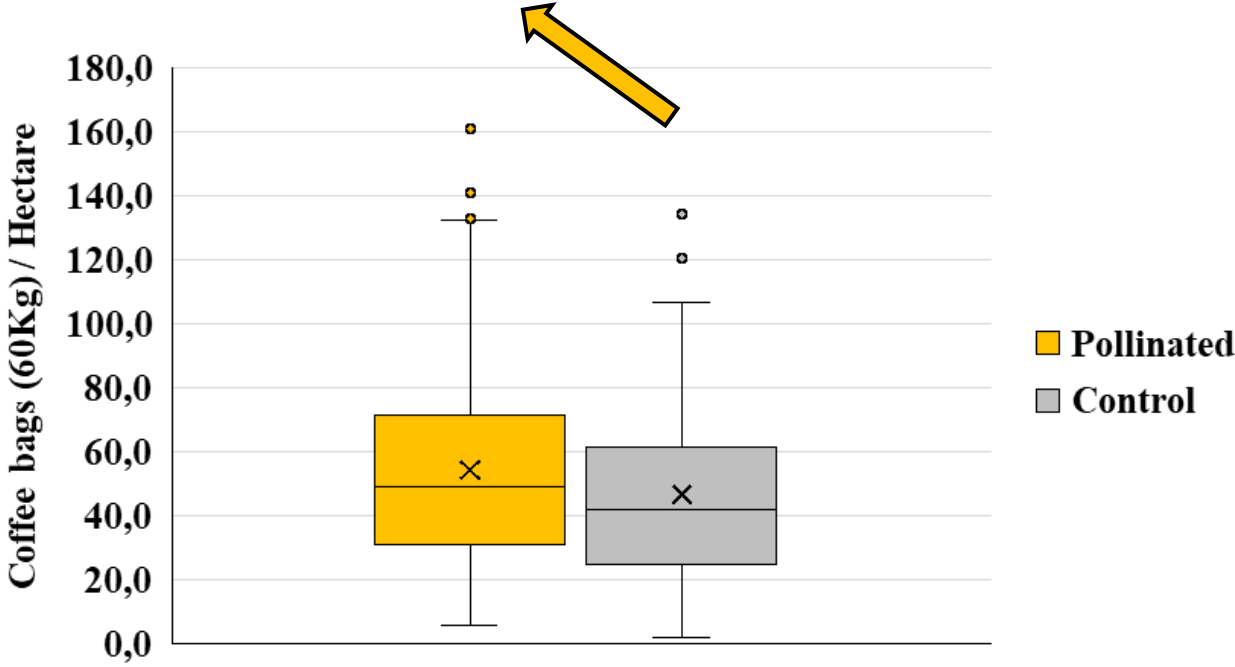
Arabica Coffee

- 1.8 million hectares in production in Brazil
- 34 million bags (60 kg) exported in 2024
- Perennial and autogamous plant
- Pollination application: 12 days



Arabica Coffee

+ 20.1% in coffee yield
+ 7.8 bags 60 Kg / hectare



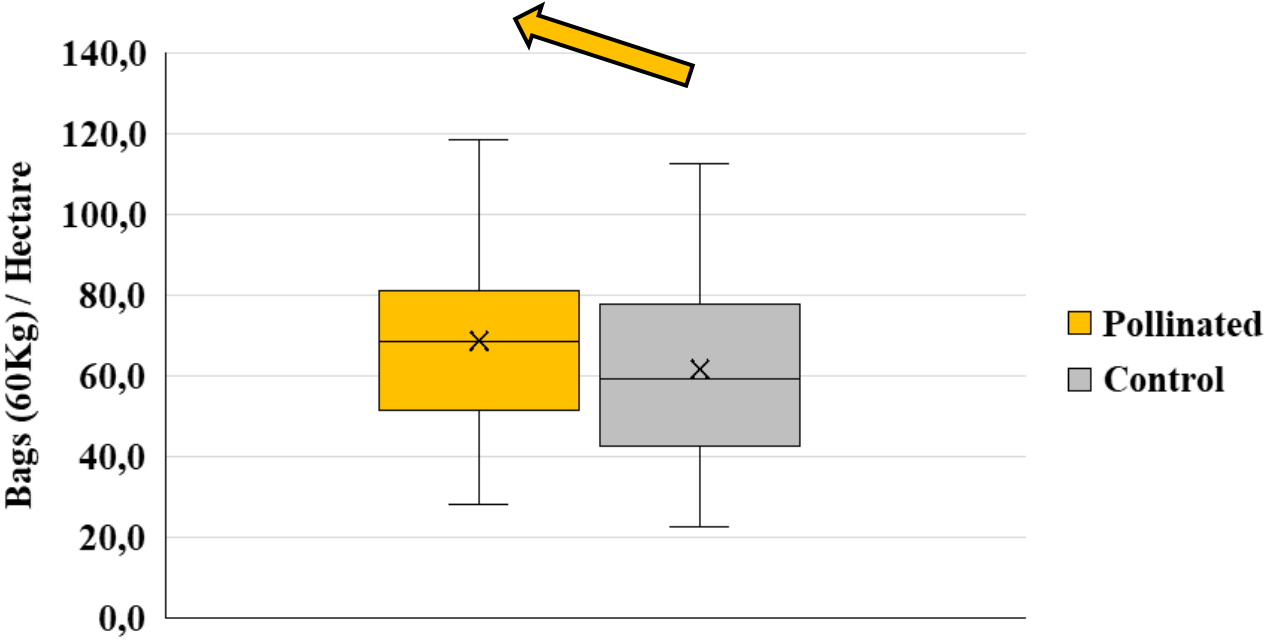
Soybean

- 47.5 million hectares in production in Brazil
- 167.4 million tons produced in 2024/25
- Cycle of approximately 120 days
- Pollination application: 12 days



Soybean

+ 13.0% in soybean yield
+ 7.2 bags 60Kg / hectare



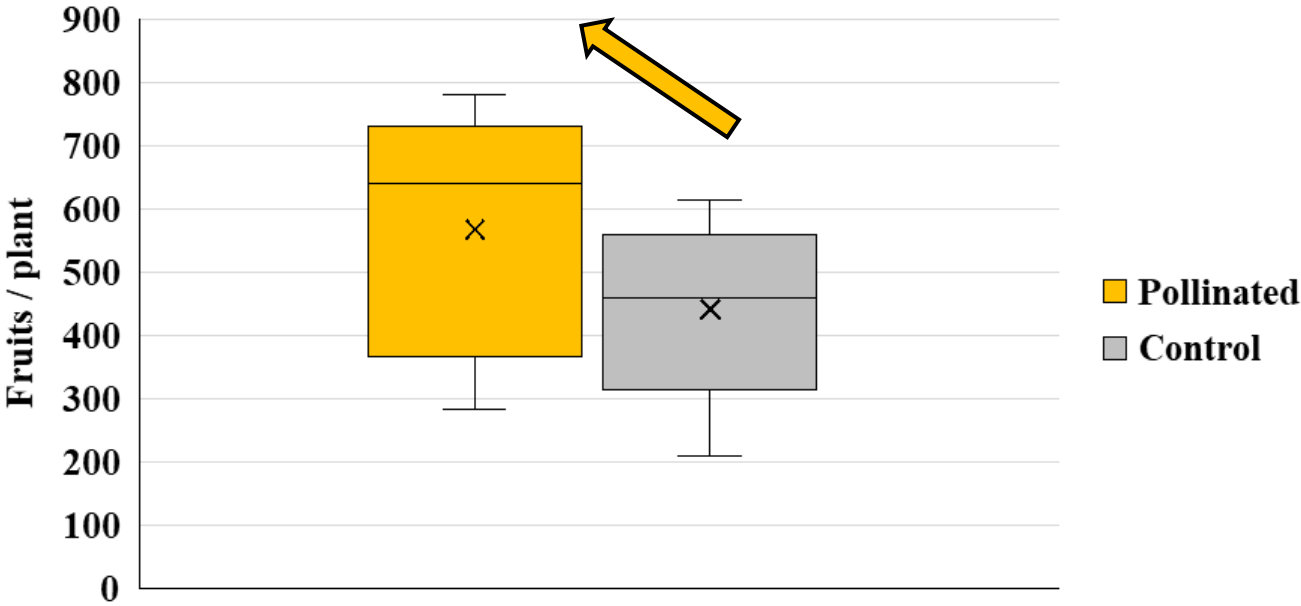
Orange

- 570,000 hectares in production in Brazil
- 15.3 million tons produced in 2024
- Perennial plant susceptible to pests and diseases (e.g. greening disease)
- Pollination application: 20 days



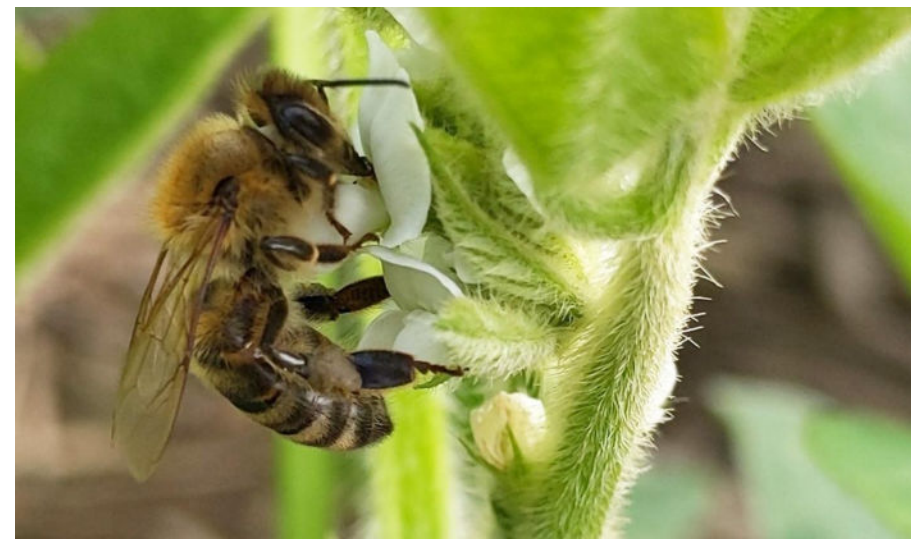
Orange

+ 28.2% in orange yield
+ 194.7 boxes 40.8 Kg / hectare



Conclusions

- These results represents one of the **largest commercial pollination studies** ever conducted for these crops
- Demonstrated economic potential: **+US\$ 12 billion** annual revenue for Brazilian agribusiness
- Clear evidence that Applied Pollination drives both **financial resilience and environmental sustainability in agriculture**





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