Developing South Africa's biomanufacturing industry through a hub for open innovation: Experiences from the Biomanufacturing Industry Development Centre

Dr Daniel Visser
CSIR research and development strategy manager
1. Why biomanufacturing?
2. Industrial problem statement
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Why biomanufacturing?

- **Industrial biotechnology** is the application of biotechnology for industrial purposes, including manufacturing, alternative energy (or "bioenergy"), and biomaterials.

- Also known as white biotechnology (green = agricultural biotechnology, red = health biotechnology)

- Chemicals
  - Amino acids, vitamins, organic acids and solvents
- Polymers
  - Acrylamide
- Enzymes
  - Biocatalysis, food processing, detergents, paper and pulp
- Bio-energy
  - Ethanol, biodiesel
- Renewable feedstocks
  - Corn, sugar, cellulose
- Performance chemicals
  - Biopolymers, bio-molecules
Why biomanufacturing?

**BioRenewables**
- Become more competitive
- Reduce CO₂ emissions
- Conserve fossil resources

**BioProcesses / BioConversions**
- More selective processes improve economy and ecological impact
- Processes simplified by integrating several stages

**BioProducts**
- Biopolymers
- Biopharmaceuticals
- Enzymes, e.g. for detergents
- Biofuels
Industrial biotech – the next S-curve in biotechnology

Market penetration

Red biotech

Green biotech

White biotechnology

Today

Time

Industrial applications today

**Bio-feedstock**
- Replacement of oil and gas with biomass

**Bio-processes**
- Replacement of chemical synthesis by fermentation or biocatalysis

**Bio-products**
- Products with new characteristics (e.g., biopolymers, enzymes, nutrition/health ingredients)
SA biomanufacturing sector
Strategic context: Addressing the innovation chasm

Technology Concepts
- Basic Research
- Applied Research

Innovation "Chasm"
- Bioprocess Development
- Piloting

Products & Services
- Toll Manufacturing
- Commercial Implementation

Universities
- Biomanufacturing Industry Development Programme
- TIA Bioprocessing Platform, Agroprocessing Platforms EC, Limpopo

CSIR Biosciences
- HEIs
- Science Councils
- Industry

Industry
- Innovation Hub, eGoLiBio, Maxim Incubator
BIDC programme objectives

Key objectives:
• To stimulate the growth of a biomanufacturing-based economy by industrialising bio-based R&D

• To strengthen specialist bioprocess and product development competences, including infrastructure

• To provide affordable and readily accessible support to entrepreneurs, SMEs and existing industry in the bio-manufacturing sector to penetrate and grow their target markets

• To support skills development and vocational training to prepare resources for the industrialisation of biomanufacturing
Infrastructure, skills and training
BIDC track record

- 20 permanent staff (high-level bioprocessing and engineering skills)
- 22 enterprises supported
- 72 interns trained, majority placed with industry or studying further
- 181 new permanent jobs created in enterprises
- 201 temporary jobs created
- 75 new products transferred to enterprises
- 2 spin out companies
**BIDC track record**

<table>
<thead>
<tr>
<th>ENTERPRISE NAME</th>
<th>SECTOR</th>
<th>Product</th>
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<tbody>
<tr>
<td>ResynBio</td>
<td>Biotech</td>
<td>Resyn microbeads</td>
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<td>Optimus</td>
<td>Biotech</td>
<td>Industrial biologics</td>
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<td>JVS Biotech</td>
<td>Biotech</td>
<td>Laboratory reagent</td>
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<td>Amimo Investment Holdings</td>
<td>Biotech</td>
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<td>Homecare</td>
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<td>Linda</td>
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<td>Nutrition-Animal</td>
<td>Plant based protein</td>
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<td>Nutrition-Human</td>
<td>Traditional beverage</td>
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<td>Elvema Nutrition</td>
<td>Nutrition-Human</td>
<td>Moringa fortified foods</td>
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<td>Sliek</td>
<td>Nutrition-Human</td>
<td>Lactose free products</td>
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<td>ConnectMe</td>
<td>Speciality chemical</td>
<td>Biopolymer</td>
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<tr>
<td>Abxtracts</td>
<td>Speciality chemical</td>
<td>Hydroxytyrosol</td>
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<tr>
<td>Biomoringa</td>
<td>Agroprocessing</td>
<td>Processed moringa leaves/seeds</td>
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<td>Lighthouse</td>
<td>Biotech</td>
<td>Probiotics</td>
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<tr>
<td>Grapeseed</td>
<td>Nutrition-Human</td>
<td>Traditional beverage</td>
</tr>
<tr>
<td>Origen</td>
<td>Speciality chemical</td>
<td>Cane wax</td>
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**Region**

- GAU: 1
- EC: 3
- FS: 2
- KZN: 1
- MP: 1
- NW: 2
- WC: 1

**Sector**

- Nutrition-Animal: 3
- Homecare: 4
- Biotech: 1
- Nutrition-Human: 5
- Speciality chemical: 2
- Cosmetics: 6
- Agroprocessing: 1

**Company Ownership**

- BF: 1
- BM: 4
- WF: 6
- WM: 12
BIDC programme design

INNOVATION ECOSYSTEM

Smaller established industry: CPT, Teubes, Puris, NemaBio, AgChem

Large established industry: AECI, Anglo, SAPPI

Supply chain development programmes

BIDC (Implementation partner)

Advisory panel (Industry)

Steering committee (DST, CSIR, dti, TIA etc)

Programme owners

DST, dti, DSED, TIA, SEDA, DAFF, DEA etc

Private sector CSI: SNG

Business Incubators

SMME 1, SMME n, HEI 1, HEI n, Company 1, Company n
BIDC programme – what we offer to industry

- **FUNDING**
- **PRODUCT / PROCESS DEVELOPMENT**
- **TRAINING AND SKILLS DEVELOPMENT**
- **ACCESS TO MARKETS**
- **SUPPLYCHAIN DEVELOPMENT**
- **BUSINESS DEVELOPMENT AND SUPPORT**
- **CONTRACT MANUFACTURE**

**INNOVATION ECOSYSTEM**
Enterprise examples
Case study: Elvema

- Makekele Somo-Tladi
- Fortified food products
- Transferred 5 products:
  - Vanilla Adult instant porridge moringa fortified
  - Vanilla Advanced instant porridge moringa fortified
  - Vanilla Kids instant porridge moringa fortified
  - Moringa teabags
  - Moringa powershake

- Exporting into Southern Africa (Zimbabwe and Namibia): 700 tonnes
- Manufacturing facility was set up
- Products in selected Spar’s in SA
- 14 new permanent jobs created
Case study: OptimusBio

- Green cleaning and environmental solutions
- Transferred 21 new products developed jointly with entrepreneur
- Knock on enterprise support - BioCentric, Agchem, Earth Probiotic, Procon
- Significant job creation in the value chain (13)
- Company premises (CSIR campus) where formulation, filling and labelling of products will be done
Case study: JVS Biotech

- JVS obtained licensed IgF technology
- Required validation and scale up
- BIDC validate, made process improvements, manufactured IgF market samples the quality of which exceeds gold standard
- Currently contract manufacturing for JVS
- Order volumes increasing
How can BIDC help industry

Skills
- Biochemists, microbiologists, chemical and bioprocess engineers, chemists, analytical specialists

Infrastructure
- Pilot scale (up to 1000L) infrastructure for chemical, biochemical and agroprocessing operations

Capabilities
- Bespoke biological manufacturing platforms across all microbial classes (yeast, bacteria, algae), biocatalysis, chemical synthesis, downstream processing, formulation, packaging, natural product extractions, agroprocessing

Other
- Quality control specifications, design engineering, business support, regulatory support (dossier generation), market access and linkages
Thank you

dvisser@csir.co.za
dgardiner@csir.co.za
lkotze@csir.co.za