

## Curbing food losses through solar drying integrated with biogas-assisted dehumidification

### Full-time research-based master's degree in chemical engineering

**Host:** Prof. Eugene van Rensburg

**Commencement:** The successful candidate must assume postgraduate work in January 2025.

**Bursary:** The successful candidate will be offered a minimum bursary of ZAR150 000 per year of study, for two years of master's studies.

Solar thermal drying is a mature technology and converting perishable food to shelf-stable commodities through dehydration is a proven practice. Yet, effective technologies remain under-utilised in rural African settings that are frequently characterised by high levels of poverty and malnutrition. More than 30% of all fresh produce in sub-Saharan Africa (SSA) is lost or wasted after harvesting due to spoilage or damaged during storage, transport and at markets. Affordable and low technology level interventions are thus required to lower the barriers to innovative technology deployment. On-farm drying is a potential solution to this challenge, which additionally empowers rural small farmers to add value and serve more predictable markets. Anaerobic digestion (AD) of farm wastes e.g., offcuts generated in the preparation for drying, such as peeling and trimming, in combination with farm animal manure, is a synergistic technology that can provide biogas as a source of heat for absorption cooling or dehumidifying desiccation, to provide a dehumidification system integrated with solar drying. This study aims to assess the effectiveness of AD in combination with on-farm solar drying on representative food applications, such as fish, fruit, vegetables and leafy greens, as part of a circular food waste prevention system with the extended benefits of supporting the development of the circular economy and contribute to socio-economic development.

An opportunity is available for postgraduate research to investigate the use of waste to generate cooling through the combustion of biogas from anaerobic digestion (AD) to avoid food spoilage, especially at the post-harvest stage. Integration of the AD technology with a solar drying system forms a unique aspect of the work. Such technology is specifically targeted at subsistence farmers in rural settings throughout the African continent where such a robust and rugged system will serve as a key intervention to minimise food losses by drying. The project will include (i) technical modelling to determine mass and energy balances to determine the sizing of all equipment components, including AD reactor, dehumidifier components and the contribution of solar radiation, (ii) development, commission, and test a drying system, (iii) integrate the dehumidifier into a real size (ca. 80 kg capacity) hybrid solar drying technology system consisting of a solar drying tunnel with forced air circulation, and (iv) use experimental data to populate a simulation model to estimate financial return and benefits through avoided food waste.

### Requirements

- A bachelor's degree (BEng/BScEng or similar) in chemical engineering from an accredited tertiary institution. *Applicants with BTech, National Diploma, or Advanced Diploma qualifications will not be considered for this position.*
- Applicants must display academic excellence preferably with a degree aggregate >65%.
- Previous experience in bioprocess development and/or biomass processing will be a definite advantage but is not required.
- Hands-on experience with developing and building equipment will be considered a plus.
- Preference will be given to South African citizens and permanent residents who display academic excellence.

## Application

Interested candidates must provide a cover letter, CV, degree certificate(s), complete academic transcript(s) and contact details of at least three academic references. Applicants may also send their final-year research project (or similar) for an example of previous academic written work. Incomplete applications will not be considered. Applications can be sent to [eugenevrb@sun.ac.za](mailto:eugenevrb@sun.ac.za). Candidates may consider their application unsuccessful if they do not receive any feedback within four weeks of applying.

Further to submitting the application documents to Prof van Rensburg, candidates must also complete and submit an institutional application. Please read more about the application process [here](#).

*Stellenbosch University reserves the right not to fill the position.*