



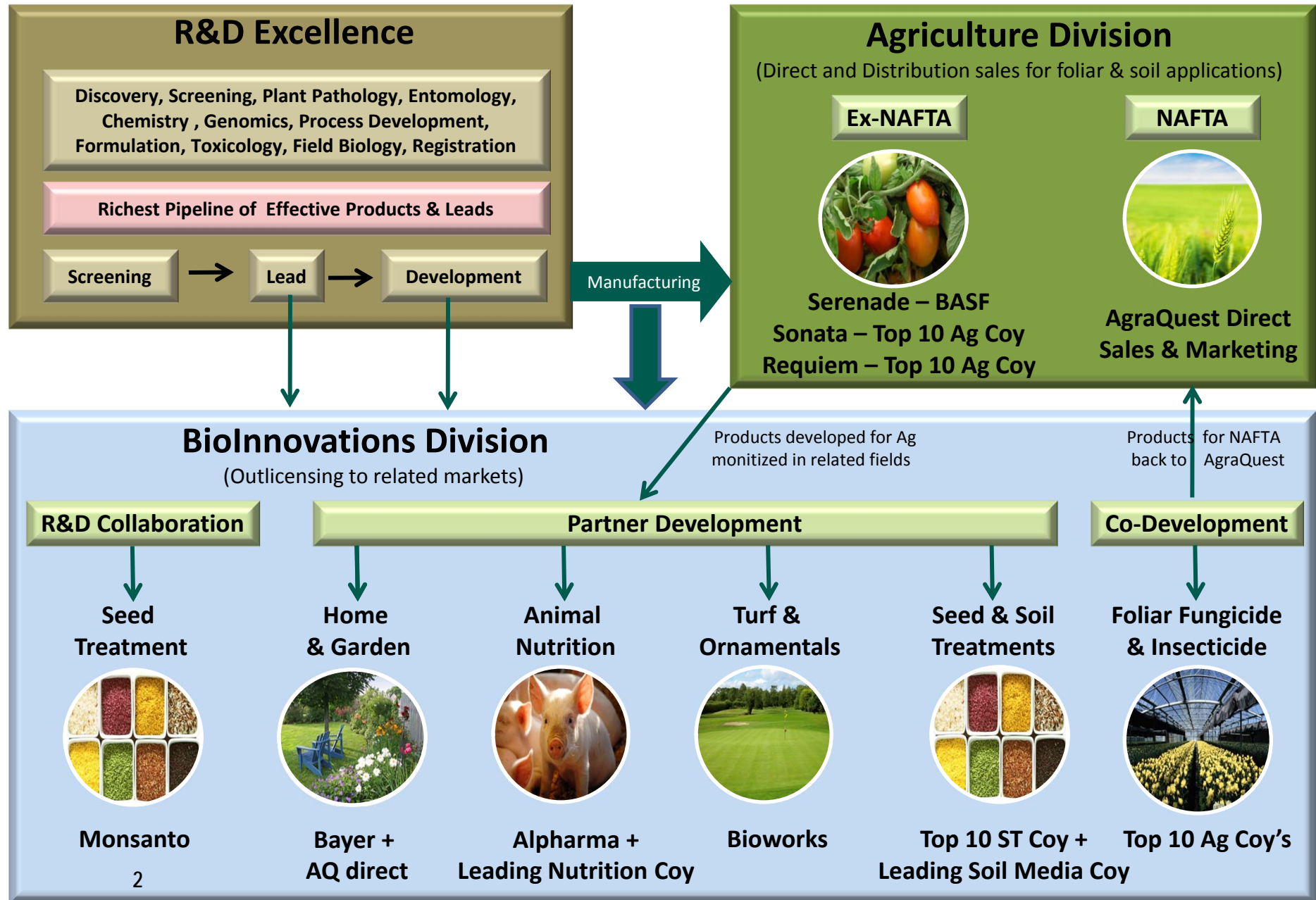
Going beyond mainstream crop protection

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AgraQuest

ABIM 2010



AgraQuest



Summary

- There are numerous opportunities for biologically based products outside of traditional mainstream crop protection.
- Addressing these opportunities is directly linked to commercializing NEW products designed to meet the specific needs of these markets.
- Currently almost all new products for these smaller markets come from mainstream crop protection and are re-purposed hand – me – downs.
- This talk will propose a new model to change this approach.
- The result is to open the door to expanded roles and use of biopesticides in these smaller markets, similar to what is happening in mainstream crop protection.

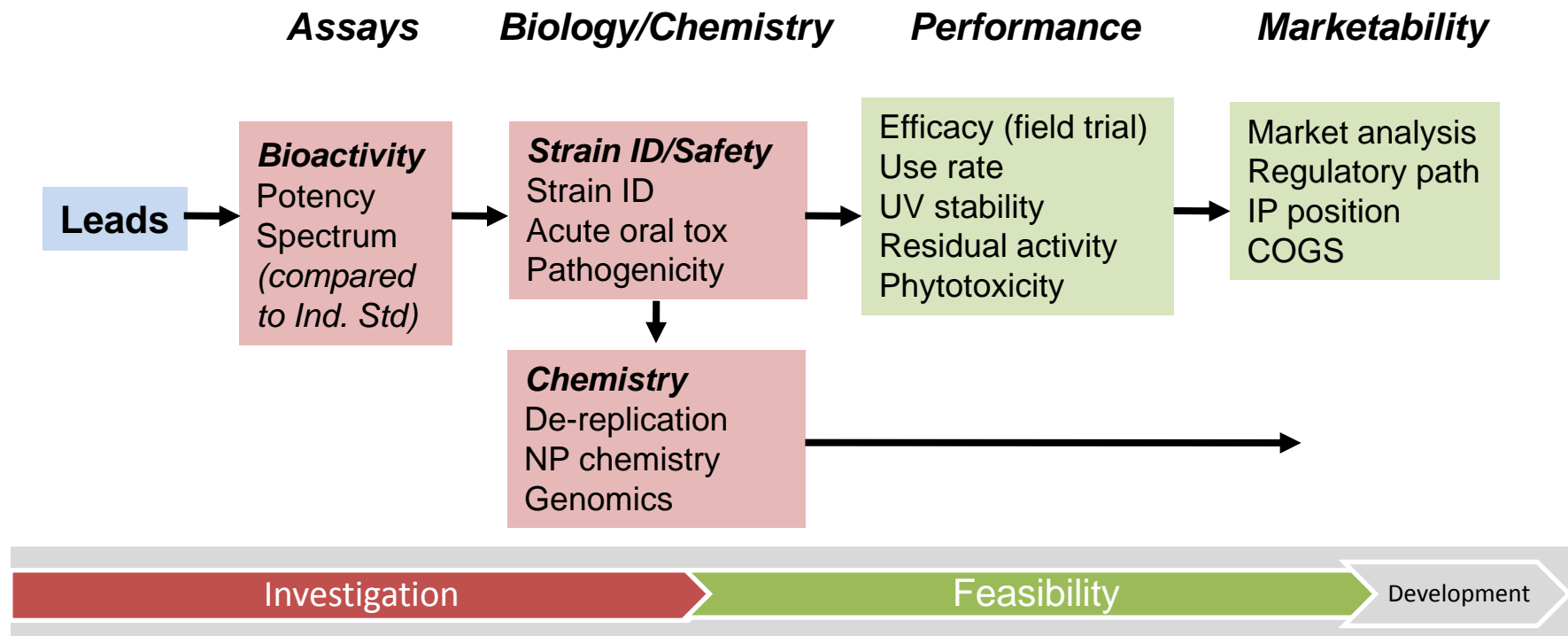


Current Model



Pipeline: Rapid Lead Evaluation

Four Stage Evaluation Process to Advance Pipeline Leads



Why is this the primary model?

Return On Investment

- When you calculate the cost to bring a new product to market and compare that to the projected revenues and profits over life of patent, the Return On Investment does not meet the hurdle for approval for most small markets when the commercialization costs are >\$100M.
- As a consequence, products for markets outside mainstream crop protection must come from mainstream ag development and be repurposed.
- Result is the use of products that are not ideal or customized for the targets or specific needs of these smaller markets, or lack of products all together.





How can we change this model?



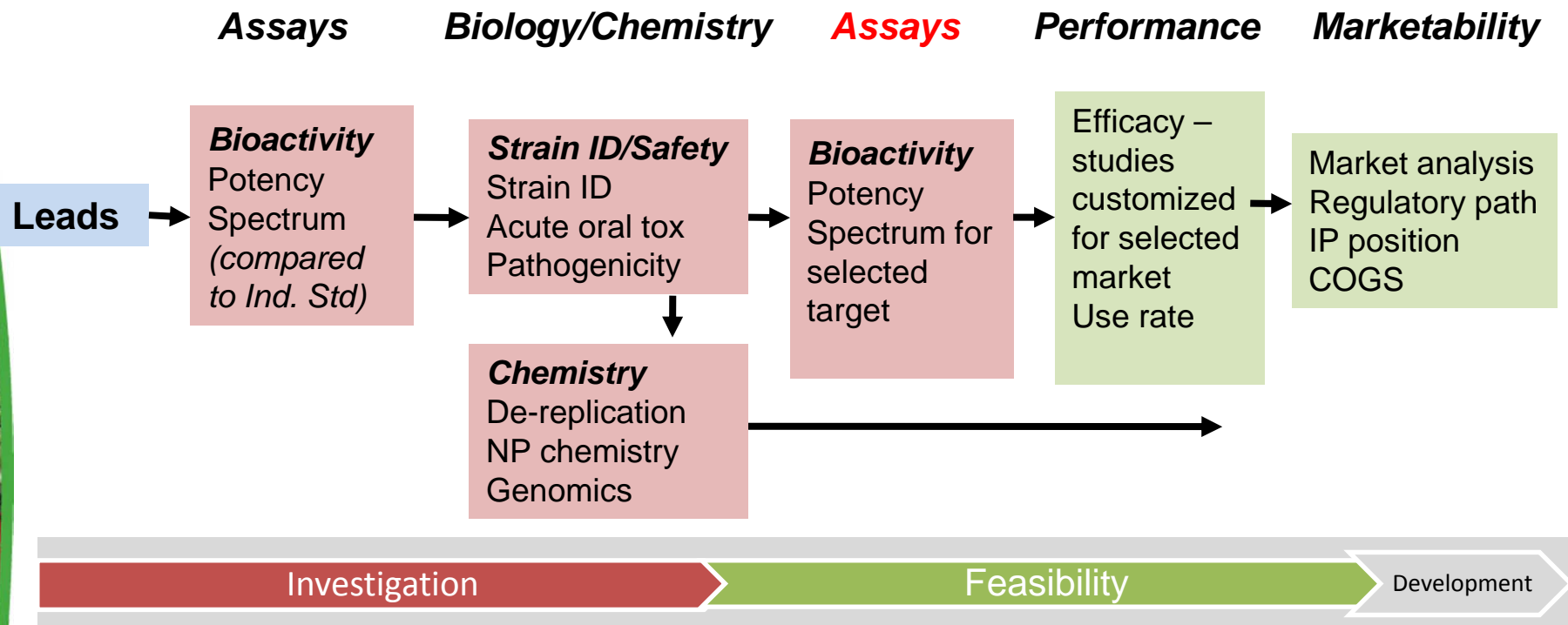
Two key concepts

1. Focus on microbial solutions to take advantage of both their lower commercialization costs and their range and potency of activity.
2. Identify and develop effective assays that are specific and customized for the specific market being addressed.

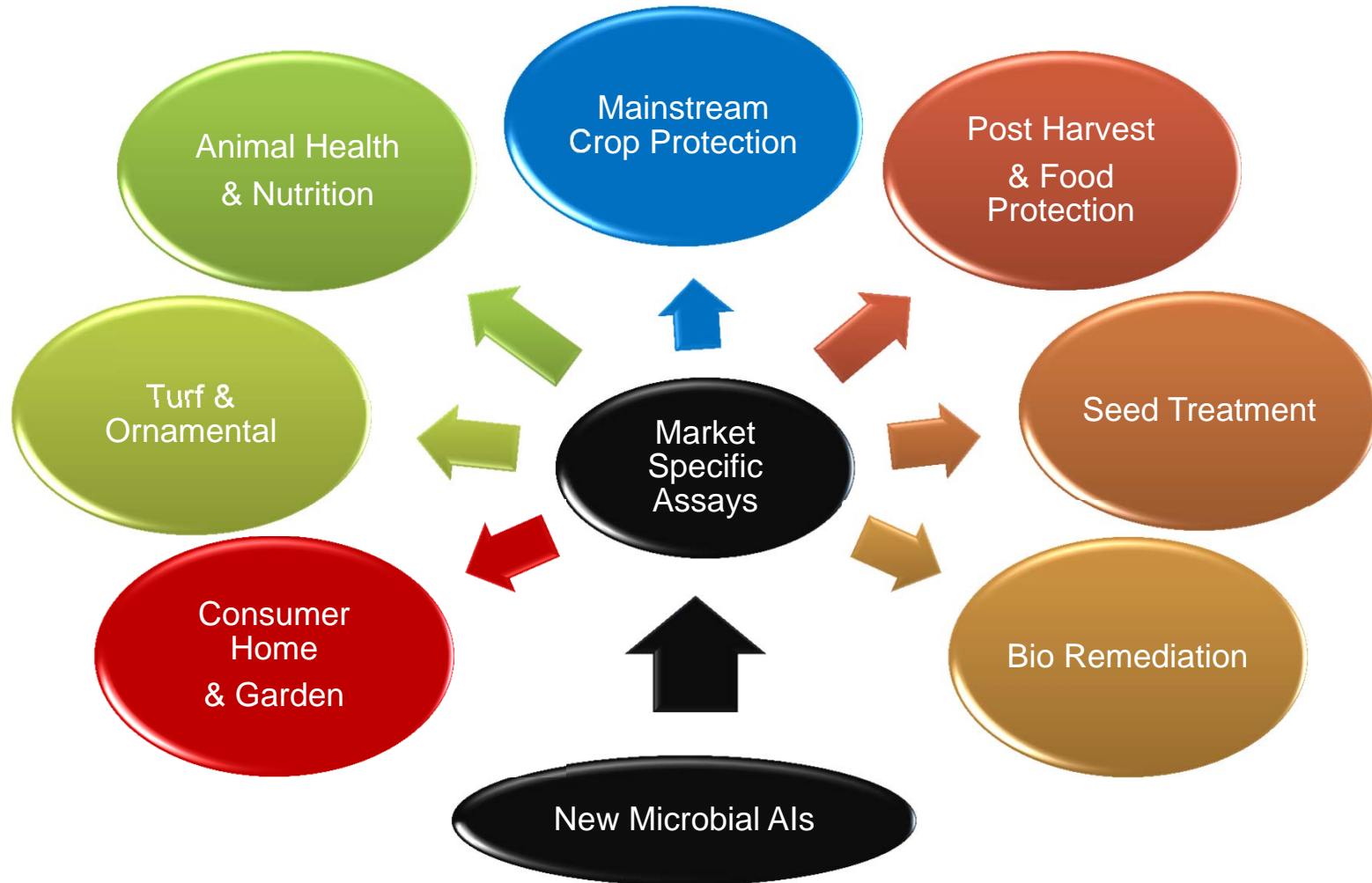


Pipeline: Rapid Lead Evaluation

Five Stage Evaluation Process to Advance Pipeline Leads



New Paradigm





Key factors to make this model work

- Pipeline of characterized leads
- Market specific commercially validated assays
 - Seed Treatment – root colonizers and nematicidal activity
 - Animal Nutrition – Salmonella or Clostridium activity
 - Turf – pink snow mold or pythium activity

Closer look at two examples

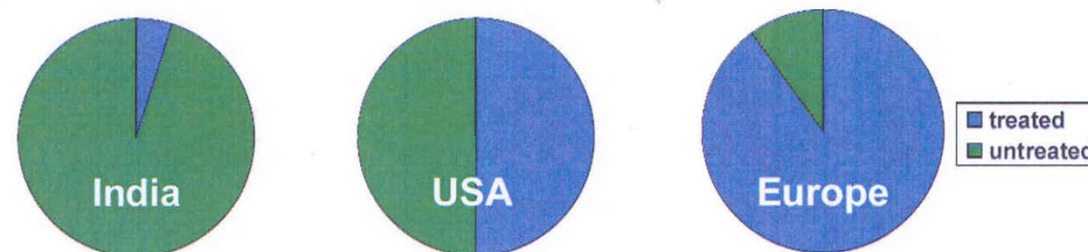
- **Seed Treatment**
- **Animal Health and Nutrition**



Seed Treatment -- Market

Economics of Seed Treatment (ST)

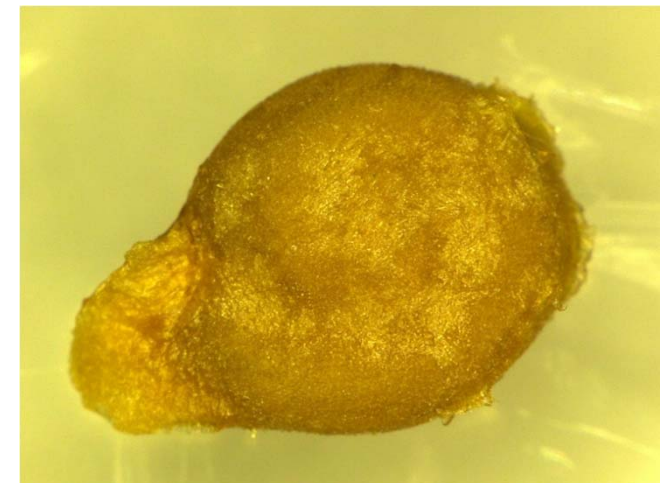
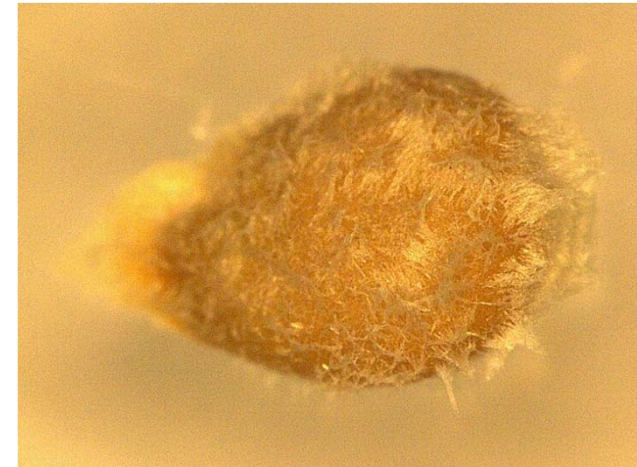
- 2007: ST market worth 1.5 billion EURO
- Global growth per annum: 5%
- Global seed market: 5% of total crop protection market
 - 48% fungicides
 - 41% insecticides
 - 11% mixed
- Higher value crops experience higher adoption rates (e.g. sugar beet, corn, vegetables)



Percentage of treated seed (blue) in different areas of the world

AQ BioFungicide Seed Treatments

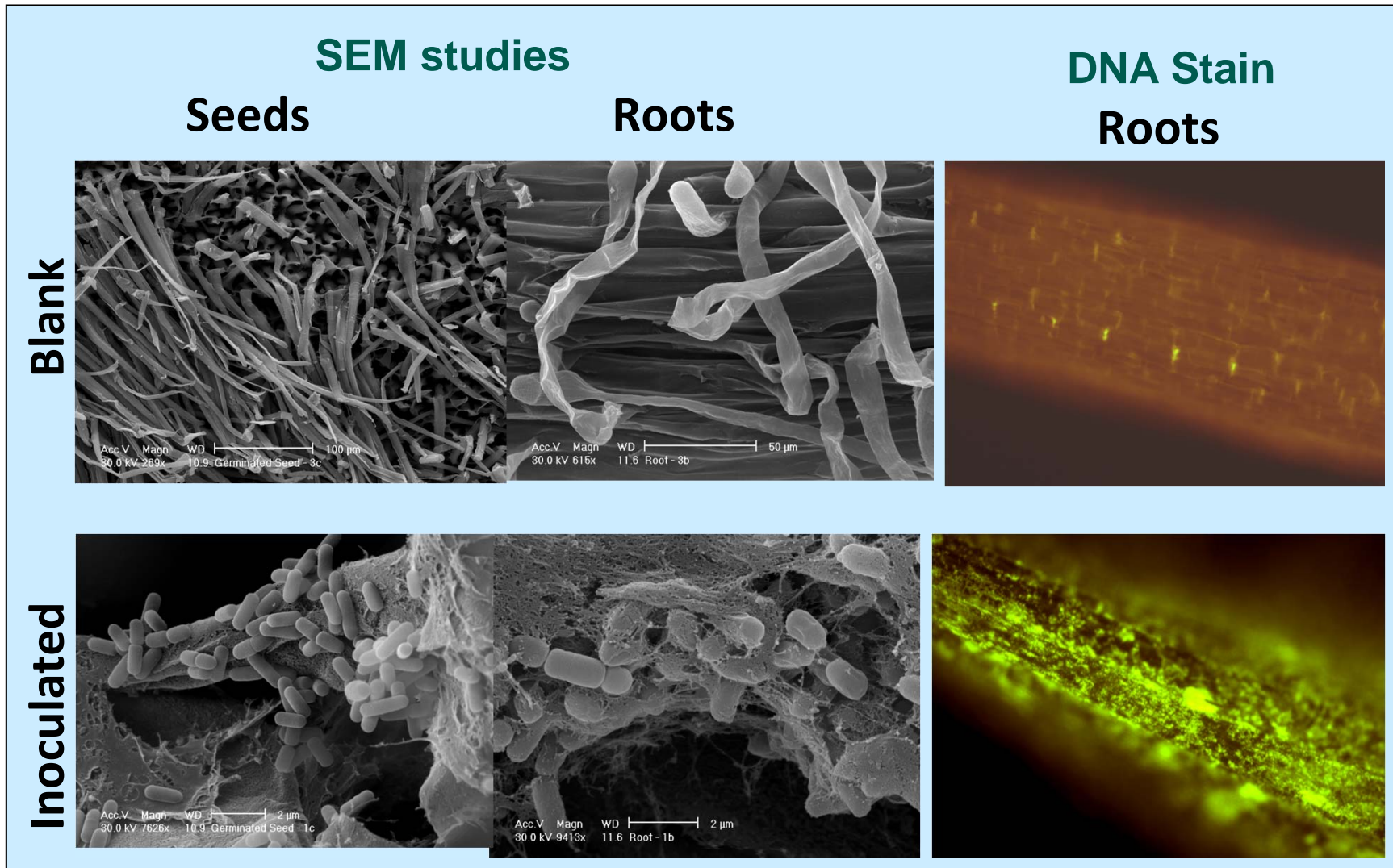
- Collaborative studies with academic and contract research labs
- *B. subtilis*, *B. pumilus* and other biocontrol strains are good root colonizers
- Antimicrobial compounds in formulated products are present in the rhizosphere
- Bacillus lipopeptides are ISR elicitors
- Combined activity result in plant health and growth promotion



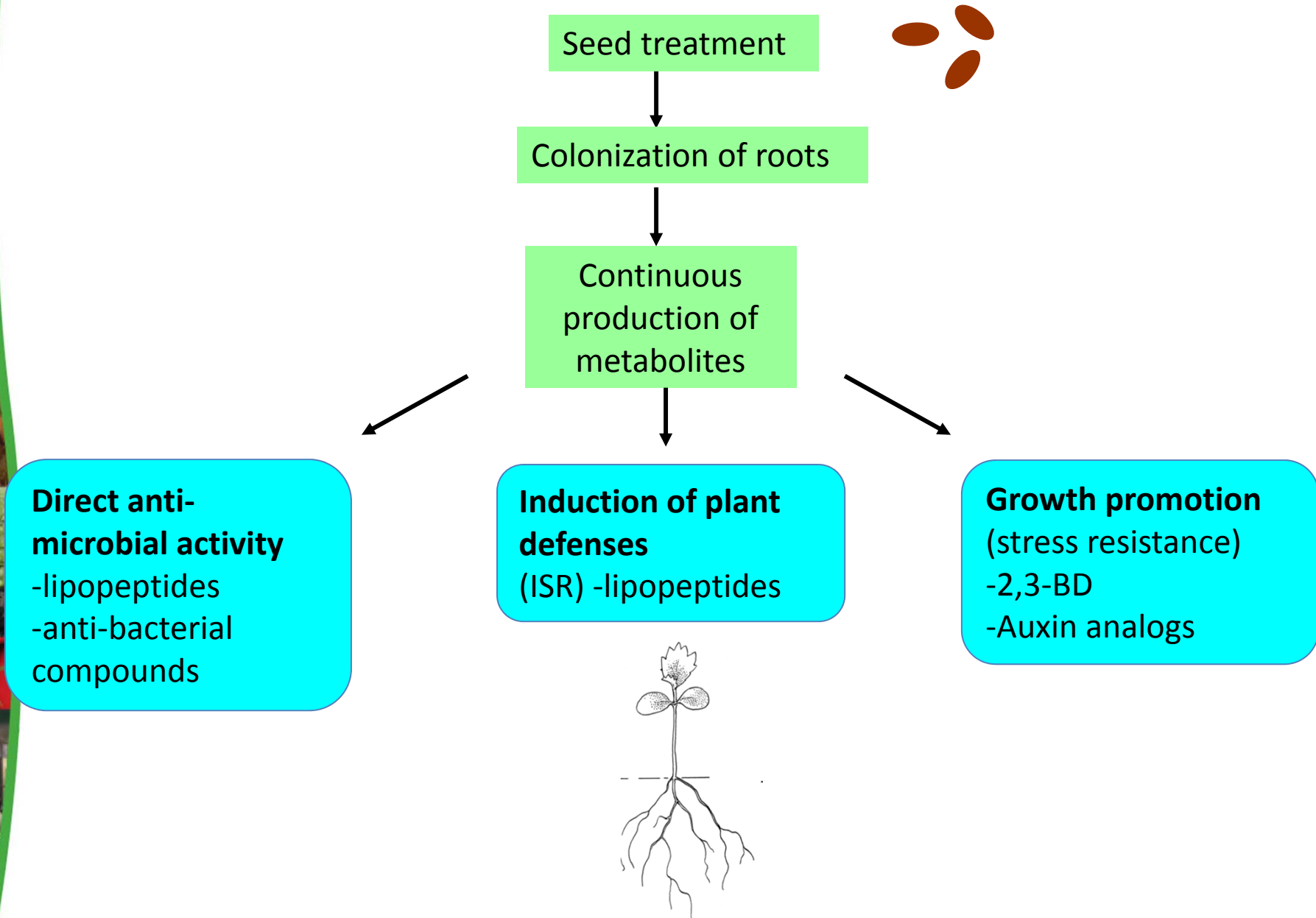
Spore Slurry-Treated
Tomato Seeds



Serenade Seed Treatment: Active Colonization of Tomato Roots



Serenade-Plant Interactions





Animal Health and Nutrition



Use / Trends / Market

- Antibiotic growth promoters (AGP's) and other performance enhancing ingredients are fed to food-producing animals to reduce production costs
 - Primary Uses: To enhance conversion of feed to animal protein and speed of weight gain
 - Secondary Uses: To reduce disease incidence, mortality and pathogen shedding
- Most AGP's are also used in human health leading to fear of resistance in animals crossing over >> regulatory bans and pressure from major food companies are continuing to reduce their use
 - As a result, alternatives are gaining commercial credibility and success – spore-forming Bacillus have been emerging over the past decade
- The global market for AGP's and alternative products is estimated to be roughly \$500 million, with Bacillus products comprising an estimated \$50+ million and growing



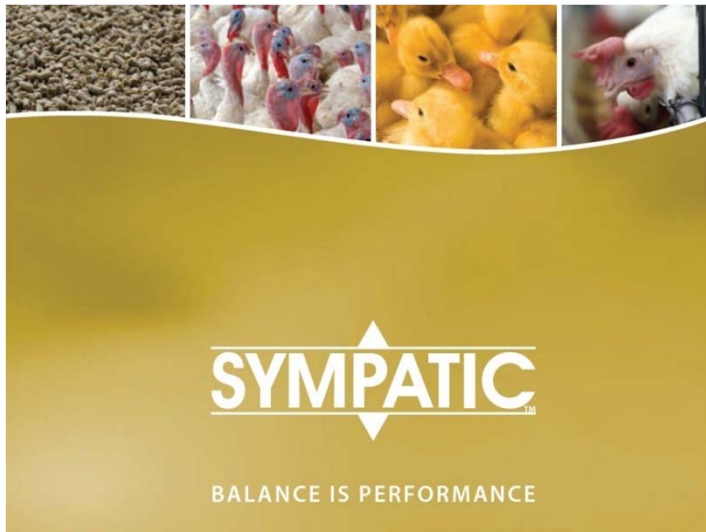
Market Needs for AGP Alternatives

- Consistent performance
- Cost comparable to mid range / premium AGP's
 - Most non-antibiotic alternatives are priced at sizable premiums
- Strong technical understanding and representation
- For probiotics, well characterized strains to minimize risk of short and long-term regulatory challenges
- Stable through the feed pelleting process

A successful *Bacillus* requires a PARADIGM SHIFT

- Lower price points – A “high cfu” production method and customized products, including local final-formulation
- Appropriate positioning by the right partner(s): Focus on taking market away from AGP's rather than competing *Bacillus*

Nutrition, Disease, and Biosecurity



Compatible with and complementary to common nutrition and health management practices

- Cost-effective and consistent option to antibiotic growth promoters (AGPs).

Natural, differentiated and patented *Bacillus subtilis* that requires no withdrawal period before slaughter (~PHI-REI)

- Proven results in controlled research studies on key performance metric (including *Clostridium challenge* models).
- Minimizes pathogen adherence to the intestinal tract and environmental stress

Status by Specie

- **Poultry**
 - Broilers: multiple battery and floor pen trials showing economically interesting utility
 - Layers: TBD;
- **Swine**
 - Multiple trials in progress.
- **Aquaculture**
 - Both cold and warm water aquaculture
- **Bovine**
 - Milk Replacer





Brief Look at Other Markets



Opportunities Abound

- **Turf Market**
 - Numerous unmet needs today
 - Size of market will help with the ROI
 - Good fit for efficacious biopesticides
- **Consumer Home and Garden**
 - Great fit for efficacious biopesticides
 - Multiple markets within this segment
 - Foliar (looking for 3 in 1's)
 - Soil
 - Soil media
- **Post Harvest and Food Protection**
 - Largest potential and biggest need for new and innovative solutions
 - Relatively small investment being made today
- **Bioremediation**
 - Growing interest
 - Need for environmentally safe solutions

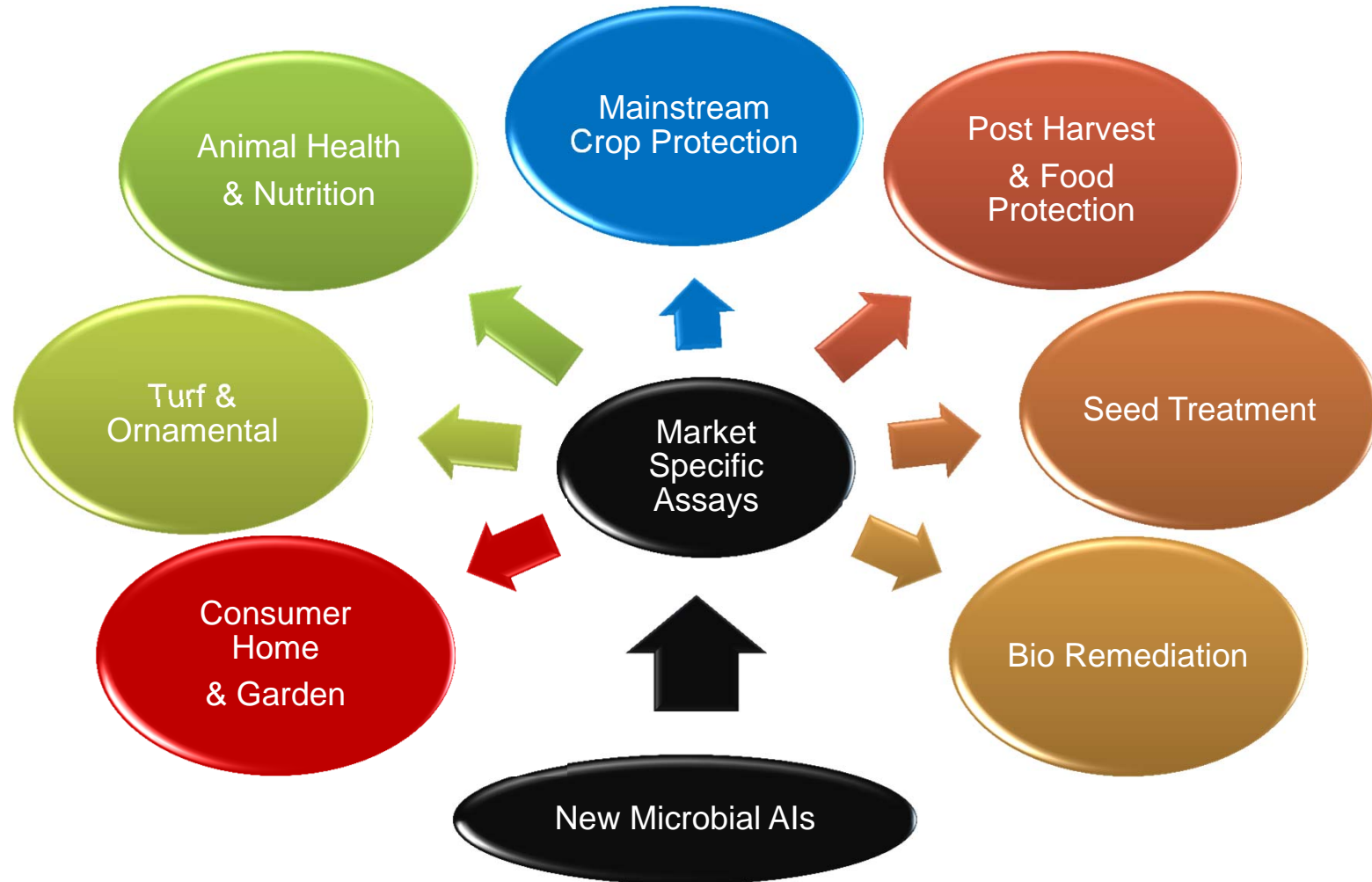


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New Paradigm





**Thank you, and
GO GIANTS!**

