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**6.22.2026**

**15:00-16:00**

Venue

Biomedical Membrane Research  
and Open Innovation Center  
Room Z5

All are welcome

Free of Charge

## **The 8th KUEB Premier Seminar & The 16th EGBRC Lecture**

### **Linking Synthetic Biology to Commercial Opportunities for Sugarcane Biorefineries**

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<https://www.su.ac.za/en/faculties/engineering/departments/chemical-engineering/prof-johann-gorgens>

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# Linking Synthetic Biology to Commercial Opportunities for Sugarcane Biorefineries

## Abstract

This work presents an integrated framework for prioritising and developing commercially viable sugarcane biorefinery pathways, spanning benchmarking, technology development and pilot-scale validation. More than forty sugar-derived products were evaluated using Aspen Plus® simulations, techno-economic assessment (TEA), and life cycle assessment (LCA), enabling identification of high-potential pathways based on economic and greenhouse gas (GHG) performances. While many biofuels and bioplastics remain cost-challenged, selected food-related and specialty chemicals show strong potential for diversification. Synthetic biology is positioned as a key enabler to realise these opportunities. Modelling of bioprocess performance demonstrated how improvements in yield, productivity, and titre can drive economic viability for target molecules such as 3-hydroxypropionic acid (3-HP) and 2,3-butanediol (2,3-BDO), providing a quantitative basis for prioritising R&D investment. Complementary strain engineering work established a novel oxaloacetate pathway for 3-HP production in *Komagataella pastoris*, achieving titres up to 50.6 g/L and demonstrating the feasibility of efficient sugar-based bioprocesses in non-conventional yeast hosts. These capabilities are integrated through a 1000 L containerised demoplant, to demonstrate pilot-scale process performances of advanced microbes under the conditions of industrial operations and feedstock variations in the sugarcane industry, as exemplified by a current project on cellulosic ethanol production. The platform enables translation from modelling and laboratory development to pilot-scale validation across multiple feedstocks and products. Collectively, this end-to-end approach provides a robust pathway to identify priorities for the application of synthetic biology to the development of new microbial bioprocesses, and accelerating the commercialisation of these in diversified sugarcane biorefineries.