Technology development and localisation of bio-based products for agricultural and preventative health

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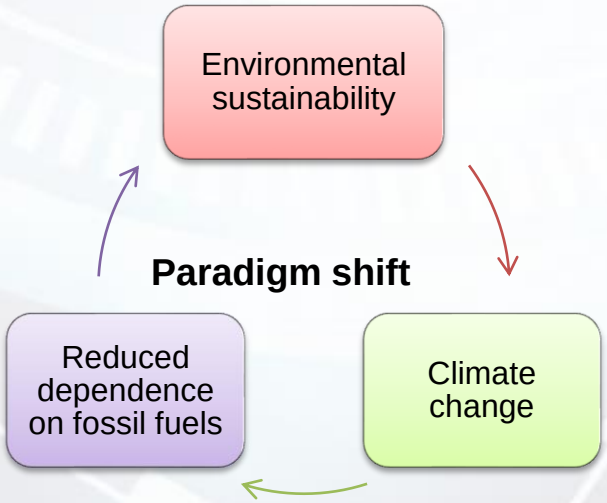
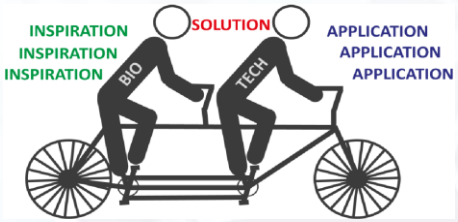
Context

- Introduction
  - Global initiatives in sustainable production
- Bioprocess Development Group
  - Research focus and expertise
  - Platform technologies – Bioaugmentation
- Agricultural biologicals
  - Opportunities
  - Chemical replacements
- Probiotics
  - Preventative health
  - Animal probiotics
- Key to success
  - Collaboration (external and internal)
  - Potential industry partners

Introduction
Global initiatives in sustainable production

Global paradigm shift towards the conversion of renewable feedstocks to chemical products





Disruptive bio-based technologies and products

Competition for new value chains from bio-based feed-stocks

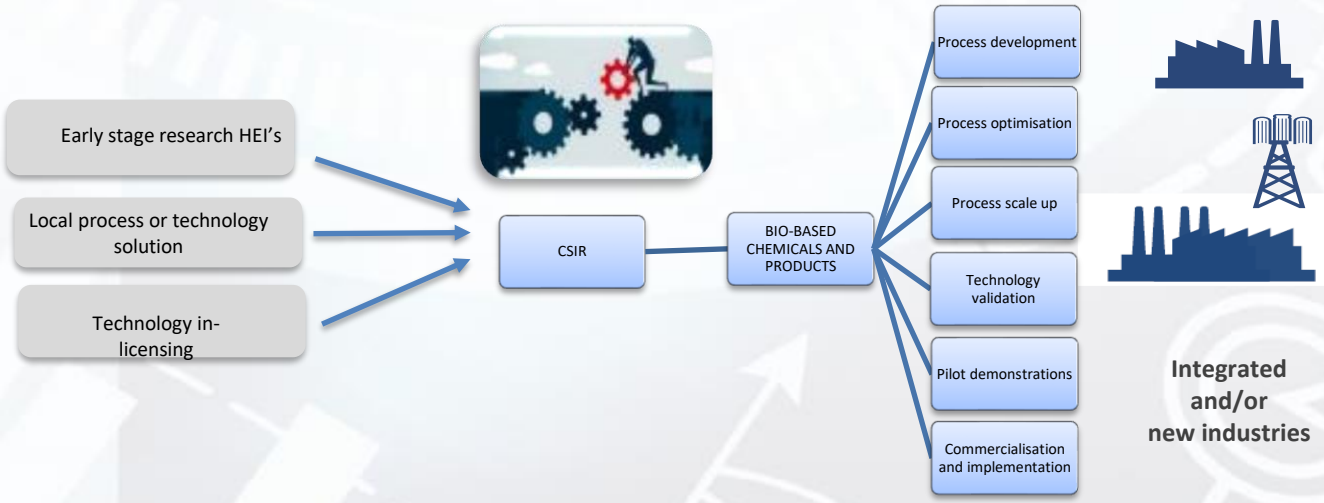
Climate change

Research shows that since the Fourth Industrial Revolution, we have burned 1.4 trillion tons of carbon into the atmosphere

Bioprocess Development Group

Research direction

Developing disruptive bio-based technologies and products **for integration in existing industries or for the establishment of new bio-based small, medium and micro enterprises.**

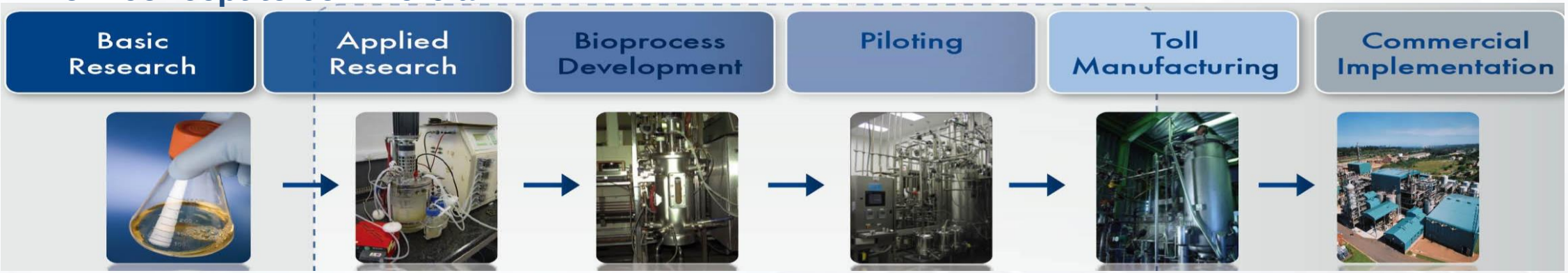


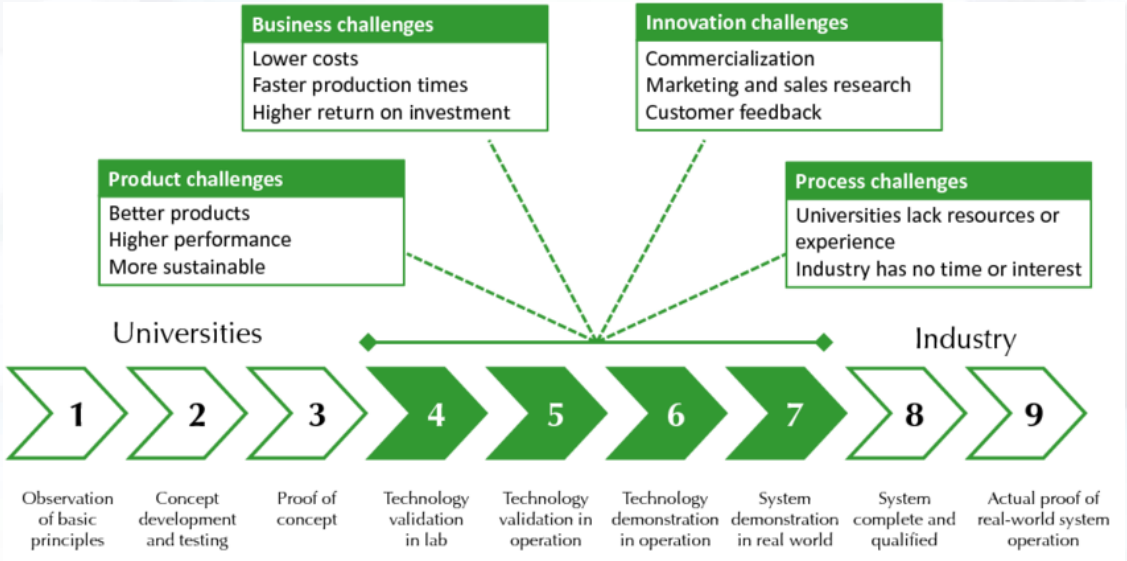
Aligned to Sustainable Development Goals (SDGs)

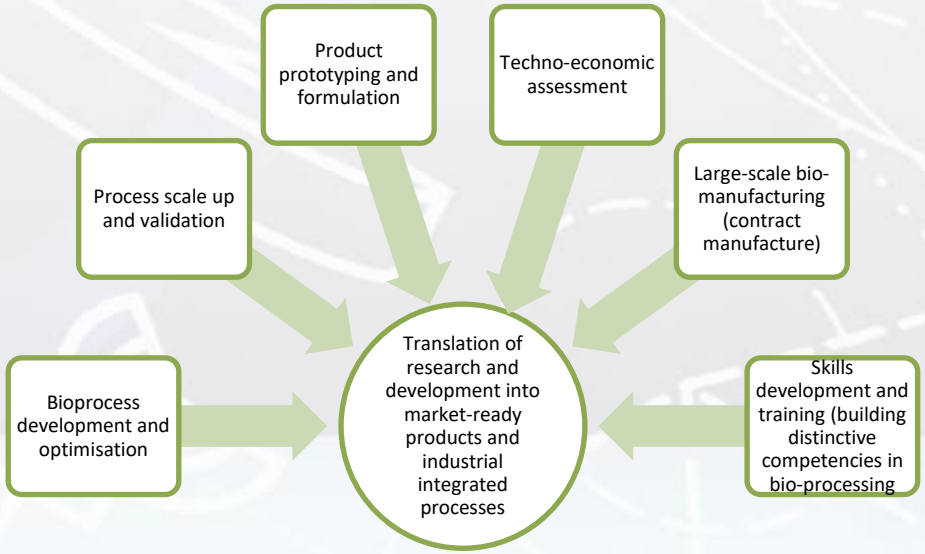
The AFRICAN-HUB FOR DISRUPTIVE BIO-BASED INNOVATIONS

Research focus and expertise

From concept to commercial







Area of expertise

Platform technologies – Bioaugmentation

- ✓ Use natural eco-friendly microbes
- ✓ Find the best combination for a specific application
- ✓ Augment natural systems
- ✓ All indigenous
- ✓ Pure-strain production processes
- ✓ Quality Control throughout the process
- ✓ Stability and efficacy proven

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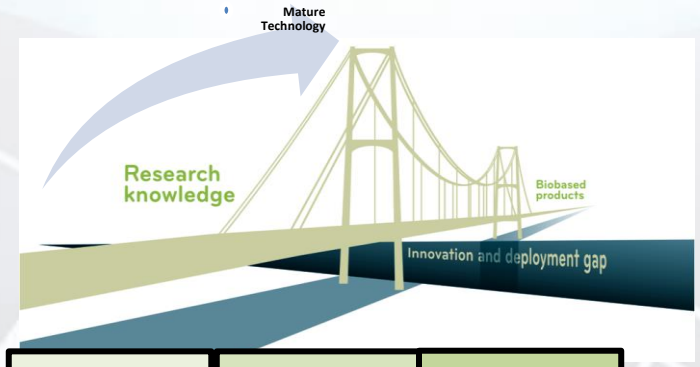
Agricultural biologicals

Probiotics

Bio-additives

Product and process development
Technology optimisation
Technology scale up
Market-ready prototypes



TRL 1-3 | **TRL 4-6** | **TRL 7-9**

Unique techno-economically feasible production processes for chemical replacements

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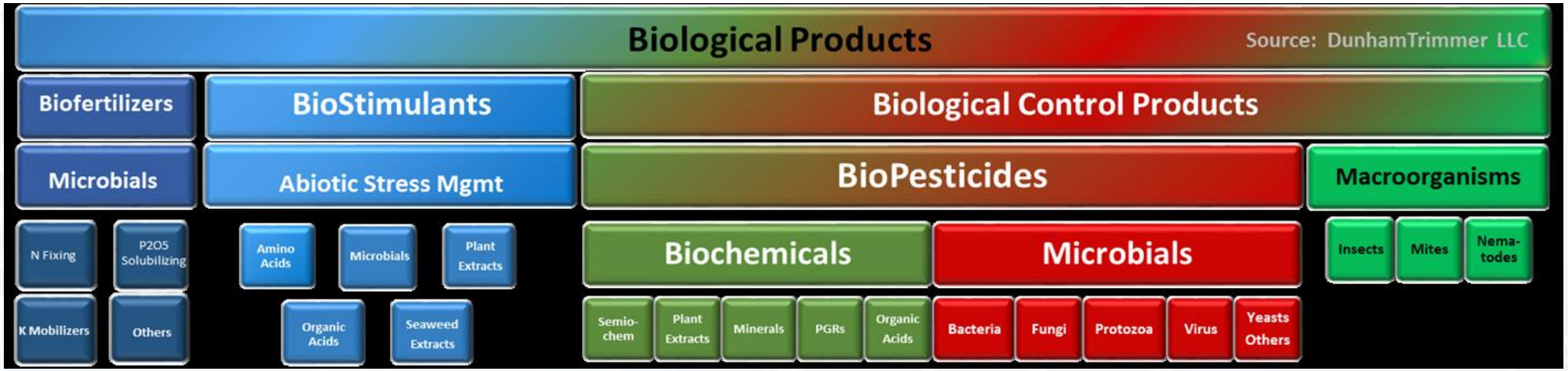
Agricultural biologicals opportunities



- ✓ Wide range of microbial strains.
- ✓ Used by farmers to increase crop yield and health by improving plant growth and nutrient uptake, as well as helping to protect plants from insects and fungal disease.
- ✓ Driven by negative effects of chemicals (pesticides, growth stimulants and so forth).
- ✓ Key issue in South Africa – imported products, low-to-no local manufacture, not indigenous bio-diversity.
- ✓ **Opportunity – locally developed products that are affordable and manufactured locally.**

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Chemical replacements

Biofertilizers | **Biostimulants (Plant Growth Promotion)** | **Biopesticides**

- ✓ Microorganisms (*bacteria, fungi and viruses*) isolated from soil and plants for their beneficial activities
- ✓ Microbial products (metabolites)
- ✓ Microbes – pure cultures – bio-manufactured

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- ✓ DEVELOPED using locally isolated microbes
- ✓ Manufacture – 1 000 L scale

Bio-control – bananas

Bio-stimulants – wheat

New developments

- **Targeted crops**
- **Combined bio-control and plant growth promotion**
- **Slow release and prolonged efficacy**

Probiotics preventative health

- Known as “live microorganisms”, which, when administered in adequate amounts, confer a health benefit on the host

- Human digestive system known to contain:
  - ~ 400 different types of microorganisms
- Probiotics can be used to:
  - treat or prevent disease conditions;
  - maintain health; and
  - reduce the risk of future diseases.
- **Increased research – gut microbiome**

Competitive offering

- ✓ **Production technology**
- ✓ **Formulation – encapsulation**
- ✓ **Efficacy and slow release**

- ❑ Local manufacture and supply
- ❑ Novel – slow release (nano-encapsulation technology)

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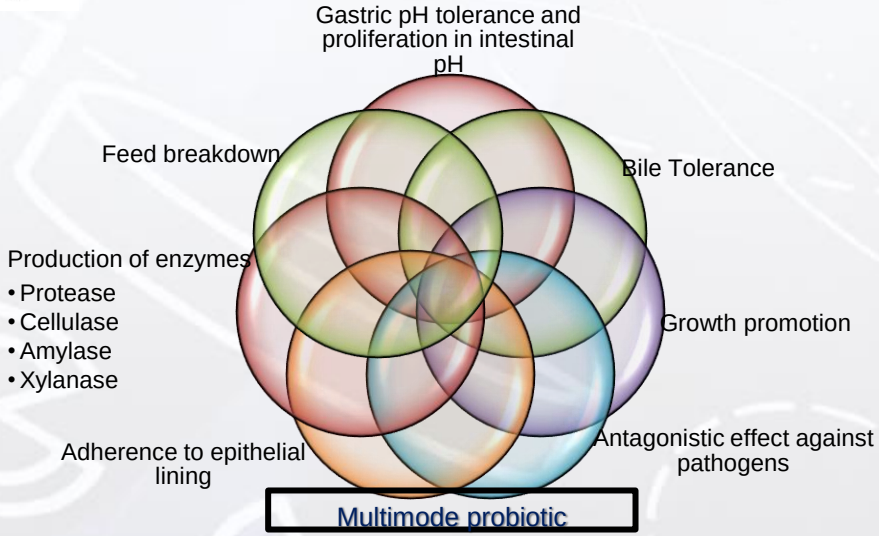
Animal probiotics

Broilers – existing challenges

- High stocking densities
- Excessive use of Agricultural Growth Promoters
- Heat stress
- Ammonia generation
- High mortality rates

Probiotics provide a suitable alternative

- Feed conversion ratio
- Average daily gain
- Increased resistance to disease
- Lower mortality rates



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Key to success

Testing in-house and with industry partners against benchmark products and processes

Laboratory-scale development

Concept to commercial approach

Rapid prototype development

First generation product prototypes and process retrofits

Development of upstream production processes

Development of down stream processes

Scale up models before technical work commences

- ✓ People
- ✓ Distinctive competencies

THANK YOU

CSIR Bioprocessing Team

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