



# RWANDA

Country Report 2021



## Summary of RSIF in Rwanda

**20** Rwandan RSIF doctoral scholars enrolled

**24** PhD scholars and faculty trained

**14** Trainings held

The **PASET** Regional Scholarship and Innovation Fund



**PASET**  
Partnership for Skills  
in Applied Sciences,  
Engineering & Technology

*An Africa-led initiative to bridge the skills gap in Applied Sciences, Engineering, & Technology*



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## RSIF IS THE FIRST PAN-AFRICAN SCIENCE FUND OF ITS KIND

Contributing countries: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Kenya, Mozambique, Nigeria, **Rwanda** and Senegal have made or are at the final stages of making contributions to PASET RSIF, in addition to the Government of Korea, the ACP Innovation Fund of the European Union and the World Bank.

**RSIF is the first Pan-African Science fund of its kind connecting innovative minds to resources for revolutionary solutions.**

It is the flagship product of PASET, an initiative led by African governments aimed at building skills of citizens of sub-Saharan Africa countries in the field of applied sciences, engineering, and technology for national economic growth on the continent. RSIF builds sustainable doctoral training, highly advanced research and innovation ecosystems to develop transformative technologies in Africa for economic growth and development.



At least 40% of the beneficiaries are women and priority is given to young faculty without a PhD.

## Rwanda's contribution to RSIF

Rwanda is a founding member of PASET, was among the first countries to contribute to RSIF and it hosted the 5th PASET Forum in Kigali in 2019. The Minister of Education represents Rwanda in the PASET Governing Council, and the Adviser sits in the PASET Executive Board.

Rwanda's initial US\$2 million contribution has now been fully exhausted. 80% of Rwanda's contribution directly supports training of Rwandan scholars and is currently committed to enrolled students in the RSIF PhD scholarship programme. The potential of Rwanda's innovative expansion due to this investment is multiplied when leveraged by the funds through matching support from various donors, including the Government of Korea, international partner institutions and others.

By being part of RSIF, Rwanda benefits from joint resource mobilization with other countries and capacity building for PhDs and research and innovation far into the future. PASET aims to mobilise over USD 500 million into the RSIF endowment fund, with an estimated 20% to be allocated to research and innovation projects for the benefit of citizens and institutions of participating countries. Many African countries are interested to be part of this.

## RSIF competitively selects and harnesses the brightest minds with:

(i) doctoral scholarships at Host Universities in Africa and 'sandwich' training at selected International Partner Organizations, (ii) research awards, and (iii) innovation awards to faculty of graduated RSIF scholars.

## PASET members have prioritized five cutting-edge thematic areas that will drive growth on the continent:



ICTs including big data & artificial intelligence



Minerals, mining & materials engineering



Energy including renewables



Food security & agribusiness



Climate change

# BENEFITS TO CONTRIBUTING GOVERNMENTS

**As a contributor to RSIF, Rwanda benefits in more ways than through the cost-effective training of its doctoral students.**

Countries also benefit from efficient centralized administration of the scholarship and other grants, support for the RSIF scholars to ensure that they complete on time, as well as regular monitoring reports on the progress of their students. The pooling of funds, the highly competitive selection of host universities, international partners and students, and the efficient administration of the fund enhances the value and increases the benefits.

Rwanda's participation in RSIF benefits the entire Rwandan higher education, science and innovation ecosystem. All RSIF scholars will undergo high quality doctoral training in competitively selected SSA universities partnered with international universities, with study abroad for part of the time, at a fraction of the cost of sending students abroad for a full time PhD. On successful completion of the PhD, the students will be eligible for research and innovation grants.



## Highly Skilled Human Capital as a Driver for Rwanda Vision 2050

The rationale for RSIF is that Africa requires world class scientists in priority thematic disciplines that are relevant to national economic growth across sub-Saharan Africa. Some of these areas include orphaned research areas such as mining, minerals and materials science, energy and information and

communication technology among others. This African led program aims to support the training of African innovators and leaders, with focus on women and faculty, to be able to strengthen the capacity of universities to train at the doctoral level and undertake innovative and impactful research for the future needs of the country. Nurturing High-Impact Partnerships



# NURTURING HIGH-IMPACT PARTNERSHIPS

and Strengthening Research and Innovation capacity of University of Rwanda

Photo: Worcester Polytechnic Institute in Boston is hosting two Rwandan RSIF-PASET scholars in the inaugural PASET programme.



In 2019, University of Rwanda (UR), the Africa Centre of Excellence in Internet of Things (ACEIoT), was competitively selected as an RSIF African Host University in the PASET priority thematic area of ICTs including big data and artificial intelligence. The selected PhD at UR programme is in Internet of Things: Embedded Computing Systems.

[UR is currently hosting five RSIF funded doctoral scholars \(of which two Rwandans\).](#)

Six more Cohort 3 students will join this year. As an RSIF African Host University, UR benefits from various capacity building and technical support, such as strengthening internationalization and accreditation.

UR benefits from linkages with other RSIF AHUs as well as with RSIF international partner institutions for the RSIF's 'sandwich programme' - whereby students spend 6-24 months at an advanced institution conducting collaborative research.

RSIF has supported the establishment of research networks to support UR. For example, faculty members participated in a study visit to Mohamed 6 Polytechnic (UM6P), Morocco in September 2019 to identify areas for research collaboration and student sandwich training along with ten other universities.

UR is co-leading the PASET-RSIF network in Big Data and Artificial Intelligence together with University Gaston Berger, Senegal.

Photo: Agreement between UR, an RSIF African Host University, and *icipe*, the Regional Coordination Unit for RSIF, was signed in Nairobi in presence of the Kenya government chairing the PASET Governing Council, and the Executive Director of PASET Executive Board, on the 7 October 2019. [Read more](#)



Photo: Three faculty members from UR benefited from RSIF grant writing training at *icipe*, in January 2020.



UR has received video-conferencing equipment and related facilities to enhance e-learning, particularly as a response to the pandemic. RSIF is also providing increased access to a wide range of scientific journal resources to UR library and its students.

To help universities respond to COVID-19, *icipe* has provided two training workshops on 'The use of Online Educational Resources in Higher Education' and on 'Online Educational Resources as a Response to the COVID-19 Crisis' co-organized by EPFL (Switzerland) and University Mohammed VI UM6P (Morocco). A training was also done on 'Helping Faculty Deliver their Courses Online during the COVID-19 Crisis' with the Director of Digital Innovation at Arizona State University.

Strengthening university innovation and delivery of personal protective equipments (PPEs) – eight session training were provided by Worcester Polytechnic Institute (WPI), Boston, USA on COVID-19 and 3D printer assembly as well as printing of face masks, face shields and respirator. Universities were able to learn practically how to print various PPEs and supplied these to hospitals and to the public.

### RSIF Training Courses Provided:

1. Research Communications and social media
2. Digital Storytelling
3. Reference management & open access
4. Grant writing
5. E-Resources
6. Grievance address mechanisms
7. Sexual harassment
8. Strategies for a successful PhD
9. PhD proposal writing
10. Responsible conduct of research including research ethics
11. Introduction to information literacy
12. Introduction to research methods and statistics, data analysis and management
13. Science presentations
14. Science posters

## Training Applied Researchers in Science and Engineering Fields

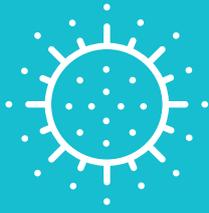
The program has supported more than 180 students. 20 of these are Rwandans. More scholars will be selected in Cohort 4 in late 2021.

The Rwandan RSIF graduates are equipped with advancing technologies and strategic research skills for innovation solutions. This provides opportunities for building new university departments that respond directly to national priorities, boosting Rwanda's capacity to train at the PhD and postdoctoral level. With the ability to undertake high quality research, Rwanda will be well positioned to lead improved outputs, ranking and prestige.

## Breaking Barriers for Women in Science

**Women's participation in research remains low in Africa, with women making up only 30% of the science community.**

30% (six of 20) of the Rwandan scholars in the first three cohorts are female. RSIF assigns attention to not only women, but also, underrepresented groups, seeking to promote family-friendly policies as well as language and accessibility measures.



# RESILIENCE OF RSIF SCHOLARS: COVID-19 CHALLENGES AND LESSONS LEARNT

In a [published article](#), three female RSIF PhD scholars on international sandwich placements in Korea and USA, discuss the impact of COVID-19 pandemic on their personal lives and research journeys. Their immense resilience to pursue despite the unprecedented challenges is evidence of the determination and caliber of RSIF scholars. While the COVID-19 pandemic is affecting all scientists in general, women scientists, especially those with young families, are uniquely impacted. RSIF not only ensures that women scientists enter and thrive in PhD programmes, but also, guarantees that all its 183 scholars are able to circumvent the challenges related to the pandemic. *icipe*, RSIF's RCU is already providing support to scholars in various ways, including online training support, and psychosocial support on issues like mental health. In addition, RSIF is working with partner universities and students towards timely progression in research and overall course completion.

<https://www.universityworldnews.com/post.php?story=20201208123315401>

# CATALYZING RESEARCH

to Generate Transformative  
Technologies for Innovation  
and Development

Faculty members engaged in PhD training at UR are eligible to apply for RSIF Research and Innovation Awards. These competitive grants enable faculty members to advance their research and to help their PhD students generate exceptional research results to solve pressing African challenges.

## Innovation spurs from collaborative knowledge sharing.

RSIF's establishment of international networks provides UR with a global pool of like-minded innovators. For example, faculty study visits were supported to Japanese universities to learn about university-industry linkages.

RSIF provides research and innovation funding for staff at UR. Currently funded, are two active projects that bridge the gap between scientific research and practical innovative solutions. RSIF is encouraging partnership with international partners and private firms to leverage some of the brightest minds on the continent. This will contribute to enhanced partnership in higher education, science and innovation ecosystem and collaboration in training, research and innovation.



My knowledge and dreams are transformed into meaningful skills because of RSIF.

Jeanne Pauline Munganyinka

By working closely with academic institutions, relevant investors and governments, and other stakeholders within sub-Saharan Africa; specialized knowledge will be integrated in the region and transferred to the future generation.

Photos: Rwandan RSIF PhD scholar Jeanne Pauline Munganyinka is doing her sandwich research placement at Worcester Polytechnic Institute, Boston, USA. She went to the World Bank HQs in Washington to present her research in March 2020. She also travelled to Japan on the RSIF study trip in September 2019.





# RSIF INNOVATION PROJECT:

Photo: Exhibition of smart bee hiving technology at the 5th PASET Forum in Kigali in May 2019

## Smart Bee-Hiving Technology

**Project Title:** [Smart Bee-Hiving Technology \(SBHT\)](#)

**Project leader:** [Dr. Damien Hanyurwimfura, UR](#)

**Collaborating partners:**

1. NARADA Electronics Ltd, Rwanda
2. Seed Technology Engineering and Science Group, Rwanda
3. University of Malawi, Malawi
4. Copperbelt University, Zambia
5. Södertorn University, Sweden

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

The SBHT is intended to increase efficiency in the beekeeping environment management, efficiency in management of forestation, increase the viability of the beekeeping industry leading to more job opportunities and improved well-being of people.

# RSIF RESEARCH PROJECT:

## Controlling In-Door Air Pollution

**Project Title:** [Real time Assessment of the indoor air pollution in sub-Saharan African households \(Case study: Rwanda rural and urban areas\)](#)

**Project leader:** [Dr. Frederic Nzanywayingoma, UR](#)

**Collaborating partners:**

1. Makerere University, Uganda
2. Rwanda Environment Management Authority (REMA)

This project seeks to investigate indoor air pollution in households using effective and adapted indoor air pollution IoT monitoring tools. The project will raise awareness about indoor air pollution and its potential risks for rural and urban households. A prototype of an indoor air pollution monitoring tool affordable for the rural population will be developed. While this IoT tool will be tested in Rwanda, it is expected that the same tool will be used to assess the levels of indoor air pollution in their households in Sub-Saharan countries and anywhere world-wide. The research results will provide tangible data useful for policy makers to establish policies for indoor air pollution control in households.

The research results will provide tangible data useful for policy makers.

The project will increase the viability of the beekeeping industry leading to more job opportunities and improved well-being of people.

# SPOTLIGHT ON AFRICA'S FUTURE LEADERS

in Science, Engineering  
and Technology



RSIF PhD scholar  
**NOEL GAHAMANYI** – Sokoine  
University of Agriculture (SUA),  
Tanzania with sandwich  
research placement at the  
Korea Institute of Science and  
Technology (KIST), Korea

As soon as I arrived at KIST, I was provided with a workstation, where I could place my belongings and computer. I immediately began an online Biosafety course on Living Modified Organisms (LMO), which I was informed, was a requirement for accessing laboratory facilities at the institution. The course was very useful and introduced me to the general principles on handling samples and instruments in the laboratory and other aspects of working in the laboratory. The course also included information on how to handle emergencies, such as accidents and, for instance, the use of the fire extinguishers in case of fire.

After receiving primers, master mix, and getting the required reagents, I was able to begin running my samples. My research is on Transmission dynamics and antimicrobial resistance of thermophilic *Campylobacter* in humans, animals, and the environment in Kilosa District, Tanzania. I am making use of Sequencing technology, Polymerase Chain Reaction (PCR), Gel electrophoresis, and an ultra-violet Trans-Illuminator to view bands of amplified DNAs. The research is still ongoing, but I have already been able to prepare and submit a manuscript to a high-quality journal. The research is of importance to my country and the wider Africa region.

**“I am pleased to have had the opportunity to come to Korea and look forward to finishing my research and going back to Sokoine University in Tanzania, my home university, and then back to Rwanda to start my career”.**



RSIF PhD Scholar  
Jean Nepomuscene  
HAKIZIMANA

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**My interest in science started early, based on the desire to become involved in the fight against diseases.**

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## Recently published articles by Rwandan RSIF PhD Scholars

### **RSIF PhD Scholar Jean Nepomuscene**

**Hakizimana**, registered at Sokoine University of Agriculture, SUA, SACIDS.

African swine fever (ASF) is a contagious viral disease that causes high mortality, approaching 100%, in domestic pigs and wild boars. The disease has neither a cure nor a vaccine, and it is caused by an ASF virus (ASFV), the only member of the family *Asfarviridae*, genus *Asfivirus*, and the only known DNA arbovirus. Twenty-four genotypes of ASFV have been described to date, and all of them have been described in Africa. This study profiles the outbreak in Northern Malawi in 2019. [Paper link](#)

### **RSIF PhD Scholar Jean Nepomuscene**

**Hakizimana**

In the context of enhancing understanding of the transmission and spread of African swine fever, to formulate science-based control policies and support development of vaccines, the study describes a virus of the disease, showing high genetic similarities with other strains previously described in domestic pigs, wild suids, and soft ticks in East Africa. These findings indicate a possible common wild source and continuous circulation in domestic pigs in the region. [Paper link](#)

### **RSIF PhD Scholar Noel Gahamanyi,**

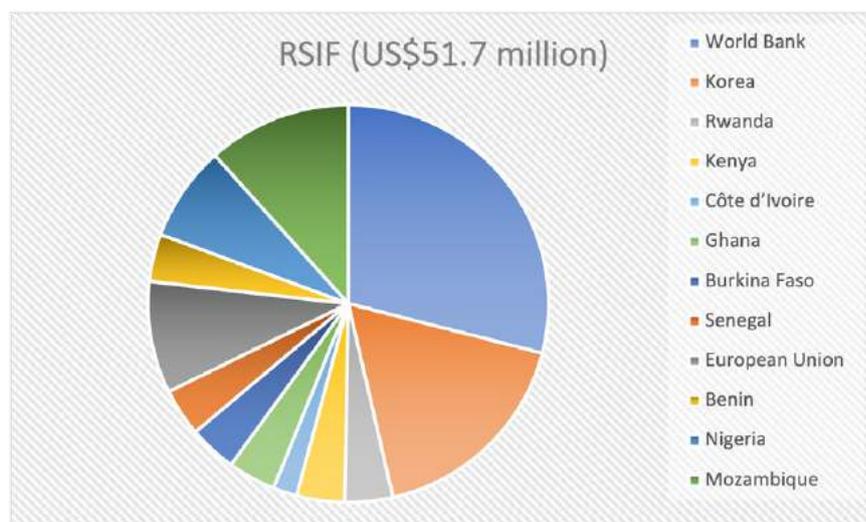
registered at Sokoine University of Agriculture, SUA, SACIDS.

This study identifies natural products that are effective against drug-sensitive and drug-resistant *Campylobacter* strains. The bacteria is one of four key global causes of diarrhoeal diseases, and the most common bacterial cause of human gastroenteritis in the world. The identified products can be exploited by the food processing industry and poultry farms to control this specific bacterial, and other foodborne pathogens. [Paper link](#)

**See repository of RSIF Scholar Research [here](#)**

Name	Research Topic	African Host University	
<a href="#">Jeanne Pauline Munganyinka</a>	Mining and mineral processing: Development of methods to optimize gold recovery and minimize waste and environmental hazards: Case study of Rwanda and Nigeria.	African University of Science and Technology (AUST), Nigeria	
<a href="#">Jean Baptiste Habinshuti</a>	Minerals development (optimization of beneficiation methods for Tantalum)		
Theophile Mugerwa	Clay mineral deposits in Rwanda and their potentiality for ceramics industrial applications		
<a href="#">Gahamanyi Noel</a>	Determining transmission dynamics and antimicrobial resistance of Thermophilic Campylobacter in humans, animals and the environment in Kilosa district, Tanzania	Sokoine University of Agriculture (SUA), Tanzania	
<a href="#">Jean Nepomuscene Hakizimana</a>	Understanding genetic variation and epidemiology of African swine fever virus in Eastern and Southern Africa		
Isidore Nsengimana	Linking serological, molecular and spatial epidemiology to elucidate the Rift Valley Fever Virus activity in Rwanda after the 2018 epidemics		
Celestin Sirimu	Stress activation of dynamically freeze-dried starter cultures		
Donatien Ntawuruhunga	Food Security and Cities: Exploring Urban Food Systems and Trends		
Drocelle Nirere	Standardization of management practices of soyabeans to improve livelihood of farmers and processing industry in Rwanda		
Jean Damascene Tuyizere	The effect of maggots-based organic manure on soil microbiota population and soil fertility restoration under enhanced conservation agriculture cropping system		
Vincent Habimana	The rumen microbiome in health and diseases: new opportunities for diagnosis, prognosis and prevention of livestock diseases		
Nduwayezu Anastase	The effect of climate change on potato pests and diseases: Impact on intensity and yield, and farmer perceptions		University Felix Houphouët-Boigny (UFHB), Côte d'Ivoire
<a href="#">Petronille Dusingizimana</a>	Analysis of impacts of future emission in Rwanda, an emphasis on major crops and their suitability in Rwanda		
Ma-Lyse Nema	Landslide occurrences in the Congo-Nile ridge of Rwanda; their causes and risk management	University of Ghana (UG), Ghana	
Jean Claude Dusabumuremyi	Zero energy cooling and drying system for reduction of postharvest losses of fresh carrot ( <i>Daucus Carota L</i> ) in Rwanda		
Safia Kalisa	Overcoming agricultural value chain challenges. A gateway to food security and economic growth		
Jean d'Amour Mwongereza	The Role of Improved Cooking Stoves for Rural Development in Rwanda's Future Energy System	University of Nairobi (UoN), Kenya	
Fidele Maniraguha	Agriculture pest insect's species monitoring with a polarimetric weather radars	University of Rwanda (UR), Rwanda	
Eric Nizeyimana	Structural design patterns of smart devices for designing a system to monitor the air pollution in East Central Africa	Nelson Mandela African Institution of Science and Technology (Tanzania)	
Collette Abimana	Improved energy storage systems for sustainability of renewable energy technologies for electric power generation		

# THE FIRST PAN- AFRICAN SCIENCE FUND INTUITIVELY DESIGNED FOR GROWTH



RSIF is designed for sustainability and has two components: (i) the General Fund and (ii) the Permanent or Endowment Fund, with proceeds to capitalize the general fund.

Country contributions have been earmarked to scholarships, and in some cases to support research and innovation projects, aligned with national needs. So far, most countries have focused on doctoral training.

More importantly, RSIF aims to create a permanent vehicle for supporting science, technology and innovation capacity building through an endowment fund that is being established by the governments.

Rwanda is encouraged to continue its leading role in PASET through continued contribution to RSIF and investment in the RSIF endowment fund for lasting returns.

Rwanda is a country gaining immense traction that can be used to explore innovative ways of raising more funds for RSIF. By providing tax incentives for private sector companies investing in RSIF, by recommending RSIF to its development partners and by making a fixed annual budgetary allocation to RSIF, Rwanda will be in alignment with its commitment to PASET's vision.

Photo: The Rt. Hon. Prime Minister Dr. Ngirente Edouard opened the 5th PASET Forum hosted by Rwanda focused on the Implications of the Fourth Industrial Revolution (4IR) and Digital Economy on Higher Education and Skills Development in Africa. [Link](#)



PM Ngirente reminded that the key principles of Africa's Education Strategy are the consideration of quality and relevant education, training and research as core for technological innovation and entrepreneurship. Many African countries including Rwanda have been fully committed to their membership to PASET, as one of their key strategies to achieving the goal of quality relevant skills in higher education and research.

**RSIF will play a key role in training a critical mass of highly skilled scientists, professionals and innovators.**

Rwanda seeks to transform itself into a globally competitive knowledge-based economy, hence evidenced in its commitment to PASET and its initiatives. He urged all African countries and their partners to support PASET in achieving its objectives.

Considering its 50-year history of contributing to science and innovation in Sub-Saharan Africa, in 2018, the International Centre of Insect Physiology and Ecology (*icipe*) was competitively selected to implement RSIF, PASET's flagship initiative.

#### Connect with us

Please contact the RSIF-RCU at *icipe* for further details.

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Regional Coordination Unit



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