



The Brazilian Program for Bio-inputs

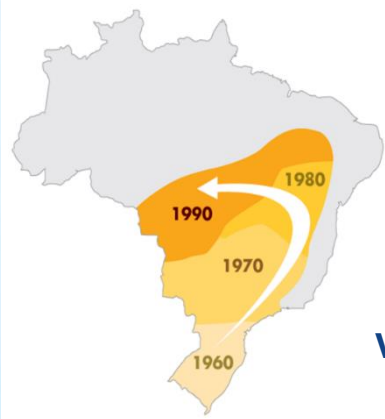
enhancing biological inputs for a sustainable agriculture

Marcelo A. B. Morandi
Embrapa Environment



Trajectory of Brazilian Agriculture

EXPANSION



COMPETITIVENESS



"Tropicalization" of varieties and animals

Transformation of acidic and poor soils into fertile soil

SUSTAINABILITY



Development of a Sustainable Production Platform

<p>NO-TILLAGE SYSTEM</p>	<p>INTEGRATED CROP-LIVESTOCK-FOREST SYSTEMS (ICLF)</p>	<p>BIOLOGICAL N FIXATION</p>
<p>MANURE TREATMENT</p>	<p>PASTURE RECOVERY</p>	<p>PLANTED FORESTS</p>

2030...

MULTIFUNCTIONALITY



Agriculture...

- ...Food – Fibers – Energy...
- ...Feed – Nutrition – Health...
- ...Environmental Services – Ecosystem Services...
- ...Biomass – Biomaterials – Green Chemistry...
- ...Biofactories – New Manufacturing Processes...
- ...Microbiome – Bioinputs – Bioprocesses...
- ...Culture – Tradition – Gastronomy – Tourism...

Science-based development





2010-2020



2020-2030

PLAN FOR ADAPTATION AND LOW CARBON EMISSION IN AGRICULTURE

Strategic vision for a new cycle

NO-TILLAGE SYSTEM



INTEGRATED CROP-LIVESTOCK-FOREST SYSTEMS (ICLF)



MANURE TREATMENT



PASTURE RECOVERY



BIOLOGICAL N FIXATION



PLANTED FORESTS



Plan for Adaptation and Low Carbon Emission in Agriculture



INTEGRATED STRATEGIES FOR PROPERTY RURAL MANAGEMENT

Keep motivation for adoption and maintenance of SPSabc

Encourage farm environmental compliance

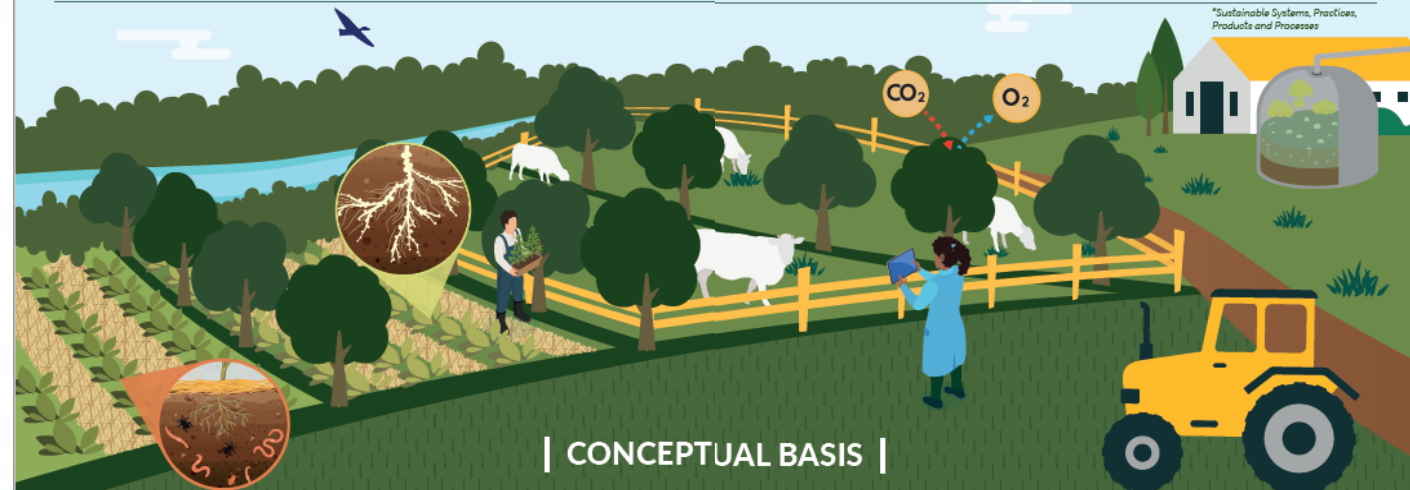
Transfer of technologies, training, and technical assistance

Encourage and support scientific research and technological development

Strengthen mechanisms of recognition and appreciation

Foster economic, financial and tax-related instruments

Integrated data and information management system



CONCEPTUAL BASIS

INTEGRATED LANDSCAPE APPROACH (ILA)

FOSTER ADOPTION AND MAINTENANCE OF SUSTAINABLE SYSTEMS, PRACTICES, PRODUCTS AND PROCESSES

COMBINATION OF ADAPTATION AND MITIGATION STRATEGIES

Designed by @freemak



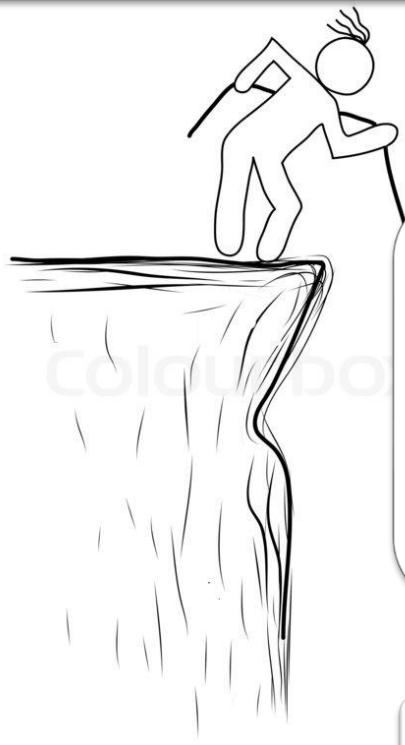


In this context, the **Brazilian National Program for Bio-inputs** aims to expand and strengthen the use of bio-inputs to promote the sustainable development of Brazilian agriculture

Decree No. 10,375, of May 26, 2020

Some background

Over the past decades, the Brazilian academy (*including research institutions and universities*) has generated significant basic knowledge on biological pest control.



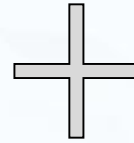
But, due to the detachment between academy and the incipient private sector on biological control at that time; and due to the low capacity of the academy to practice the "D" of the Research & Development framework

Few technological solutions on biological control were developed in Brazil until the 2000s

Some background

2006/2007... 2011... 2015

Improvement on legislation for BCAs registration



The creation of the Brazilian Association of Biological Control of Companies (ABCBio) in 2007



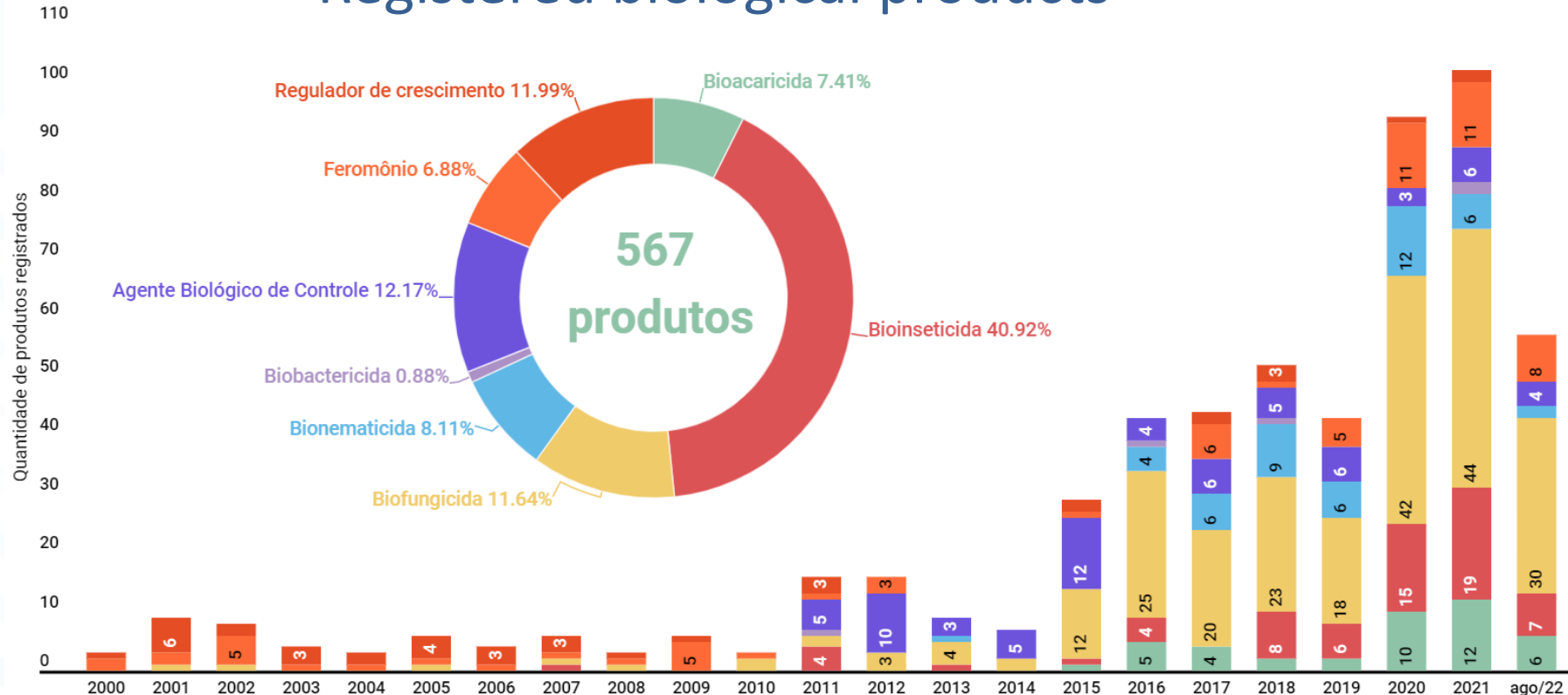
Very positive impacts:

due ABCBio work with the federal agencies, bottlenecks related to the slow registration of biological products were solved (or partially minimized)

and provide greater synergy between private companies and public R&D institutions in the generation of technological solutions

Main milestones

Registered biological products



1980
← academy development

← pioneer entrepreneurs

INC*

← ABCBio

← Business maturation

← business boom



Brazilian Program for Bio-inputs

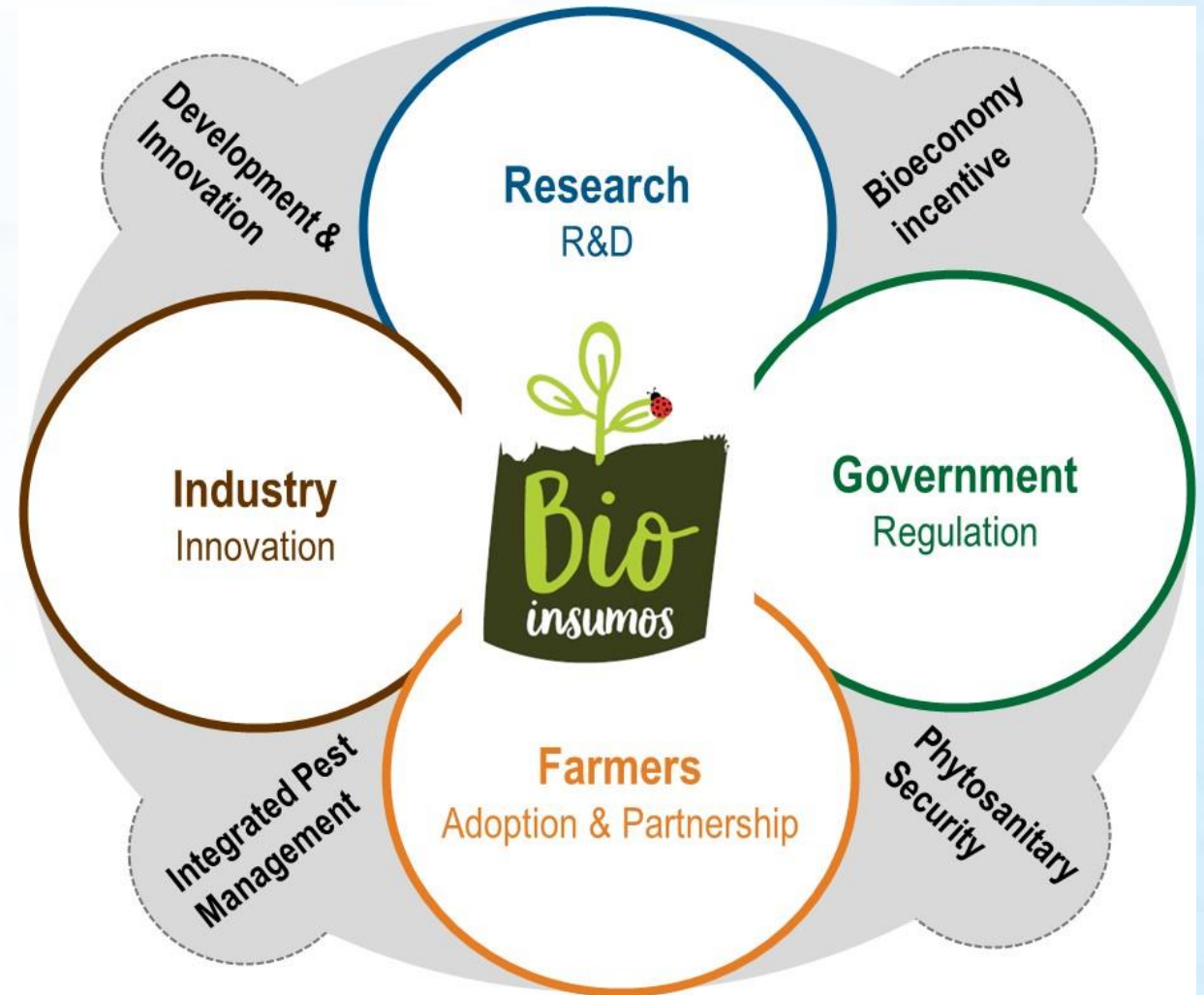
Induction for the transition from chemistry to biology

* Joint normative instructions (Agriculture, Environment and Health authorities)

Brazilian National Program for Bio-inputs

Strategic objectives

- ✓ Propose a **regulatory framework** that encourages the production and use of bioinputs;
- ✓ Foster **science, technology and innovation** to offer new technologies, products, processes, services, knowledge and information;
- ✓ Articulate **credit and promotion instruments** aimed at the development, production and use of bioinputs;
- ✓ Stimulate the generation and dissemination of knowledge and qualified information on the use of bioinputs, in order to stimulate the training and formation of **technical competence** in good practices for the use and application of bioinputs;
- ✓ Foster the **production of bio-inputs** in the country;
- ✓ Promote the **construction of policies, programs and plans in States and Municipalities** aimed at promoting the use of bioinputs.



Brazilian National Program for Bio-inputs



Thematic axes

Crop production

Biological control of Pest and diseases

Fertilizer and growth promotion

Weed control

Animal production

Animal Health

Animal Feed & nutrition

Aqua-culture

Parasites control

Post harvest

post-harvest of plant products

processing animal and plant products

Use of biological control in Brazil - estimated area



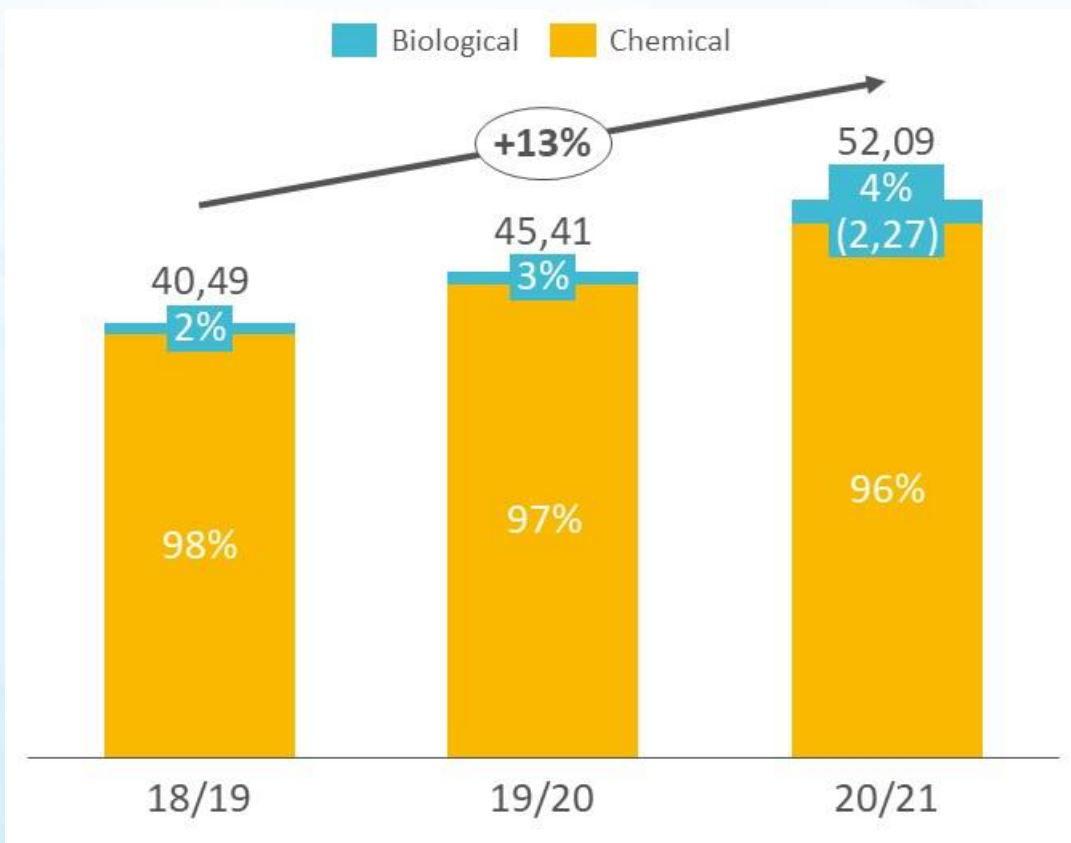
In 2017, in an initial approximation, the total area under biocontrol of pests and plant diseases in Brazil was greater than 33 million ha.

A data update shows that the area treated was more than 50,000,000 ha in 2020.

Market Sizing in Brazil Biodefensives x Chemicals



Bi R\$ - Farm Gate Price



Key factors for market growth

- ✓ Strong growth in consumer market demand for biological products for pest control and inoculants, due to the challenge of large-scale agricultural production under tropical conditions
- ✓ Emergence of companies investing in biodefensives in their portfolio as business diversification, search for competitiveness.
- ✓ Requirement (market and government) for a transition to more sustainable agriculture, promoting investment in new technologies with a focus on bioeconomy

*Crops considered: Soybean, Sugarcane, Corn, Cotton, Eucalyptus, HF (apple, grape, potato and tomato).

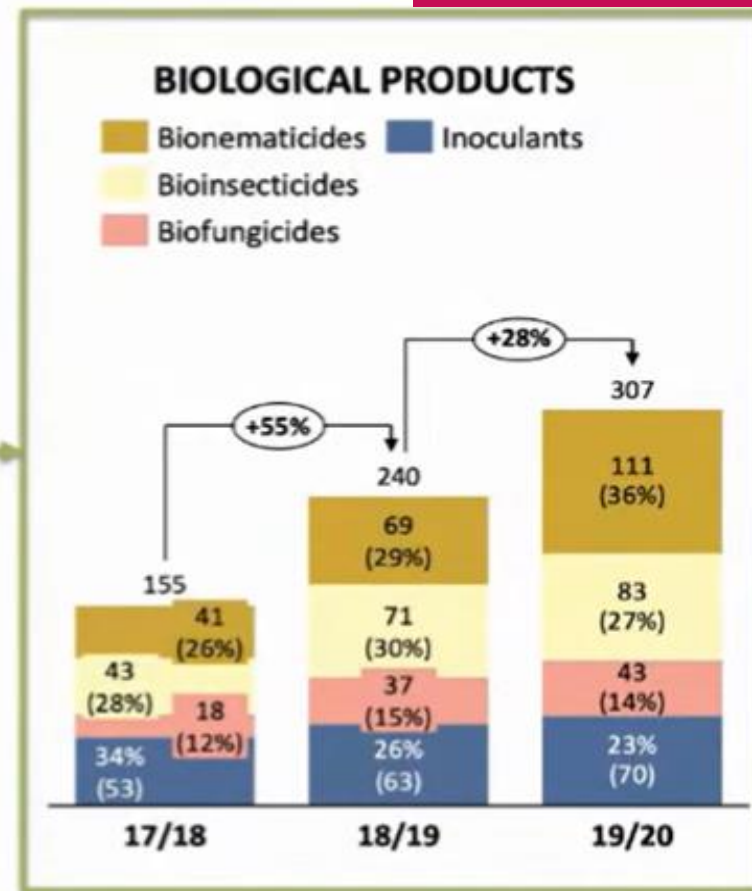
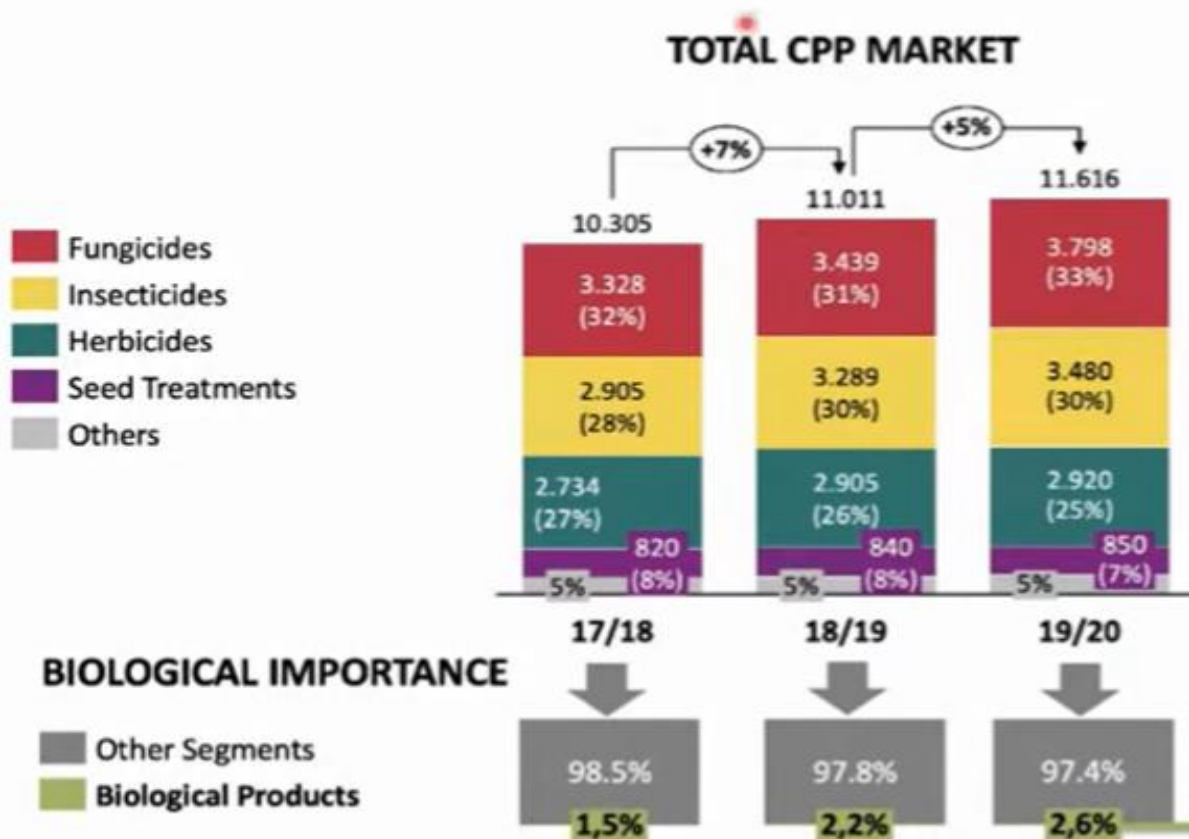
Market Sizing in Brazil



MARKET EVOLUTION – TOTAL CROP PROTECTION vs. BIOLOGICAL PRODUCTS

TOTAL CPP

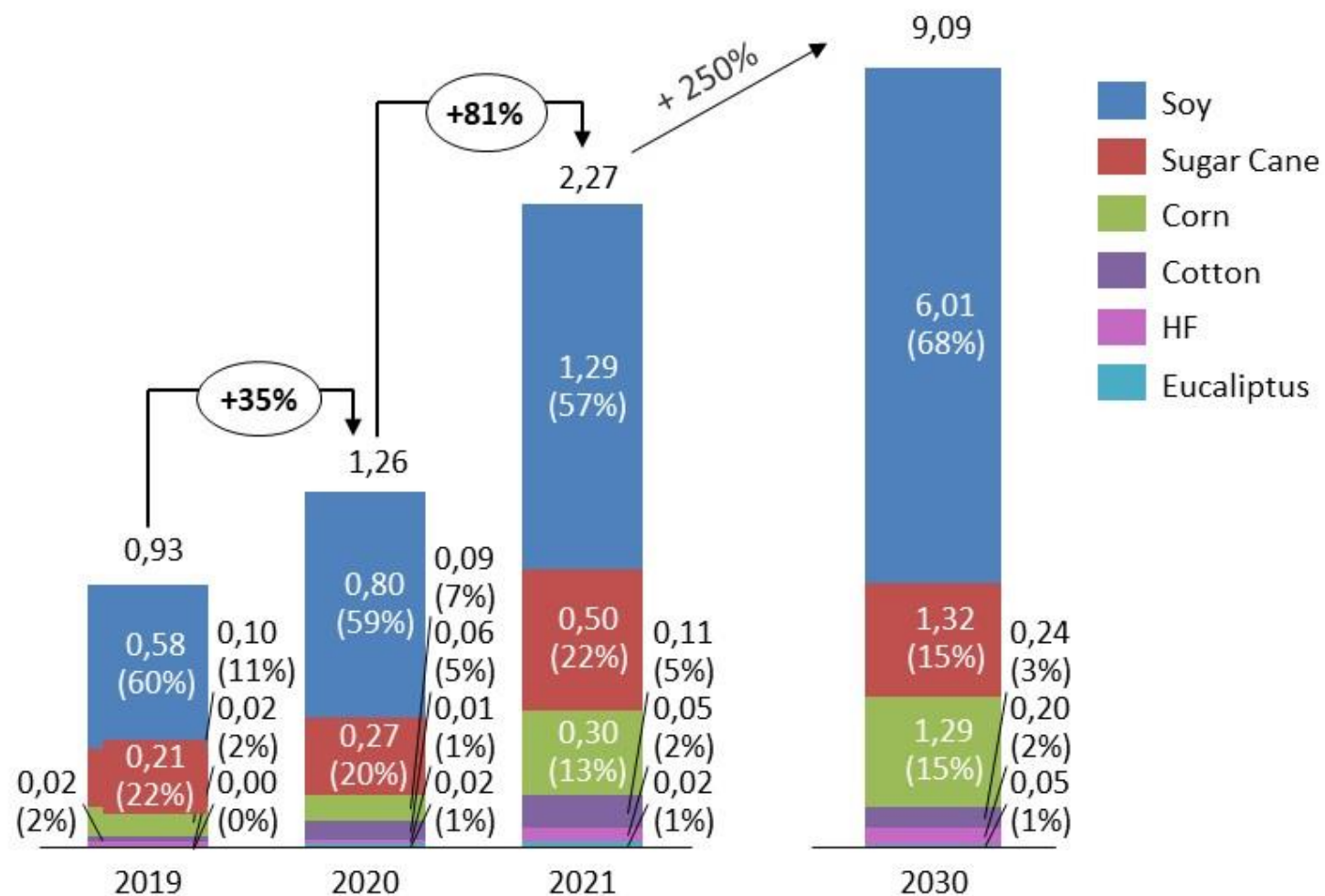
Indications in %. Basis in Turnover (USD mi).



Market Sizing in Brazil Biodefensives by crop

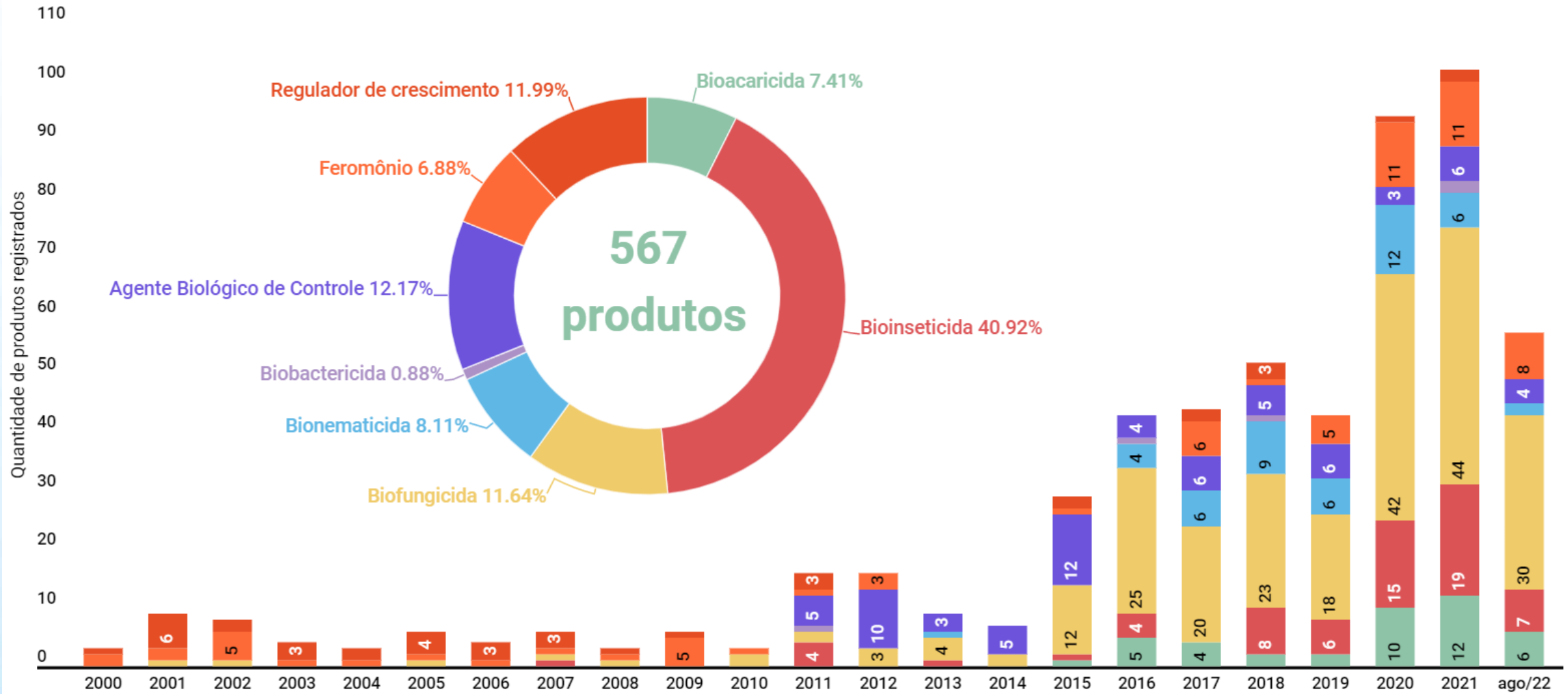


Biodefensives Market Value | Bi R\$ - Farm Gate Price



Source: Blink Projetos Estratégicos

Registered biological products



Bioproducts available by active ingredient

PRODUTOS DISPONÍVEIS POR ATIVO BIOLÓGICO



Fonte: Agprofit, 2020



AGENTES BIOLÓGICOS REGISTRADOS NO BRASIL

Vírus

- Baculovirus Anticarsia gemmatalis multiple nucleopolyhedrovirus*
- Baculovirus Autographa californica nuclear polyhedrosis*
- Baculovirus Chrysodeixis includens nucleopolyhedrovirus*
- Baculovirus Helicoverpa armigera*
- Baculovirus Helicoverpa armigera nucleopolyhedrovirus*
- Baculovirus Helicoverpa zea single nucleopolyhedrovirus*
- Baculovirus Helicoverpa zea nucleopolyhedrovirus (VPN-HzSNPV)*
- Baculovirus Spodoptera frugiperda*
- Baculovirus Spodoptera frugiperda multiple nucleopolyhedrovirus*
- Chrysodeixis includens multiple nucleopolyhedrovirus*

Ácaros

- Neoseiulus californicus*
- Orius insidiosus*
- Phytoseiulus macropilis*
- Stratiolaelaps scimitus*
- Amblyseius tamatavensis*

Nematóides

- Deladenus siricidicola*
- Heterorhabditis bacteriophora*

Fungos

- Beauveria bassiana*
- Isaria fumosoresea*
- Metarhizium anisopliae*
- Paecilomyces fumosoroseus*
- Paecilomyces lilacinus*
- Pochonia chlamydosporia*
- Trichoderma asperellum*
- Trichoderma harzianum*
- Trichoderma koningiopsis*
- Trichoderma stromaticum*
- Hirsutella thompsonii*

Bactérias

- Bacillus amyloliquefaciens*
- Bacillus firmus*
- Bacillus methylotrophicus*
- Pasteuria nishizawae*
- Bacillus subtilis*
- Bacillus thuringiensis*
- Bacillus licheniformis*
- Bacillus pumulis*

Insetos

- Ceratitis capitata*
- Cotesia flavipes*
- Cryptolaemus montrouzieri*
- Trichogramma galloi*
- Trichogramma pretiosum*
- Trissolcus basalís*
- Telenomus podisi*



Fonte: Ministério da Agricultura, Pecuária e Abastecimento (MAPA); 2019

Of more than 1,137 pests and pathogens registered in Brazil, only 86 have registered biological control (~8%).

no products registered for weed control





Final Remarks

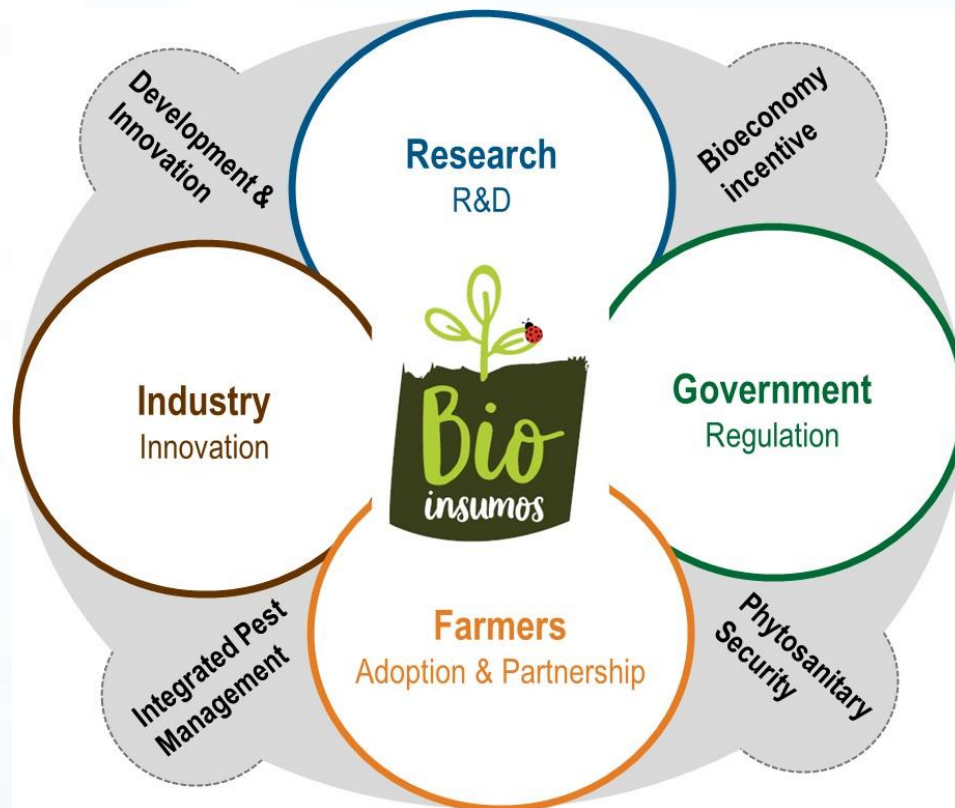
Opportunities and Challenges

- ✓ Brazilian agriculture has been building a **solid trajectory** in the use of bio-inputs (biopesticides and inoculants);
- ✓ The longevity and consistent growth of biocontrol in agriculture depends on the **efficacy, safety** and **environmental performance** of bio-inputs;
- ✓ **Innovation** is a key-factor for bio-input market. A thriving “innovation ecosystem” is developing, with the emergence or strengthening of innovative companies in Brazil;
- ✓ To be effective, the policy must create a **favorable environment** for the promotion of the sector, as well as for technological innovation in bio-inputs;

Final Remarks

Opportunities and Challenges

- ✓ The **Brazilian National Program for Bio-inputs** can promote synergy between private companies and public R&D institutions in the generation of technological solutions to Brazilian farms;



- ✓ **THE BIG CHALLENGE:** construction of a **regulatory framework** that encourages the production and use of bioinputs, induces industry innovation and bring legal certainty for entrepreneurs and investors.

Fossil

route to bioeconomy

Bio





49 years

Thank you

Marcelo A. B. Morandi
Embrapa Environment



Annual Biocontrol Industry Meeting
| 24 - 26 October 2022

