



TANZANIA

Population: 65.5 million (2022)

Research and development expenditures as a proportion of GDP : 0.51% (2013)

Researchers (in full-time equivalent) per million inhabitants : 19 (2013)

Scientific and technical journal articles: 897 thousand (2020)

Source: World Bank Data 2023

TANZANIA

Country Report 2023

Tanzania's GDP is projected to rise to 6.3% in 2024, driven by sustained recovery in tourism and gradual stability in supply and value chains according to the African Development Bank. Tanzania has vast natural capital and energy potential. Higher public education spending would contribute to boosting human capital and social inclusion in line with the ambition of Tanzania's Vision 2025 as well as the UN Sustainable Development Goals.


World-class scientists and skills development that matches business demand combined with an improved business environment hold promising potential for quality jobs and improved livelihoods.

Contribution to PASET-Rsif


Tanzania is one of eleven African countries that are active in the Partnership for skills in Applied Sciences, Engineering and Technology (PASET), and has expressed its intention to contribute to the Regional Scholarship and Innovation Fund (Rsif), which is PASET's flagship initiative (Figure 1).

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


Rsif thematic areas




Data science, including artificial intelligence




Sustainable food systems including agribusiness



Minerals, Mining and Material Science



Energy including renewables



Climate Change

Rsif in Tanzania at a glance

60



Rsif PhD students hosted (20 nationalities, 35% women, 6 who graduated)

11



Tanzanians awarded Rsif PhD scholarship (73% women, 2 who graduated)

71



Research publications

6



Rsif research and innovation projects

Rsif contributions (in mill. USD)

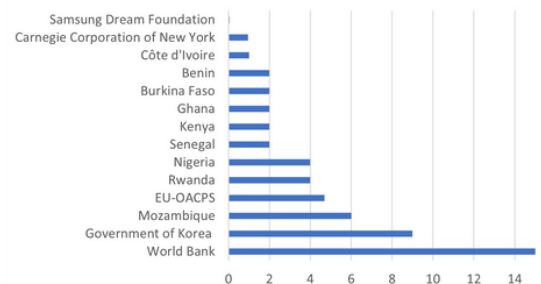


Figure 1: Rsif Contributing Countries and Partners

Table 1: Number of Tanzanian Rsif funded PhD scholars

AHU	Country	Theme	No.
NM-AIST	Tanzania	Material Science	3
BUK	Nigeria	Climate Change	2
SUA	Tanzania	Food Security	4
UR	Rwanda	ICT	2

Strengthening research and innovation capacity in Tanzania

Sokoine University of Agriculture (SUA) and Nelson Mandela African Institution of Science and Technology (NM-AIST) are Rsif African Host Universities (Figure 2).

SUA and NM-AIST benefit from linkages with other African universities as well as the Rsif international partner institutions for the Rsif 'sandwich' programme where students spend 6-12 months at an advanced institution conducting collaborative research (Figure 3).

Rsif also provided video-conferencing equipment, facilities for e-learning and access to a wide range of scientific journals to the library and its students.

Since 2017, the Southern African Centre for Infectious Disease Surveillance (SACIDS) at SUA is hosting 43 Rsif funded PhD students (33% women, 14 nationalities, 5 who graduated) and implementing 3 Rsif research and innovation projects. The Rsif students at SUA have 38 peer-reviewed journal publications.

Since 2019, the Water Infrastructure & Sustainable Energy Centre for the Futures (WISE-Futures) at NM-AIST is hosting 17 Rsif PhD students in Materials Science and Engineering (MaSE) (41% women, 12 nationalities, 1 who graduated) and is implementing 3 Rsif research projects. The Rsif students and faculty at NM-AIST have 29 peer-reviewed journal publications.

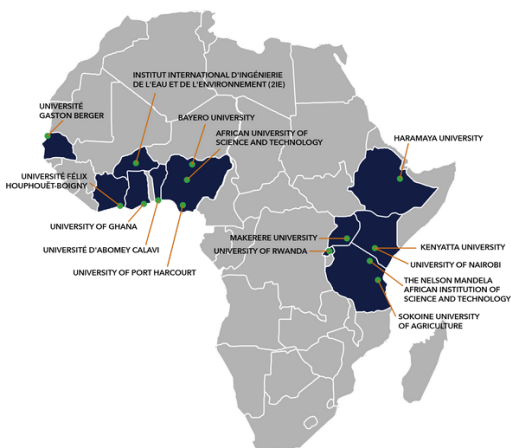


Figure 2: Rsif African Host Universities

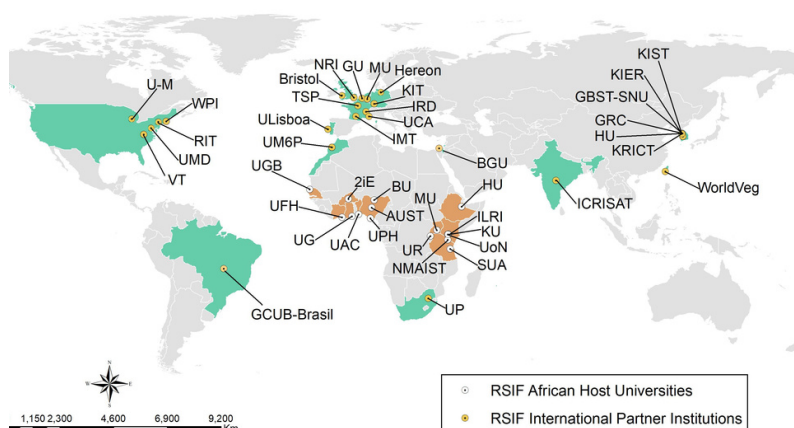


Figure 3: Rsif International Partner Institutions

Spotlight on Tanzania's future science leaders

Integrated AI, Internet of Things (IoT) and a Swahili Chatbot: Agri-Tech Solution for Early Disease Detection on Maize



Theofrida Maginga, Tanzanian, 30 years

On study leave from Sokoine University of Agriculture, Tanzania. Pursuing a PhD degree in Internet of Things and embedded systems at the University of Rwanda with an Rsif scholarship. Research placement to the Seoul National University Global Research & Development and Business Center (GRC), Korea.

Research topic: Convergence of IoT, AI and natural language processing to support low-literacy rural farmers in early detection of crop diseases: Case study of maize in Tanzania. 3 publications
Grant from Gates Foundation Grand Challenges in Artificial Intelligence.



Maize is one of the most important crops in Tanzania and generates up to 50% of rural cash income. Several diseases that afflict maize are hard to detect visually, leading to substantial losses in crop productivity and income. Integrating AI with IoT technologies that use non-invasive sensors can allow detecting diseases early, thereby boosting maize yields. MkulimaGPT, a Swahili chatbot for smallholder farmers is expected to be launched by early 2024. Sensors can monitor non-visual early indicators of diseases, including volatile organic compounds, ultrasound movements, and soil nutrient uptake. Through the chatbot the scientists will interact with farmers, perform model validation and field testing.

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

Viral Epidemics



Dr Jean Nepomuscene Hakizimana, Rwandan

First Rsif PhD graduate from SUA (2021). Currently a Postdoctoral Research Fellow in Virology at Oliver R. Tambo Africa Research Chair for Viral Epidemics at the SACIDS Foundation for One Health at SUA.

Winner of Rsif Junior Investigator Research Award (U\$80,000)

Research area: Leveraging pathogen genomics for an improved domestic pig health and production by mapping African swine fever virus transmission dynamics at the wildlife-livestock interface in Tanzania.
6 journal publications

Water treatment



Tusekile Alfredy, Tanzanian

Rsif PhD student in Materials Science and Engineering at NM-AIST. Research placement at University Mohammed VI Polytechnic (UM6P) in Morocco.

Research area: Metal oxides modified carbon electrode materials for defluoridation and paraquat herbicide removal from water by capacitive deionization.
3 publications

Healthy soils



Dr Ruth Lorivi Moirana, Tanzanian

First Rsif PhD graduate from NM-AIST (2023). Currently an Assistant Lecturer at Nelson Mandela African Institution of Science and Technology (NM-AIST), Tanzania

Research placement at the Natural Resources Institute (NRI), University of Greenwich, United Kingdom.

Research area: Remediation of fluoride-contaminated soils using seaweed-derived materials
4 journal publications

Detecting RNA viruses



Dr Emmanuel Kifaro, Tanzanian

Rsif PhD graduate from Sokoine University of Agriculture (SUA) (2023). Currently a Lecturer at the Department of Microbiology, Parasitology, and Biotechnology at Sokoine University of Agriculture. Research placement at Korea Institute of Science and Technology (KIST), Korea.

Research area: Development of microparticles qPCR for the detection of selected RNA viruses from non-invasive animal specimens
2 publications

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.

Rsif funded Research and Innovation Project

Major contribution in reducing post-harvest losses and environmental remediation from adapting appropriate technology for drying of biomaterials



Prof. Thomas Kivevele, Head of Research and Innovation at WISE Futures, NM-AIST

Over 40% of agricultural produce in developing countries go to waste due to inadequate storage and processing facilities, and a lack of knowledge about processing technologies. Drying can extend product lifespans and availability, but food industries have high standards and controlling the drying rate and extent of cell damage is a complex process.

The project developed a solar-assisted heat pump dryer with thermal energy storage for high-quality drying of fruits, herbs, vegetables, grains, and fish. It outperforms traditional drying methods using firewood, fossil fuels, or electricity, which contribute to deforestation, emissions, and health issues. The Project's data and analysis demonstrate the prototype's advantages.



Drying chamber

Project title: Solar-assisted heat pump dryer with energy storage for drying biomaterials (SOHEADS)

Project leader: Prof. Thomas Kivevele, Head of Research and Innovation at WISE Futures, NM-AIST

Partners: Alpha Thermal Process, LLC; Empowering Africa Consulting Group LLC, USA; and Arusha Technical College, Tanzania.

The technology is developed using readily available materials which are cheaper, including natural rocks for energy storage. Since the dryer can be produced locally, acquiring this technology has a short payback period. The cost of production is also low, due to high energy saving potential and low maintenance cost.

The research findings have been published in three peer-reviewed articles and presented at an international conference of the African Materials Research Society in Senegal. The impact of the project has already extended to Mozambique, through a partnership between NM-AIST and another Rsif project implemented by Zambeze University in cooperation with the Government of Mozambique and the World Bank.

“

The project has developed, tested, and patented a dryer with excellent thermal and drying performance of heat sensitive biomaterials. The patent has been registered with the Business Registrations and Licensing Agency (BRELA), Tanzania. Reliable solar-powered dryer systems integrated with energy storage, facilitate drying even when it is cloudy, raining or night. The technology is expected to have a remarkable impact on drying activities mostly done by women, creating green jobs and contributing to increased quality dried products, improved farmers' livelihoods, positively impacting national income at large.

”

Prof. Thomas Kivevele, NM-AIST



Contact us

Regional Coordination Unit (RCU)
International Centre of Insect Physiology and
Ecology (*icipe*)
P.O. Box 30772 – 00100, Nairobi, Kenya
Tel +254 (20) 8632000
Email: rsif@icipe.org

 www.rsif-paset.org

 @PasetRsif

 @PASET-Rsif

 @TheRSIF