

***Keys to
Commercial
Adoption and
Success of
Biologicals***

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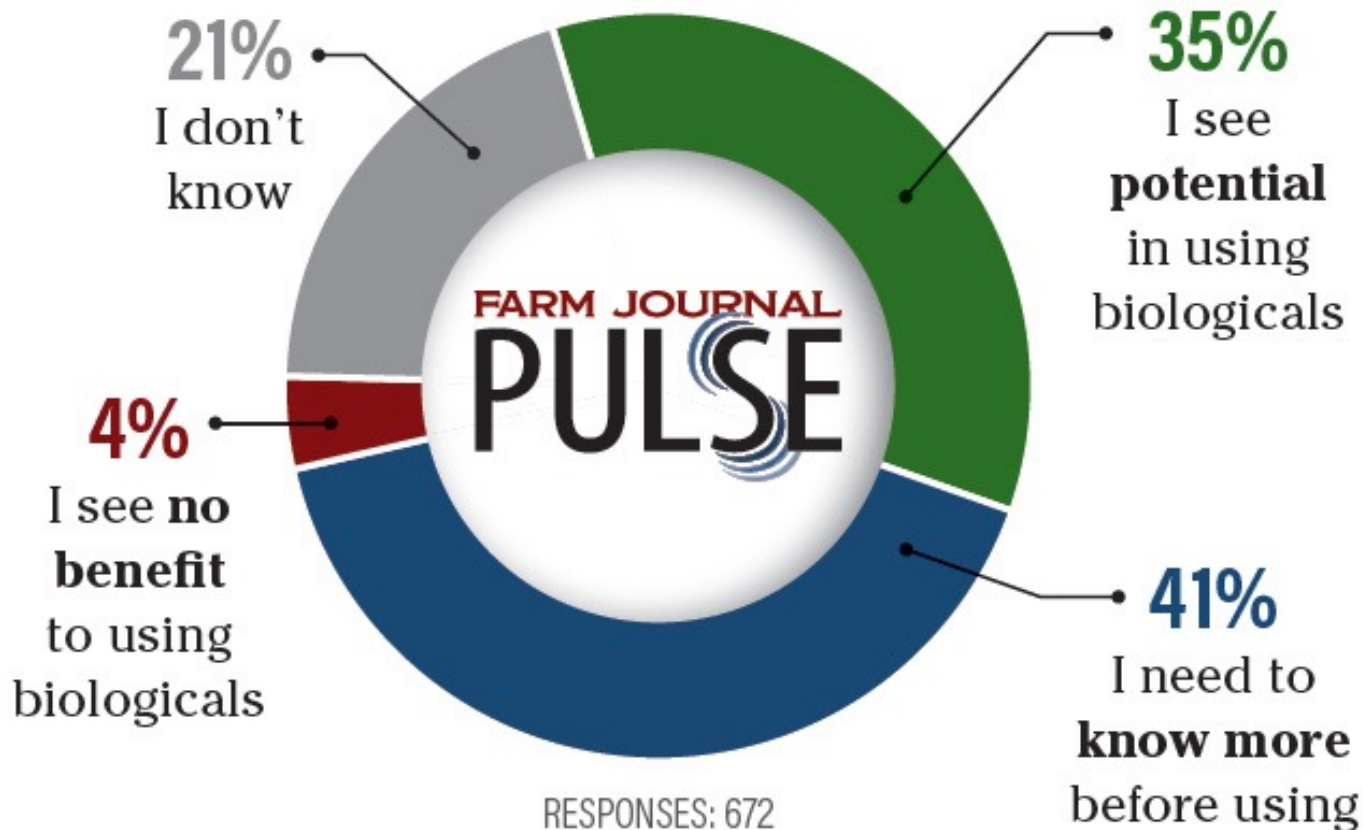
Senior Fellow



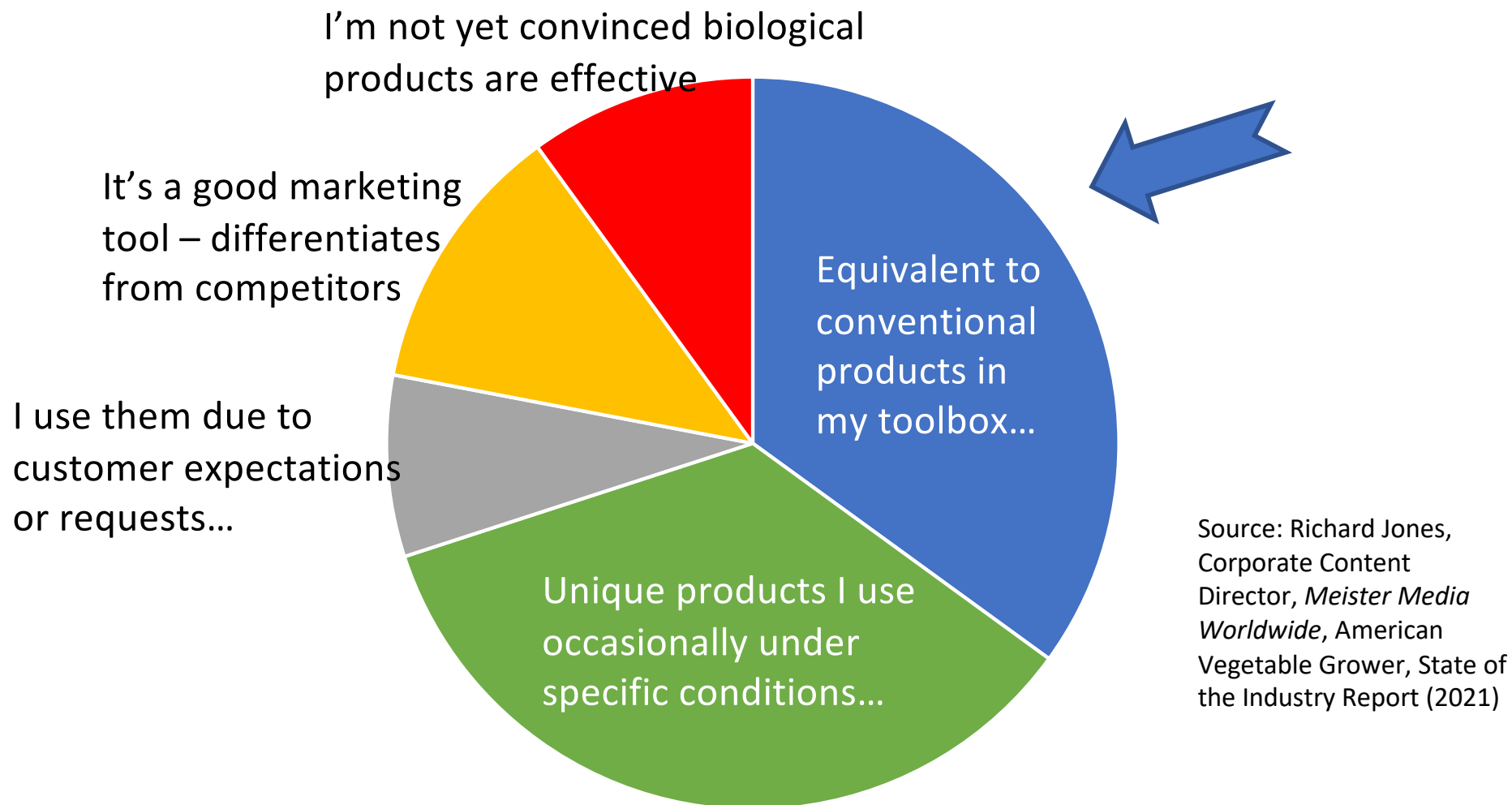
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Farmers Have Low Understanding of Biologicals (2020)

What is your opinion about using biologicals on your farm?



How Do You View Biological Products?



Source: Richard Jones,
Corporate Content
Director, *Meister Media
Worldwide*, American
Vegetable Grower, State of
the Industry Report (2021)

- They're equivalent to conventional products in my crop protection and plant health arsenal
- These are unique products I use occasionally under specific conditions
- I use them due to customer expectations or requests
- It's a good marketing tool - it differentiates from competitors
- I'm not yet convinced biological products are effective

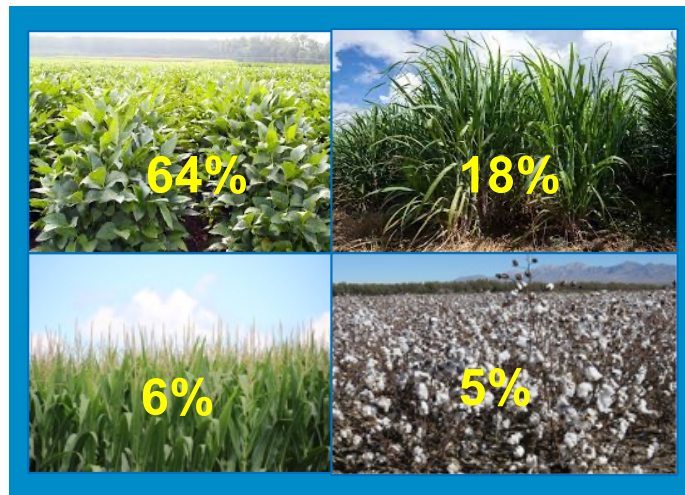
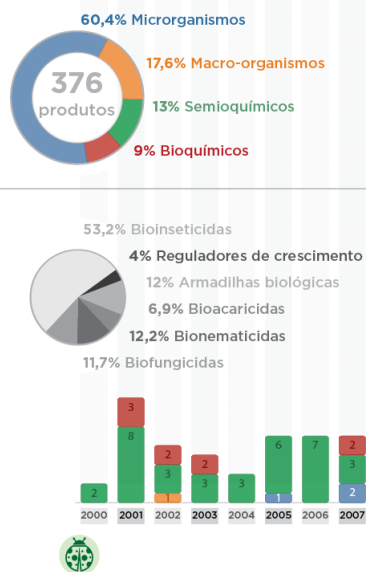
Understand How to Incorporate Biologicals – NOT IF They Work, But HOW to Make Them Work

- **New models for IPM:** More **education & training** needed on how the products work based on their unique modes of action.
Prevention vs. knockdown or curative.
- Make **proficiency in biologicals** part of Cooperative Extension job requirements.
- Add more info on **ecologically based IPM** incl. soil health, beneficials, biocontrol/biopesticides to **PCA/CCA** licensing.
- **Go beyond counting bugs or leafspots.** Because of biologicals unique modes of action, **marketable yields & quality** (incl. **nutrient density**) can be the **same as or better than** chemical programs.
- Trials should be conducted in realistic **integrated programs** rather than just stand-alone comparisons.
- Look at **season long** beneficial **soil & plant health** effects.
- Go beyond small plots and conduct **larger block trials**.

Brazil has Become the Largest Biologicals Market

10.2 million hectares treated

PRODUTOS BIOLÓGICOS REGISTRADOS

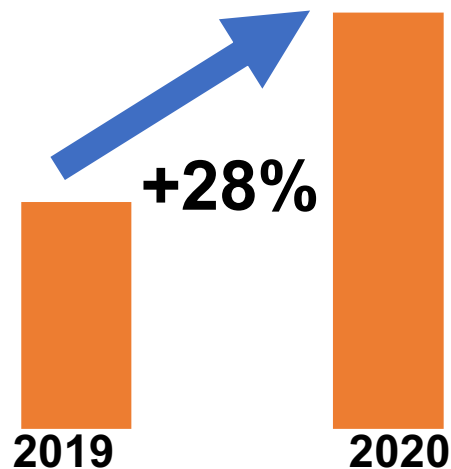


US \$342 million in 2020

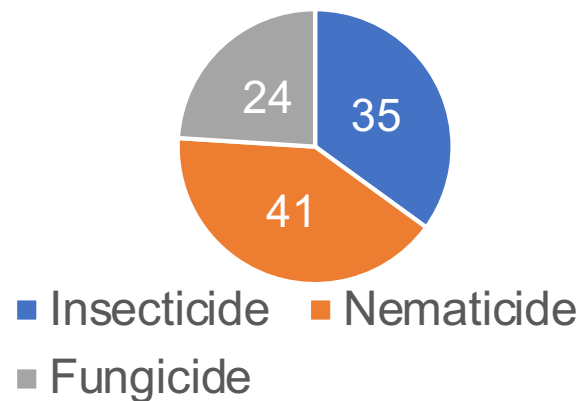


Fonte: Ministério da Agricultura, Pecuária e Abastecimento (MAPA); setembro, 2020

Robust growth possible:
Brazil farmers typically used only one biopesticide



Sales Percent



Develop the Biological Product With Your Grower Customer

Version 1.0 EPA submission, formulation & manufacturing process

Early adopter customers try Version 1.0 generating new sales

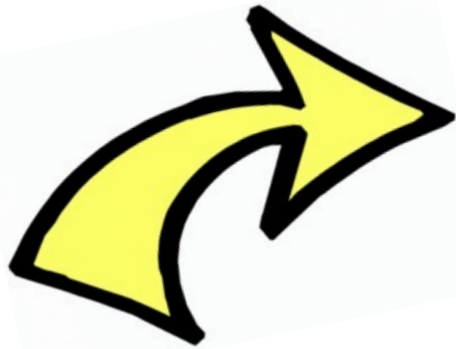
- Atypical model for larger agchem, but is standard for startups
- Is possible because of high safety, low risk, faster registration of biologicals & ability to continuously improve microbial processes
- Capital efficient; fund as you go
- **Successful biologicals cos. involve growers early in the process for product vetting**

Version 2.0 developed while waiting for EPA approval of Version 1.0

Version 2.0 is placed with the same and new customers



How Do You Succeed in this Competitive Market?



Is #2 even possible for a new entrant anymore?

Business Model 1

Biological company with one technology is focused on unmet needs in the market; Partnering for sales and marketing) (e.g. most bio cos.) or *selling through independent retailers*

Business Model 2

Biological company develops a broad product portfolio across multiple market segments; Vertically integrated (e.g. Marrone Bio)

Business Model 3

Biopesticide companies add precision technologies and shift from being just product supplier to solution provider (eg. Semios). SaaS models increase.



**Suffice to say, new entrants need
to have differentiated technology
with clearly articulated competitive
advantages**

If every biostimulant company claims X% win rate and X% yield increase, you need a lower price or a higher yield/quality than the pack; new technology won't be enough

FILLING AN UNMET MARKET NEED IS THE FASTEST WAY TO GAIN ADOPTION



CUSTOMER
NEED

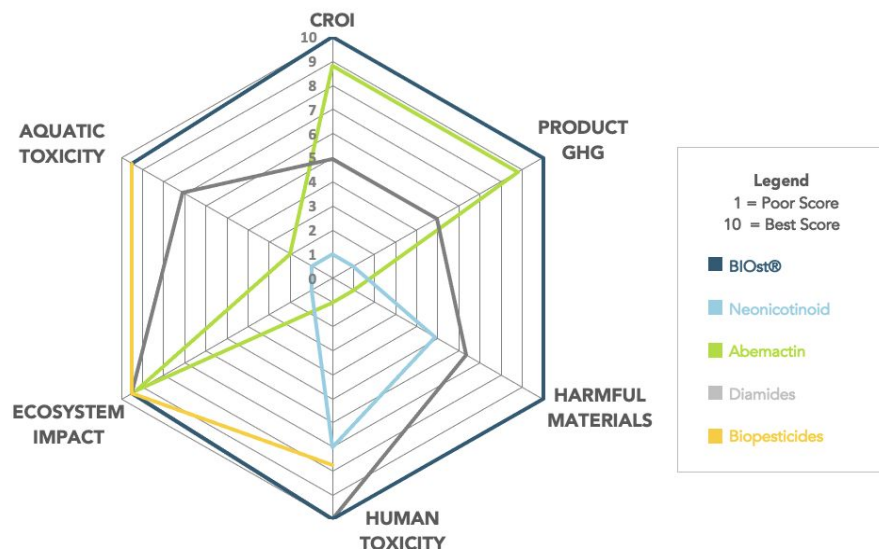


THE RIGHT
PRODUCT

*Growers still have many issues that chemicals
cannot solve well*

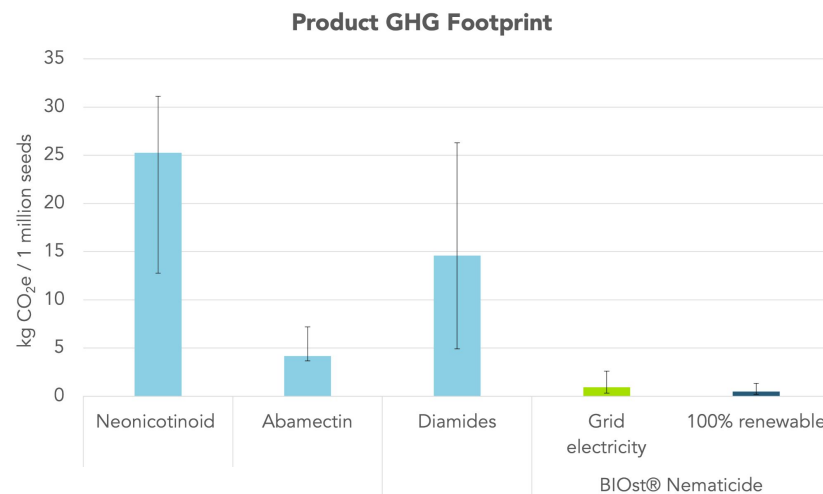
The Climate Impact Study Showed that **BIO_{st} Nematicide** (*Burkholderia rinojensis*) Reduced Greenhouse Gas (GHG) Emissions by 85% in Soybeans and 87% in Corn Compared with Conventional Pesticides

Benchmarking and Conclusions



The estimated GHG footprint of BIOst® Nematicide considering 100% renewable electricity supply is:

- 98% lower than that of neonicotinoids
- 88% lower than that of abamectin
- 97% lower than that of diamides.

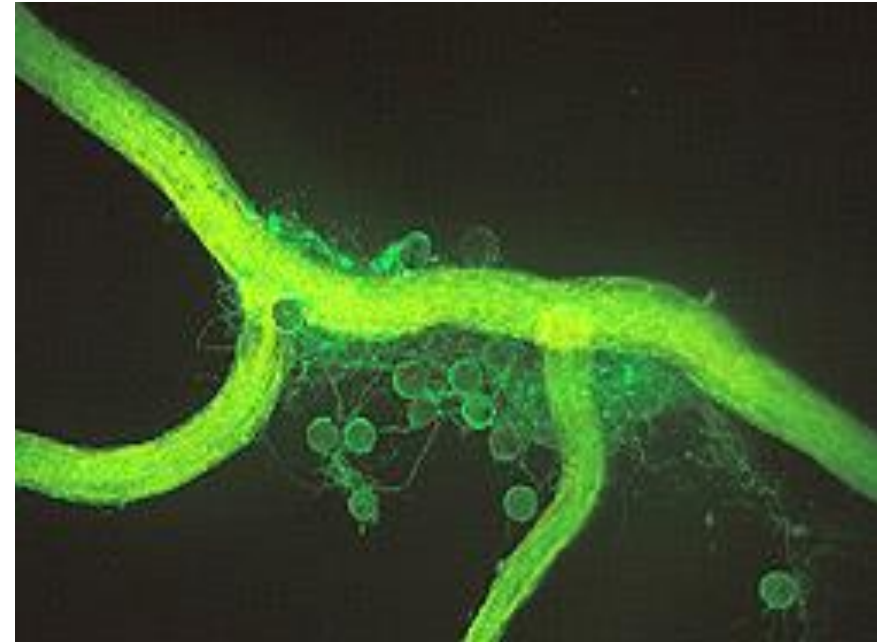


Climate Impact Score: 9.8/10



Mycorrhizal Inoculants are an Effective Method for Carbon Sequestration

- To date, farmers are mostly ineligible for carbon credits, as permanence of carbon sequestration in agricultural lands is debatable and qualifications are not standardized
- **Glomalin** is unique in its ability to store carbon over decades & can be considered a persistent and stable carbon sink
- Arbuscular Mycorrhizal Fungi (AMF) are the only known source of glomalin, and are in fact its namesake
- Once recognized as an acceptable method of carbon sequestration, farmers should benefit from carbon credits



Glomalin, dyed green, shown to completely cover mycorrhizal corn root and fungal spores
Photo by Sara Wright

What I've Learned from Building Three Biopesticide Companies

- **Innovative products that work (provide grower ROI)**
- A **diversified portfolio** to fill range of growers' and channel partners' **needs** in **integrated programs**
- Having a **sales team** who truly **believes in biologicals** and are **"hunters"**
- **Education** on how to use the novel products successfully
- Field trial data gets you in the door; **grower demos** drive adoption and sales
- **Profitable** for the **channel** partners
- **International** expansion – **faster growth ex-USA**