The CSIR as a Regional Technical Support Hub – A practical approach to knowledge, skills and technology transfer

1. Introduction

The global bioeconomy is currently valued at approximately US$4 trillion, with projections suggesting it could grow to US$30 trillion by 2050. This sector holds immense promise for fostering equitable, sustainable and nature-positive economic growth—especially in the face of mounting challenges such as population growth, food insecurity, environmental degradation and climate change. In alignment with South Africa's G20 Presidency theme of solidarity, equality and sustainability, the development of the bioeconomy should actively contribute to poverty alleviation and promote inclusive outcomes across diverse communities, especially in the Global South.

2. Problem statement

Despite its potential, the bioeconomy faces a critical bottleneck in the Global South: the inability to translate laboratory-based research and innovation into market-ready products, processes and services. This innovation gap stems from:

- A lack of translational research infrastructure;
- Scarcity of specialised skills; and
- High costs associated with scaling up technologies

Consequently, bioeconomy growth remains uneven across regions.

3. Opportunity for regional cooperation in Africa

Achieving meaningful bioeconomic progress requires robust regional and international collaboration. This is echoed in G20 Bioeconomy High-Level Principle 9, which advocates for cooperation that addresses global challenges, leverages complementary strengths and promotes innovation, entrepreneurship and capacity building. South Africa has made notable

strides in advancing its bioeconomy and possesses innovative entities that help bridge the gap between research and commercialisation. Among these, the Council for Scientific and Industrial Research (CSIR) stands out as a leader in translational research.

The CSIR is a multidisciplinary research and technology organisation dedicated to driving industrial and societal impact. Over the past decade, it has built infrastructure and expertise to support the transition from lab-scale innovation to market-ready solutions. Through initiatives like the Biomanufacturing Industry Development Centre (BIDC) and the Biorefinery Industry Development Facility (BIDF), the CSIR has empowered startups and small, medium and micro enterprises (SMMEs) by:

- Validating technologies at lab scale;
- Demonstrating and prototyping innovations; and
- Supporting pilot manufacturing.
- These open innovation hubs also valorise Indigenous Knowledge Systems (IKS), ensuring inclusive and culturally relevant innovation.

4. Proposal

In support of the G20 Bioeconomy High-Level Principles and the G20 Initiative on Bioeconomy (GIB), we propose formal recognition of the CSIR as a regional knowledge transfer hub. This hub would support African small businesses in developing and commercialising bio-innovations across sectors such as:

- Agroprocessing and IKS valorisation;
- Biomanufacturing and biopharmaceuticals;
- Greening industrial processes via biocatalysis;
- Biomass conversion through biorefineries; and
- Circularisation of agricultural value chains.

By combining CSIR's proven technical capabilities with business development support from partners like The Innovation Hub (website) and UVUBio (website) we aim to establish a comprehensive commercialisation pipeline for small enterprises.

5. Funding request

We seek €10 million to implement a three-year programme that will support between eighteen to twenty-two African small businesses in developing competitive bio-based technologies. The funding breakdown includes:

- € 6.7 million for training and capacity building; and
- €150 000 per business for post-training commercialisation and market entry in their home countries

Businesses will be selected through open, competitive calls evaluated by a technical advisory panel. Final selection will be overseen by a dedicated steering committee.

6. Capacity and scope

The CSIR can host approximately between six to eight small businesses per year, each engaging in 18 to 24-month projects. Support will include:

- Technology development and hands-on transfer;
- Intern training; and
- Business development services via CSIR partners

7. Entrepreneurial benefits

Participating entrepreneurs will receive:

- Technical support for product and process development;
- Technology packages to build investment-ready business cases;
- Business and entrepreneurial development training;
- Practical biomanufacturing experience; and
- Establishment grants for market testing and scoping manufacturing needs in their home countries.

8. Expected outputs and outcomes

8.1 Outputs

- Fifteen to twenty-five products and technologies developed and transferred; and
- Sixteen technology prototypes/demonstrators transferred to small businesses

8.2 Outcomes

- Eighteen to twenty-two African small businesses supported to commercialise innovations; and
- Eight to ten localised technologies adapted for regional contexts.

8.3 Knowledge transfer

The initiative will foster cross-border knowledge exchange, collaboration on shared priorities, and alignment with bioeconomy standards.

8.4 Alignment with G20 Bioeconomy Principles

This programme directly supports several key high-level principles, including:

- **Principle 5**: Promoting sustainable and circular use of biological resources
- **Principle 6**: Ensuring responsible use of science, technology and traditional knowledge
- **Principle 8**: Applying transparent, inclusive and science-based sustainability metrics
- **Principle 9**: Advancing international cooperation, innovation and capacity building

9. Prototype and product development solutions offered by the CSIR

The CSIR provides a comprehensive suite of prototype and product development services across three key domains: 1) Agroprocessing and IKS valorisation, 2) biomanufacturing, and 3) biorefinery technologies. These capabilities are designed to support small businesses and industry partners in transforming research outputs into commercially viable products.

9.1 Agroprocessing and IKS valorisation

The CSIR's Agroprocessing facilities support the natural products sector through green chemistry, bio-based innovation and advanced processing technologies. Services include continuous flow microwave food processing, high-precision analysis, small-scale production and plant-based material development. Key laboratories include:

- **Botanical Supply Unit**: Develops herbal products and functional foods.
- **Capsule Laboratory**: Enables efficient, small-scale production of high-quality capsules for research and development.

- **Cosmetics Formulation Laboratory**: Produces regulatory-compliant cosmetic products with functional properties.
- **Supercritical Carbon dioxide (CO_2) Facility**: Uses advanced separation techniques to extract valuable compounds.
- **Microwave Processing Facility**: Enhances shelf-life, nutrition and safety of fruit, vegetable and blended food products.
- **Food Analytical Laboratory**: Equipped with two-dimensional chromatography for high-accuracy, rapid analysis.
- **Food Innovation Laboratory**: Develops shelf-stable, nutritious and high-value food products.

9.2 Biomanufacturing

The CSIR offers biomanufacturing services from 10 to 1 000 L scale, including contract manufacturing of biological materials. Core competencies include:

- Product and process development;
- Formulation and system design;
- Analytical testing and method development;
- Microbiological synthesis and Standard Operating Procedures drafting;
- Equipment installation, commissioning and operation; and
- Cost modelling and feasibility assessments

Facilities include:

- Microbiology and fermentation laboratories (10, 30, 200 and 1 000 L bioreactors);
- Wet and dry processing areas, including large-scale centrifuges;
- Protein purification labs (microlitre to multi-litre scale);
- Downstream piloting labs for distillation, evaporation and extraction;
- Analytical labs: Gas Chromatography (GC), High-Performance Liquid Chromatography (HPLC);
- Chemistry labs with kilolitre-scale flow chemistry capabilities;

9.3 Biorefinery capabilities

The CSIR supports SMMEs and industry in scaling biorefinery technologies that convert waste biomass into high-value chemicals and materials, promoting a circular bioeconomy and reducing reliance on fossil-based feedstocks.

Facilities include:

- **Analytical Characterisation Laboratory**: Equipped with pyrolysis Gas Chromatography-Mass Spectrometry (GC-MS), supercritical fluid extraction, High-Performance Liquid Chromatography (HPLC), ultraviolet-visible spectroscopy (UV-VIS), Fourier-Transform Infrared spectroscopy (FTIR), organic elemental analysis and Scanning Electron Microscope with Energy Dispersive X-ray Spectroscopy (SEM/EDX) for biomass characterisation and product evaluation.
- **Bench/Pilot-Scale Laboratory**: Includes digesters for biomass fractionation and a biogas reactor for 25-day production trials. Supports pulping research and development for major paper companies.
- **Scale-Up Facility**: Houses biochar reactors, rapid displacement heater digesters, and a wastepaper recycling plant for fibre recovery and reuse applications. Equipment is scalable to commercial implementation.

10. Call to action for G20 members

We invite G20 members and strategic partners to support this initiative and contribute to resource mobilisation efforts. By investing in the CSIR's role as a regional knowledge transfer hub, stakeholders will help unlock the potential of Africa's bioeconomy, foster inclusive innovation and advance the G20 Bioeconomy High-Level Principles.

Learn more:

- Biomanufacturing Industry Development Centre (BIDC)
  https://www.csir.co.za/biomanufacturing-industry-development-centre

- Biorefinery Industry Development Facility (BIDF)
  https://www.csir.co.za/biorefinery-industry-development-facility