MOZAMBIQUE

Population: 33 million (2022)

Research and development expenditures as a proportion of GDP: 0.31% (2015)

Researchers (in full-time equivalent) per million inhabitants: 43 (2015)

Scientific and technical journal articles: 173 thousand (2020)

Source: World Bank Data 2023

MOZAMBIQUE
Country Report 2023

Mozambique is one of the fastest growing economies in Sub Saharan Africa, with GDP growth of 4.8% in 2023 and 8.3% projected in 2024, according to the African Development Bank. Extractives and agriculture contribute the highest to the GDP. With its abundant natural resources, including arable land, water, energy and mineral resources, Mozambique has potential to diversify its economy. It's strategic location as a logistics corridor in the Southern Africa region is another natural advantage.

Mozambique is paying great attention to higher education, science and innovation to increase the proportion of scientifically skilled workforce that is necessary to sustain and increase growth opportunities.

Contribution to PASET-Rsif

Mozambique is one of the nine African countries that is contributing to the Regional Scholarship and Innovation Fund (Rsif) of the Partnership for skills in Applied Sciences, Engineering and Technology (PASET), since 2021 *(Figure 1)*. Its contribution of USD 6 million is through the World Bank supported Improvement of Skills Development in Mozambique (MozSkills) project and is towards training Mozambican PhD students and to provide pilot grants for research and innovation projects led by Mozambican universities and research institutions in strategic high potential sectors.

Through PASET-Rsif Mozambique will build strong institutions and future science leaders to drive a science and technology-led growth and development.

Why Rsif matters

- **High quality PhD training:** Combining intra-Africa academic exchange and international partnerships for world-class doctoral training.
- **Wider academic and research network:** Research placement at an advanced institution for exposure to cutting-edge technologies and connecting with global research networks.
- **Regional integration within Africa:** Strengthening centers of excellence and innovation ecosystems for the benefit of the whole region.
- **Better economies of scale:** A Pan-African partnership and a jointly pooled science fund that is professionally managed by the Rsif Regional Coordination Unit at *icipe*.

Rsif in Mozambique at a glance

32 Mozambicans awarded Rsif PhD scholarship (31% women and 78% faculty)

14 Rsif research and innovation projects

8 Mozambican institutions leading Rsif projects

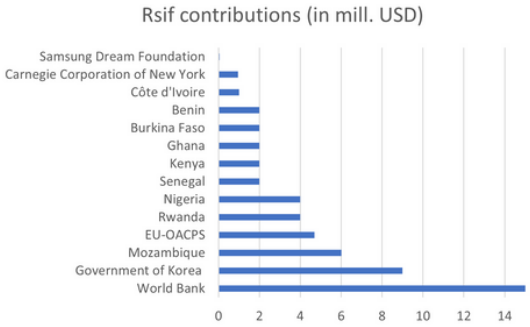

Figure 1: Rsif Contributing Countries and Partners

Rsif thematic areas

- Data science, including artificial intelligence
- Sustainable food systems including agribusiness
- Minerals, Mining and Material Science
- Energy including renewables
- Climate Change

Strengthening research and innovation capacity in Mozambique

There are 32 Mozambican Rsif doctoral scholars registered in 10 different Rsif African Host Universities *(Figure 2)*. They will spend 6-12 months for the Rsif 'sandwich programme' at an advanced international partner institution conducting collaborative research. A third of the scholars are female. 78% of the scholars are faculty at various universities in Mozambique.

14 research and innovation grants have been awarded to eight different Mozambican institutions *(Table 1)*. These are: Eduardo Mondlane University (6 projects), University Rovuma (2 projects) and with one project each: Universidade Save, Universidade Zambeze, Universidade Púnguè, Instituto Superior Politecnico de Manica (ISPM), Instituto Superior Politécnico de Gaza (ISPG) and Mozambique Agricultural Research Institute (IIAM). *(Figure 4)*

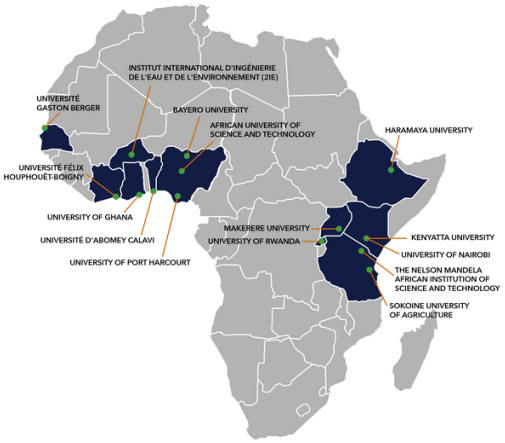

Figure 2: Rsif African Host Universities

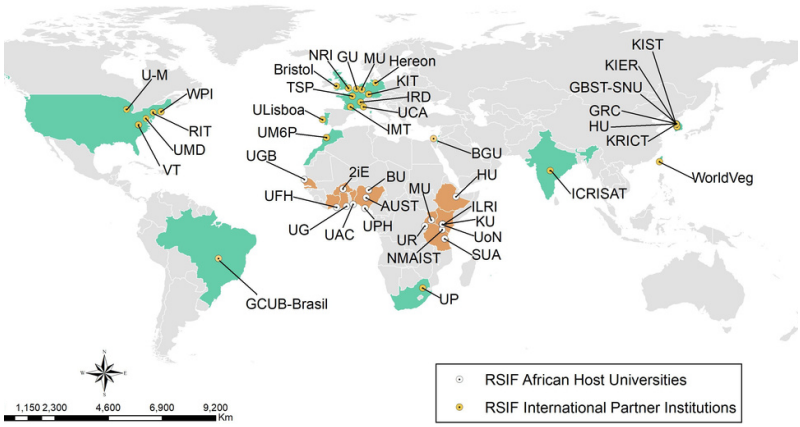

Figure 3: Rsif International Partner Institutions

> **By working closely with academic institutions, relevant investors and governments, and other stakeholders; specialized knowledge will be integrated in the region and transferred to the future generation.**

Spotlight on Mozambique's future science leaders

Modernizing agriculture: Internet of Things and AI predictive models for agricultural value chain. Incubator for prototype development and commercialization of new agri-products

Armando Egas José.

Assistant lecturer at University Eduardo Mondlane (UEM), School of Rural Development (ESUDER), with background in crop production, agriculture engineering, mechanization and precision farming.

His expertise involves small scale farmers' smart machinery prototyping, photovoltaics and living plants energy harvesting, and crop production data analytics. He has coordinated and collaborated in several projects and won awards as best innovator in machinery prototyping.

Currently he is an Rsif PhD student in Internet of Things and Embedded Systems at University of Rwanda in Kigali, Rwanda with research placement at the Worcester Polytechnic Institute (WPI) in Boston, USA. Research area: IoT-AI predictive analytical models for agricultural value chain. Case study of cassava value chain.

In 2023, he was competitively awarded an Rsif MozSkills cooperability award for the project entitled 'Incubator for the conception and improvement of agrarian sector prototypes into marketable products'. The project aims to create an incubator at the UEM - ESUDER, Inhambane province. A network will be established between the partners: ESUDER, the Inhassoro Vocational Training Center (CFPI) and JAM-life to respond to the challenges of the small-scale agricultural sector and promoting use of appropriate machinery for improved productivity.

The project will support prototype development and commercialization of new agri-products developed by students and researchers in the UEM community with prospects of creating employment opportunities for the youth.

> Investing in training and harnessing excellent science leaders have tangible socio-economic returns for the nation and continent at large.

Cyber Security and Machine Learning

Hermenegildo Alberto

Rsif PhD student in Computer Science at the African Center of Excellence, Mathematics, Information Technology and ICT (CEA-MITIC), University of Gaston Berger in Senegal.
Research placement at Karlsruhe Institute of Technology (KIT), Germany.

Research area: Predicting and forecasting cyber attacks: a machine learning approach

Energy including renewables

Fauzia Argentina Guibunda

Rsif PhD student in Physics at University of Nairobi, Kenya.
Matched for research placement at North Western University (NWU), USA.

Research area: Design and performance analysis of a forced convection solar dryer for charcoal briquette

Improving potato yield

Sande Tamara Jose

Faculty at Zambeze University, Mozambique.
Rsif PhD student at Sokoine University of Agriculture, Tanzania.

Research area: Improving Irish potato yield by co-application of inorganic fertilizer, vermicompost, and a biofertilizer in Barue and Angonia, Mozambique

Impact of new varieties

Hercidio Jaime Tandane

Employed at Agricultural Research Institute of Mozambique (IIAM). PhD student at Sokoine University of Agriculture, Tanzania.

Research area: The contribution of new sweet potato varieties adoption on household food security, income and nutrition in Gaza province, Mozambique

Rsif awards competitive research and innovation grants that complements the PhD training at African universities by supporting research that promotes scientific excellence and use of knowledge for sustainable development impact.

Drying technology for reducing post-harvest loss and increasing high-quality market-competitive products

Project visit by the Minister of Science, Technology and Higher Education

Project title: Solar dryer integrated with natural rocks as energy storage for drying fruits and vegetables in Mozambique

Project leader: Dr Luís Cristóvão, Assistant Professor at the Faculty of Environmental Engineering and Natural Resources, Universidad Zambeze

Partners: Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha, Tanzania

In Mozambique, more than 80% of the total population lives in rural areas and depend on agriculture, livestock and silviculture – activities often affected by climate change. Post-harvest loss has been identified as a crucial challenge to achieving food and nutrition security. Thus, practical ways of cheaply and sanitarily preserving foods are needed.

Drying is an important post-harvest handling process. Despite the development of solar drying technologies in sub-Saharan Africa, most of these have some limitations that require further research. Many solar dryers are only useful in the presence of solar radiation and useless at night or during cloudy days. To enable off-sun drying, heat storage must be integrated. Thus, the main objective of this project is to develop inexpensive, effective, and reliable solar dryer integrated with thermal energy-storage system made of locally abundant and affordable materials with favorable thermal and mechanical properties.

The proposed drying technology uses solar energy, which decreases deforestation and climate change impacts resulting from using fuelwood for drying purposes. The technology will contribute to reduced post-harvest loss and increased high-quality dried products which are market-competitive and hence improve farmers' livelihood and national income at large.

Table 1 : Rsif Projects in Mozambique

Grant Type	No. of grants awarded	Institutions
Research Award	7	UEM (3) UniZambeze, UniRovuma, IIAM, UEM/ESUDER
Institutional Capacity Building Programme	4	UEM, ISPM, ISPG, UniPungué
Cooperability Grants	3	UEM/ESUDER, UniRovuma, UniSave

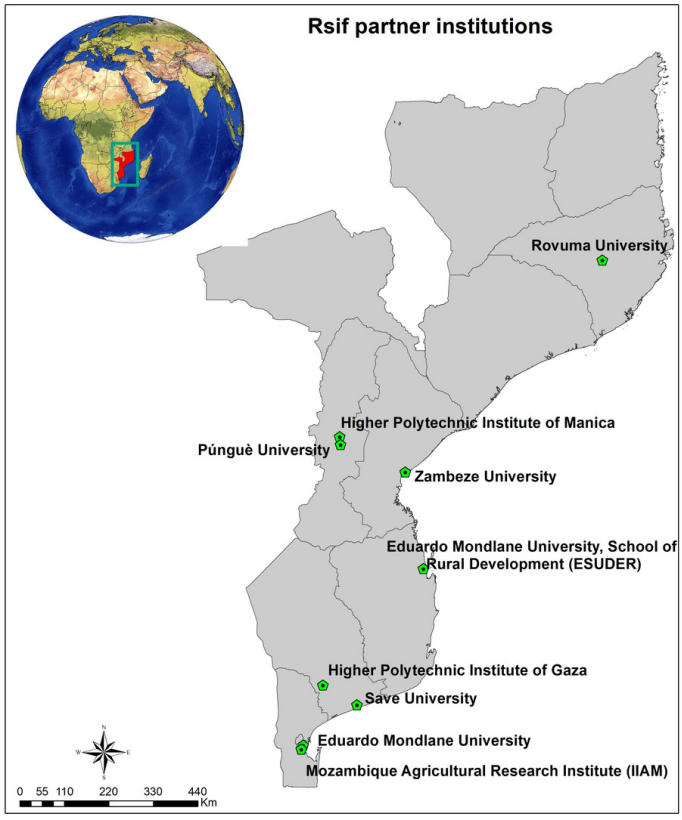

Figure 4 : Rsif implementing institutions in Mozambique

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