



# INSIDE THE CSIR BIOMANUFACTURING INDUSTRY DEVELOPMENT CENTRE - BIDC



science  
& technology

Department:  
Science and Technology  
REPUBLIC OF SOUTH AFRICA



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## OVERVIEW

The CSIR Biomanufacturing Industry Development Centre (BIDC) is a world-class facility established to translate biotechnology-based concepts into market-ready products and services. The facility offers competency throughout the value chain from laboratory scale concept validation through to technology prototyping and pilot manufacture.

## OUR OBJECTIVES ARE TO

- Stimulate the growth of a biomanufacturing-based economy and create sustainable jobs in a new industry value-chain
- Support Small, Medium and Micro-sized (SMMEs) to develop bio-based manufacturing processes and products that meet customer requirements within short time frames to exploit existing market opportunities.
- Partner with existing industry to co-develop products and technologies
- Assist R&D institutes to translate their research into products and services

The facility comprises laboratories for molecular biology, applied chemistry, biocatalysis, natural products chemistry, process chemistry, food technology, as well as laboratory scale process development. These facilities are complemented by high-end analytical infrastructure and skills within the CSIR.

## OUR PRODUCT FOCUS AREAS

The BIDC focuses on industrial biologics (e.g. biological water treatment and sanitation solutions, enzymes, whole cell biocatalysts, research reagents); products for human and animal health care (e.g. vaccines, diagnostics, probiotics); and natural products extraction and formulation for cosmetics, complimentary health, and food.

## BIOPROCESSING, AGROPROCESSING CAPABILITIES AND INFRASTRUCTURE INCLUDE

## UPSTREAM (USP) AND DOWNSTREAM (DSP) BIOPROCESS TECHNOLOGY DEVELOPMENT

The team has significant expertise and a proven track record in the development of:

- Complete inoculum trains and fermentation processes at scales ranging from 500ml to 1000L using bacterial, yeast, fungal, plant and algal systems.
- Agroprocessing capabilities from microliter to 400 litre scale.
- Extraction and formulation of natural ingredients for cosmeceuticals, nutraceuticals, food and the complimentary medicines sector.
- Protein purification capabilities from microliter to multi-litre scale.
- High-end analytical capabilities – Mass spectrometry, NMR

The team also has expertise and a track record in a wide range of process options for DSP development. These range from crude cell separation via centrifugation or filtration to more complex chromatographic purification, solvent extraction and various drying process options.



- **Product development**

Biological product development is complicated due to the sensitive nature of organisms, extracts or products produced. The group is able to transform sensitive product intermediates into saleable final products with improved shelf stability using the various process options available.

- **Process validation**

Process validation is critical to successful technology transfer for scalable manufacture. Here the team focusses on demonstrating reproducibility across the entire process while ensuring the necessary quality control measures and systems are in place.

- **Technology packaging and transfer**

All technical information is packaged into a series of reports that inform the final process. These provide inputs into the development of a process model that allows for the demonstration of efficiencies/non-efficiencies across the process. The technology package further contains detailed standard operating procedures and raw material certificates of analysis that allows for easy technology transfer.



- **Techno-economic assessment and evaluation**

The process model presents a detailed account of performance across all process unit operations. This allows the team to prepare a detailed cost of production for each product. In addition process flow sheet and factory/plant layout is prepared which contains detailed information of the equipment and utilities required. This allows the team to do techno-economic assessment of the business with projected cash flows and resultant IRR and NPVs.

- **Agile product development**

Agile product development allows the team to rapidly develop products based on platform technologies that exist with the group. Time frames from lead to final product can range from as little as 3 months to about a year. Prototypes for market testing are produced throughout this process.

- **Support of emerging enterprises and existing industry**

The BIDC is accessible to the Regional System of Innovation and can provide contract R&D, process development, process optimisation, scale-up, regulatory support, commercial manufacturing services, incubation of SMMEs and co-development of products and technologies with existing industry to enable the development of a vibrant and sustainable bioeconomy in Africa.



## **BIDC Case Studies**

**Elvema Nutritions** is an SMME trying to break into the retail market with their range of moringa-based food products. The enterprise currently makes use of contract manufacturing but have certain hurdles to overcome. 1) The enterprise need validated formulations for its products that have the necessary nutritional information, 2) the packaging the enterprise use currently is not meeting customer requirements nor does the packaging contain all relevant information, 3) in order to supply the rising demand the enterprise wants to set up its own production facility and reduce their reliance on contract manufacturing.

What can the BIDC do for Elvema?

### **The BIDC is able to:**

- Develop validated formulations and analyse final product nutritional content;
- Advise on necessary quality control parameters and compliance and assist with implementation;
- Assist in selection of packaging and in designing labelling that conforms to regulatory standards for foods;
- Assist with plant design and equipment specification based on demand projections in order for the business to apply for funds to set up their own production facility; and
- Provide inputs into a bankable business plan



**OptimusBio** is an SMME in the green cleaning products space. They use friendly microorganisms in cleaning products that break down dirt and oils and that have a far lower impact on the environment than chemical products. In order to be successful in this market, OptimusBio needs a suite of field tested products to provide a total cleaning solution for households, cleaning companies or industries that create waste. OptimusBio face a variety of challenges in order to do this. Firstly, nobody in SA can produce the quantity of microorganisms the enterprise requires to formulate their products, and as a small business they do not have the start-up capital to set up a multi-million rand production facility required for the production of the microorganisms. Secondly, in order to be at the leading edge of cleaning technology, OptimusBio needs to develop products that meet customer requirements within a short space of time.

### **What can the BIDC do for OptimusBio?**

The BIDC can:

- Offer OptimusBio contract manufacturing of the microorganisms in order for their products to find traction in the market, increase their revenue and access finances for setting up their own production facility; and
- Perform agile product development to test clients' requirements and obtain feedback in order to optimise products quickly and effectively.



**Phephisa** produces cosmetics from plants found in rural Mpumalanga. The enterprise struggles to produce products that are consistent and have a long enough shelf-life. Additionally, Phephisa is not happy with their packaging and want to expand their existing range of skin care products. The enterprise has also been advised that certain claims they make on their packaging is not compliant with current regulations around skincare products.

### **What can the BIDC do for Phephisa?**

The BIDC can:

- Standardise the extraction process of ingredients from the plants to increase the consistency of products formulated from the plant extracts;
- Formulate skin care products that are stable and have a long shelf life;
- Have the formulation clinically tested for dermal safety;
- Assist with new packaging design and packaging compatibility testing; and
- Ensure labels conform to regulatory standards.



**ConnectMe** is an SMME that wants to utilise prawn, crab and langoustine shells to produce a high value biopolymer for use in everything from cosmetics, food to fertilisers. Currently the biopolymer is imported into South Africa at high cost and no manufacturing capability exists to produce it locally.

### **What can the B IDC do for ConnectMe?**

The B IDC can:

- Develop a production process to extract the biopolymer from the shells and produce biopolymer of different molecular weights;
- Assist in designing processing equipment that is scalable to volumes that make local production feasible;
- Validate the quality of the extracted biopolymer and optimise yield of the production process to reduce cost of production; and
- Manufacture enough of the biopolymer for ConnectMe to convince customers to field test their product for possible off take agreements.



**JVS Biotech** obtained a licensed technology for the production of insulin-like growth factor (IgF), a reagent used in cell culture media. In order to meet the market demand for the product the technology has to be proven to work at laboratory scale and larger volumes need to be produced for market testing.

### **What can the BIDD do for JVS Biotech?**

The BIDD can:

- Validate the technology at laboratory scale
- Scale-up production of IgF to the required volumes
- Ensure that the cost of production is in line with the company requirements
- Contract manufacture the IgF for the company until they can set up their own facility





**Biomoringa** cultivates and processes moringa on a farm near Brits. Although the company has the required skills and experience to cultivate the moringa they need to be able to process the moringa to quality standards and add value to the processed moringa through further processing and packaging.

### **What can the B IDC do for Biomoringa?**

The B IDC can:

- Advise on the correct processing of the moringa to retain both its nutritional and antioxidant properties
- Scale-up the production of dried moringa leaves and other products and specify equipment to use at larger scale
- Do nutritional and other testing required





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