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PASET
Partnership for Skills
in Applied Sciences,
Engineering & Technology

Rsif
Regional
Scholarship and
Innovation Fund
Research. Innovate. Transform Africa

icipe

RWANDA

Population: 13.8 million (2022)

Research and development expenditures as a proportion of GDP : 0.76% (2019)

Researchers (in full-time equivalent) per million inhabitants : 59 (2019)

Scientific and technical journal articles: 264 thousand (2020)

Source: World Bank Data 2023

RWANDA
Country Report 2023

Rwanda is among the world's fastest growing economies with a projected growth in GDP of 8.0% in 2024 according to the African Development Bank. The need for highly skilled human capital is a driver for Rwanda's Vision 2050. Investing in higher education, research and innovation will enable Rwanda to close the skills gap and contribute to sustainable economic growth and development.

Contribution to PASET-Rsif

Rwanda is one of the nine African countries that are contributing to the Regional Scholarship and Innovation Fund (Rsif) of the Partnership for skills in Applied Sciences, Engineering and Technology (PASET) since 2015 (*Figure 1*). It's committed contribution is USD 4 million to train Rwandan PhD students in selected African host universities and collaborating with international partner institutions. (Additional students to be recruited in cohort 5 and 6.)

Through PASET-Rsif, Rwanda will build strong institutions and future science leaders to drive a science and technology-led growth and development. Rwanda is founding member and current chair of PASET and hosts its Secretariat since July 2023.

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 benefit of the whole region.
- **Better economies of scale:** Pan-African partnerships, and a jointly pooled science fund professionally managed by the Rsif Regional Coordination Unit at *icipe*.

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 Rwanda at a glance

17 Rsif PhD students hosted at University of Rwanda (UR) (10 nationalities, 47% women).

22 Rwandans awarded Rsif PhD scholarship (27% women, 4 in first cohort already graduated - (see photo).

47 Research publications (as of October 2023).

7 Rsif research and innovation projects (totaling US$ 521,583) awarded to Academic staff at UR.

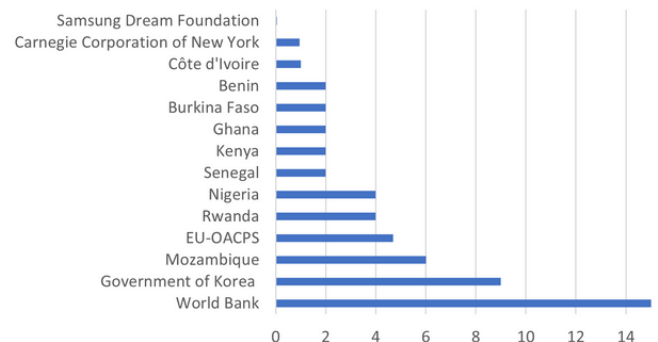### Rsif contributions (in mill. USD)

Figure 1: Rsif Contributing Countries and Partners

Strengthening research and innovation capacity in Rwanda

The University of Rwanda (UR) is one of the 15 Rsif African Host Universities (*Figure 2*).

The PhD programme in Internet of Things: Embedded Computing System at the African Centre of Excellence in Internet of Things (ACE-IoT), College of Science and Technology, is hosting 17 Rsif funded PhD students (47% women, 10 nationalities).

UR benefits 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. (Refer to Annex 1.)
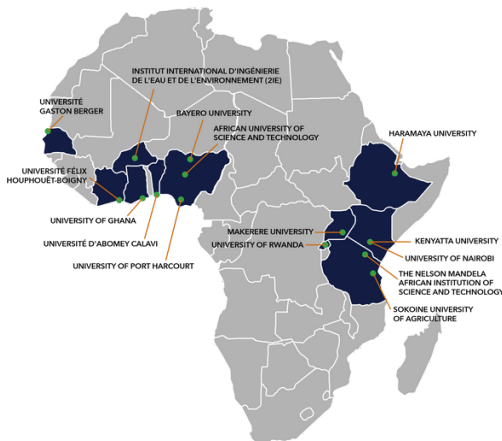
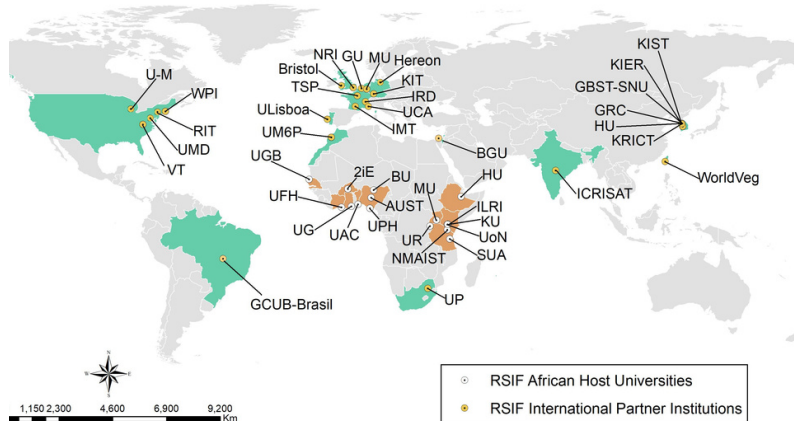*Figure 2: Rsif African Host Universities*

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 Rwandan Rsif scholars
Molecular Microbiology and Antimicrobial Resistance

Recipient of an Rsif Junior Investigator Research Award (US$ 80,000)

Research area: Prevalence, antimicrobial susceptibility profiles, and genotypes of thermophilic Campylobacter species from humans and animals in selected regions of Rwanda

Dr Noël Gahamanyi. PASET- Rsif alumnus. Director of Microbiology Unit, Rwanda Biomedical Centre (since July 2023). He also serves as a visiting Lecturer of Microbiology related modules at the University of Rwanda.

Dr Gahamanyi graduated from Sokoine University of Agriculture, Tanzania with best post-graduate thesis award 2021-22. His research placement was at the Korea Institute of Science and Technology, where molecular work related to his PhD was conducted. During his PhD journey, he produced eight publications of which five are indexed at PubMed.

Due to excessive use of antibiotics in human and animal medicine, there is an escalating number of antimicrobial resistant (AMR) strains. Fluoroquinolone - resistant Campylobacter strains are classified by the World Health organization as one of the priority pathogens requiring the discovery of new drugs.

The research project is expected to (i) reveal the prevalence and genotypes of Campylobacter species in both humans and animals in Rwanda, and (ii) produce antimicrobial resistance profiles of Campylobacter isolates in the country.

The data will help increase awareness on Campylobacter as one of the etiological agents of diarrhea and provide baseline information that can influence AMR surveillance in Rwanda or further studies.

> *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

Rsif PhD graduate from Sokoine University of Agriculture (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.
Recipient 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 publications

Mineral Processing

Dr Jeanne Pauline Munganyinka, Rwandan

Rsif PhD graduate from the African University of Science and Technology (AUST), Nigeria (2022). Research placement at Worcester Polytechnic Institute, USA.

Currently a Lecturer at University of Rwanda. Co-founder at N.M.K. Geological and Mining Consultant Services Ltd.

Research area: Geometallurgical Characterization and Environmentally friendly method of gold leaching process in Rwanda and Nigeria
7 publications

Climate Resilience in Agriculture

Petronille Dusingizimana, Rwandan

Rsif PhD student at University Félix Houphouët-Boigny, the Africa Center of Excellence for Climate Change Biodiversity and Sustainable Agriculture in Côte d'Ivoire. Research placement at University Mohammed VI Polytechnic (UM6P) in Morocco.

Research area: Assessing the potential of conservation agriculture to increase maize smallholder farmer's resilience to climate change in Rwanda: Kirehe Case study.
2 publications

Artificial Intelligence and IoT

Theofrida Maginga, Tanzanian

Rsif PhD student at University of Rwanda. Research placement at the Seoul National University Global Research & Development and Business Center, Korea.

Research area: 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.

Gates Foundation Grand Challenges in Artificial Intelligence Grant - (Link to story in New Times)
3 publications

Smart Bee Hiving Technology to Multiply Honey Production

Dr Damien Hanyurwimfura, Associate Professor and Acting Director of African Center of Excellence in Internet of Things (ACE-IoT) at UR

Project title: Smart Bee Hiving Technology

Project leader: Dr Damien Hanyurwimfura, ACE-IoT, University of Rwanda

Partners: NARADA Electronics Ltd, Rwanda; Seed Technology Engineering and Science Group, Rwanda; University of Malawi, Copperbelt University, Sodertorn University

This project introduces the Smart Bees Hiving Technology (SBHT) into bees hives monitoring, protection and production. The smart technology allows monitoring of a whole range of parameters relating to the conditions impacting on the bees' life cycle and functions. The project also does capacity building in technological skills for the implementation of smart bee farming and entrepreneurship and commercialization of the SBHT product in the market.

Knowledge of the device has been disseminated to more than 20 beekeepers. From 21-23 July 2023, a specialized training session was held for beekeepers associated with beekeeping cooperatives in Huye and Nyaruguru districts.

A doctoral student, Elias Ntawuzumunsi, was the one who first brought the idea of introducing IoT in bees keeping. Thanks to the sensors in the SBHT device, beekeepers can utilize smartphones to monitor temperature, humidity and even sound and movement inside and outside the hives. "The device is equipped with a digital siren to deter animals and intruders, smoke detectors to notify beekeepers of forest fires, and an air ventilation system to protect bees exposed to harmful external air," he said in an interview with Heritier Bahizi of the New Times (Link to the article here on the transformative solution SBHT offer for beekeepers.)

Beekeepers from Nyaruguru and Huye districts were trained in the SBHT technology

> The partnership with private company NARADA Ltd is important to ensure the viability and sustainability of the smart beehive technology devices in Rwanda. Informed by and responding to the needs of beekeepers, the innovation promises to have a significant impact on honey production. It addresses the essential elements critical to successful beekeeping, while providing timely alerts to beekeepers when an issue needs to be addressed. The device's affordability and solar-powered design make it an eco-friendly and economically viable option. This PASET-Rsif project funded through the International Centre of Insect Physiology and Ecology is part of the University of Rwanda's larger efforts to link with industry players to apply innovations in the community.
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> *Dr. Damien Hanyurwimfura, UR-ACE IoT*