



KENYA

Country Report 2021



Summary of RSIF in Kenya:

24 Kenyan RSIF doctoral scholars enrolled

36 PhD scholars and faculty trained

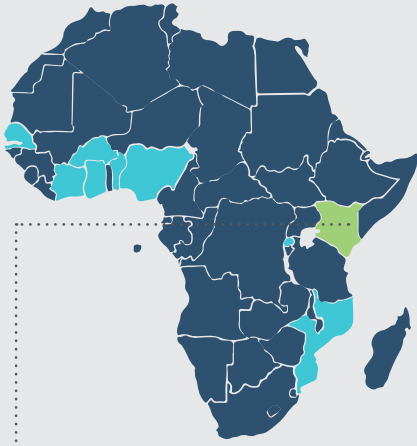
14 Trainings held

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



KENYA

Country Report 2021

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

Rsif is the first of its kind connecting innovative minds to resources for revolutionary solutions.

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.

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.

Kenya's contribution to RSIF

Kenya's initial US\$2 million contribution has now been fully exhausted. 80% of Kenya's contribution directly supports training of Kenyan scholars and is currently committed to enrolled students in the RSIF PhD scholarship programme. The potential of Kenya'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, Kenya 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, Kenya 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.

Kenya's participation in RSIF benefits the entire Kenyan 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 Kenya's Vision 2030

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.





Photo: Korea contributes US\$ 9 million to Rsif and *icipe* signs agreement with chair of PASET Governing Council to serve as the Regional Coordination Unit, November 2018.

ROLE OF KENYAN CHAIRMANSHIP

Government Contributors

Kenya hosted the 4th PASET Forum in Nairobi in 2017 and it was among the first countries to contribute to RSIF. The Cabinet Secretary for Education is currently the Chair of the PASET Governing Council, and the Adviser, Office of the Cabinet Secretary sits in the PASET Executive Board. Kenya and Rwanda were the first African countries to make their financial contribution to RSIF in 2018, playing a leading role in the establishment of the program. In the period since then, with leadership from Kenya's Ministry of Education, seven more governments have made contributions or are in

process of making their contribution to RSIF: Côte d'Ivoire, Burkina Faso, Senegal, Ghana, Benin and Mozambique. Funds from Nigeria are expected soon.

To enable the growth of PASET, Prof. Magoha as Chair of PASET Governing Council facilitated engagement by other countries including providing invitation letters to the following governments to contribute to RSIF : Angola, Cabo Verde, Cameroun, Chad, Côte d'Ivoire, Djibouti, DRC, Ethiopia, Gambia, Guinea, Malawi, Mauritius, Namibia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Photo: PASET through the Chair of the Governing Council signed MoUs with five advanced universities in Korea and Morocco for collaboration on RSIF at RSIF breakfast event hosted by *icipe* in Kigali, May 2019.

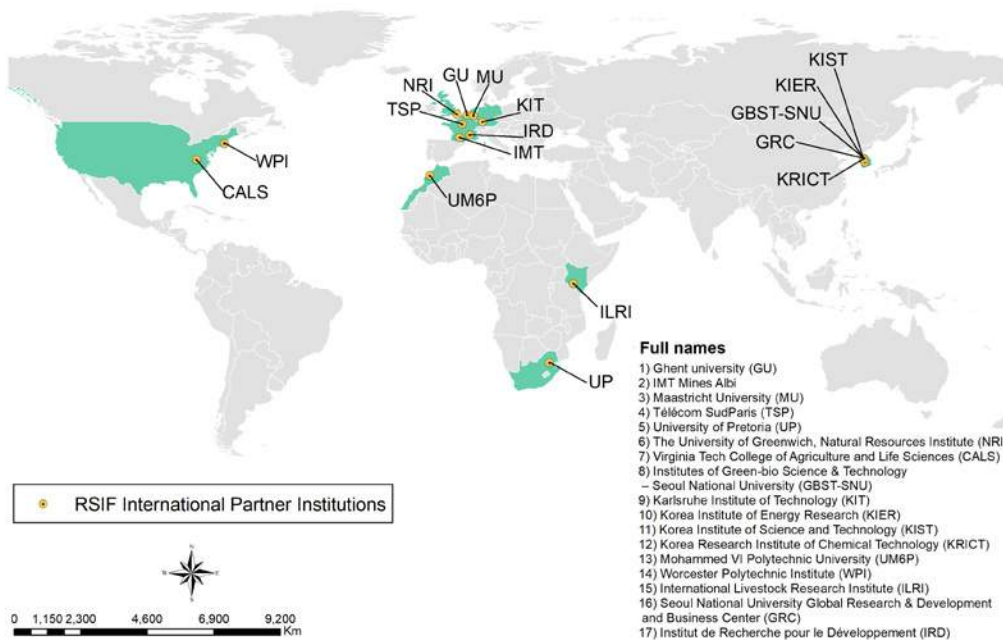


Fig 1. RSIF International Partner Institutions as of July 2021.

Agreements signed with advanced international partner organisations for collaboration with RSIF

PASET through the Chair of the Governing Council, Government of Kenya, has signed fifteen^x MoUs with some of the world's leading universities for collaboration on RSIF through academic and scientific research cooperation and capacity development (See Fig.1). The MoUs will facilitate

activities such as (i) Sandwich PhD programs; (ii) Visits of faculty for short duration teaching and capacity enhancement for research, innovation and PhD training; and (iii) Collaborative research and innovation projects with RSIF faculty and scholars. Projects will aim to address the needs of sub-Saharan African countries in the selected thematic areas and can involve collaboration with private sector firms for the development of new products and processes.

¹ MoUs with MU and KIST were signed earlier in 2018 when Senegal was still the chair.

NURTURING HIGH-IMPACT PARTNERSHIPS

and Strengthening Research and Innovation Capacity at University of Nairobi and Kenyatta University.

Photo: RSIF students and professors at UoN.



In 2019, University of Nairobi (UoN) was competitively selected as an RSIF African Host University in the PASET priority thematic area of Energy including renewables. The selected PhD programme at UoN is in Physics. UoN is hosting 20 RSIF funded doctoral scholars (of which ten Kenyans).

Kenyatta University (KU) was confirmed as an RSIF African Host University in 2020 in the PASET priority thematic area of minerals, mining and materials engineering. The selected PhD programme at KU is in Material Science and Engineering. KU is hosting six RSIF funded doctoral scholars (of which one Kenyan).

As RSIF African Host Universities, UoN and KU benefit from various capacity building and technical support, such as strengthening internationalization and

accreditation. UoN and KU benefit 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 UoN and KU. 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 nine other universities. UoN is establishing a PASET-RSIF network in Energy, including renewables. KU is joining a network in Materials and Mining Science and Technologies.

Photo: Ten faculty members from Kenya (from KU, UoN, University of Eldoret and Masinde Muliro University of Science and Technology) benefited from RSIF grant writing training at *icipe*, in January 2020.



Photo: Agreements between the RSIF AHUs and *icipe*, the Regional Coordination Unit for RSIF, were signed in Nairobi in presence of the Kenya government chairing the PASET Governing Council, the Executive Director of PASET Executive Board, the Chair of the Consultative Advisory Group and World Bank officials on the 7 October 2019².



Uon and KU 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 UoN and KU libraries and their students.

To help universities respond to COVID-19, *icipe* has provided two training workshop 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.

In 2020, the [International Livestock Research Institute \(ILRI\)](#), headquartered in Kenya, joined the PASET-RSIF network as an advanced international partner institution in the PASET priority thematic area of food security and agribusiness. Nurturing High-Impact Partnerships

² <https://www.Rsif-paset.org/significant-milestone-for-doctoral-training-research-and-innovation-in-africa/>

RSIF Training Courses Provided:

Research Communications and social media
Digital Storytelling
Reference management & open access
Grant writing
E-Resources
Grievance address mechanisms
Sexual harassment
Strategies for a successful PhD
PhD proposal writing
Responsible conduct of research including research ethics
Introduction to information literacy
Introduction to research methods and statistics, data analysis and management
Science presentations
Science posters

Training Applied Researchers in Science and Engineering Fields

The program has supported more than 180 students. 24 of the RSIF PhD scholars are Kenyans. More scholars will be selected in Cohort 4 in late 2021.

The Kenyan 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 Kenya's capacity to train at the PhD and postdoctoral level. With the ability to undertake high quality research, Kenya will be well positioned to lead improved outputs, ranking and prestige.

Breaking Barriers for Women in Science

According to UIS data only 30% of the world's researchers are women. RSIF is shifting that perspective.

67% (16 of 24) of the Kenyan RSIF 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.



Photo: Kenyan RSIF PhD scholar Sylvia Wairumu Maina presents her research to CS Education Kenya and the Rwandan Minister of Education during the 5th PASET Forum in Kigali, Rwanda in May 2019.



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 impacted³. RSIF not only ensures that women scientists enter and thrive in PhD programmes, but also, guarantees that all its 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.

³ <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 UoN and KU 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. Kenyan institutions, beyond UoN and KU, benefit from the strengthening of the research environment in Kenyan universities and across the country. RSIF is encouraging partnership with international partners and private firms. This will contribute to enhanced partnership in higher education, science and innovation ecosystem and collaboration in training, research and innovation.

Innovation spurs from collaborative knowledge sharing.

RSIF's establishment of international networks provides UoN and KU 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 UoN and KU⁴. 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.

⁴ At the time of the first call for RSIF research and innovation proposals, KU had not yet been confirmed as an RSIF AHU.



“I learnt a lot from the university and industry partners we met. The social business model applied to research which has been adopted by most Japanese universities need to be implemented here in Africa.”

Dr Mathew K. Munji, Department
of Physics, Kenyatta University

It was a great opportunity to visit Keio University where we learned the importance of developing innovation and entrepreneurship skills among graduate students. This is a concept that African universities should emulate and integrate the same in the graduate curriculum. We need to teach our students to be innovative in applying knowledge to solve societal social issues in line with the SDGs.

Prof. Francis Nyongesa, UoN



RSIF RESEARCH PROJECT:

Towards Affordable Solar Energy for Kenyan Homes

Project Title: Research and Development of Photovoltaics based on Lead-Free Perovskite Solar Cell Technology

Project leader: Prof. Francis Nyongesa, Department of Physics, UoN

Collaborating partners:

1. RIKEN Research Centre, Japan
2. Zewail City of Science and Technology, Egypt
3. Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland

Solar energy offer great potential to help bridge the unmet demand for energy, especially in rural areas. This project will undertake research and training in renewable energy particularly in affordable solar photovoltaic (PV) systems towards development of affordable solar PV home systems for rural households in Africa to meet their energy demands.

- Research towards development of affordable solar PV home systems for rural households.
- Training and skills development in PV system installations and maintenance for the Kenya and regional markets.
- Contribute to Kenya's national policy in renewable energy

RSIF INNOVATION PROJECT:

Strengthening the National Innovation Ecosystem within University of Nairobi

Project Title: Capacity building for University-
Industry business technology
transfer

Project leader: Prof. Julius Mwabora,
Department of Physics, UoN

**Collaborating
partners:** 1. Webstudent International
2. Blink Electrics Ltd.

The project aims to establish a Technology Transfer Office (TTO) to provide faculty and students with technical resources to facilitate the translation of research to innovative products and services. A pilot hub focusing on one industry will be established. Hubs will be responsible for providing innovators with both the initial investment and resources to support the proof-of-concept work and the mentorship in product development and commercialization needed to develop high priority technologies that address the highest national priorities within Kenya Vision 2030.

Kenyan RSIF PhD Scholars Scientific publications

Human, Animal and Plant Health Benefits of Glucosinolates and Strategies for Enhanced Bioactivity

Maina, S.; Misinzo, G.; Bakari, G.; Kim, H.-Y. Human, Animal and Plant Health Benefits of Glucosinolates and Strategies for Enhanced Bioactivity: A Systematic Review. *Molecules* 2020, 25, 3682 The study updates knowledge on glucosinolates, sulfur-containing compounds found in cruciferous vegetables like broccoli, Brussels sprouts, and kale, which play an important role in human and animal health (disease therapy and prevention), plant health (defense chemicals, biofumigants and biocides), and food industries (preservatives). The research also presents factors that affect the natural occurrence and biological availability of the compounds, supporting increased harnessing of their therapeutic values.

>> [paper link](#)

SPOTLIGHT ON AFRICA'S FUTURE LEADERS

in Science, Engineering
and Technology



RSIF PhD scholar
Sylvia Wairimu Maina
– Sokoine University of
Agriculture (SUA) and
sandwich programme at the
Korea Institute of Science and
Technology (KIST), Korea

My research title is “Deciphering Biosynthesis of Bioactive compounds in African Cabbage (*Cleome gynandra*)”. I am working on this local orphan crop that is used both as a vegetable and a medicinal plant in promoting human and animal health. I will be profiling different accessions to determine the levels of glucosinolate secondary metabolites compounds present. Furthermore, I will evaluate the biological activity and applicability of extracts from the plants. The research results will promote useful neglected crops nutritionally and pharmacologically. The research is relevant in many parts of Kenya and across the continent, which has rich and diverse underutilized crops with great potential in food security and health.

The opportunity provided by RSIF to engage in the ‘sandwich’ program at the [Korea Institute of Science and Technology \(KIST\)](#) has surpassed my initial expectations. I am attached to a very vibrant group of aggressive scholars who are generous with sharing knowledge. My passion is in biochemistry, biotechnology and health. Using a “bottom-up” approach, I strive to understand useful compounds in natural products. Recent technological advances have allowed smart cultivation of compound rich plants, their extraction, identification and evaluation in maintaining the health of humans, animals and plants. In combination I also use bioinformatics by integrating computers, software tools and databases to address biological questions.

My greatest challenges in this current period of my PhD collaboration in Korea is maintaining a healthy work-life balance by finding a routine that works best for me. The greatest discovery I have made so far is that success means more if I move out of my comfort zone and challenge myself in new things that allow me to grow.

I am assured that this decision to take up the RSIF PhD research opportunity will one day prove to be one of the most important and rewarding things I ever did with my life. I thank the Government of Kenya, through PASET RSIF for supporting my studies.



RSIF PhD Scholar Richard Kipyegon Koech – African University of Science and Technology (AUST), Nigeria and sandwich programme at Worcester Polytechnic Institute, Boston, USA

As a youngster, I was intrigued by the idea that most concepts learned in science are practical in nature and have real-life applications. I saw science as a way of finding solutions to most problems in society

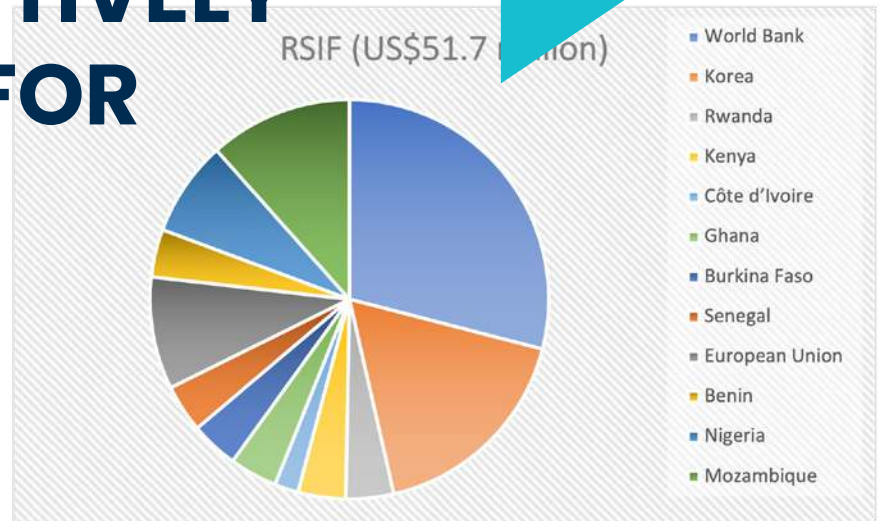
Kenyan RSIF Scholars and Research Topics

Name	Research Topic	African Host University
Jane Gachambi Mwangi	Environmental and genetic factors influencing the variation of oil quality and quantity on East African Sandalwood in Kenya	Bayero University, Nigeria Africa Centre of Excellence in Dryland Agriculture (CDA)
Maxwell Wambua Waema	Development and evaluation of recombinase polymerase amplification (RPA) Assay for detection of porcine cysticercosis in resource-limited settings	Sokoine University of Agriculture, Tanzania, Africa Centre of Excellence for Infectious Diseases of Humans & Animals in Southern & Eastern Africa (SACIDS)
Sylvia Wairimu Maina	Deciphering Biosynthesis of Bioactive compounds in African Cabbage (<i>Cleome gynandra</i>)	
Levi Ongechi Omache	Molecular studies of Peste des Petit Ruminants (PPR) virus in cattle and small ruminants in the Livestock wildlife interface in the Greater Serengeti ecosystem	
Humphrey Andalo Mabwi	Microbiome and antimicrobial resistome diversity among cattle in Tanzania	
Ivy Sylvia Okello	Pathogenicity and drug sensitivity pattern of African trypanosomiasis	
Faith Njeri Njeru	Application of nanobody technology as a diagnostic tool for maize lethal necrosis disease	
Catherine Wangui Mbutia	Migratory birds as health indicators of environmental pollution: Antimicrobial resistance profiles assessment in eskafe isolates recovered from migratory <i>Calidris alba</i> and <i>Ciconia abdimii</i> and their dissemination to goats and poultry along Lake Turkana Region	

Name	Research Topic	African Host University
Grace Wanjiku Gachara	Post-harvest practices in addressing food insecurity in Kenya: Systematic review of farming practices and mycotoxin contamination	Sokoine University of Agriculture, Tanzania, Africa Centre of Excellence for Infectious Diseases of Humans & Animals in Southern & Eastern Africa (SACIDS)
Damaris Mulwa	Spatial-temporal modeling of food insecurity in Sub-Saharan Africa	
Richard Kipyegon Koech	Solar energy (Photovoltaics/solar thermal systems/energy storage)	African University of Science and Technology (AUST), Nigeria
Jorim Okoth Obila	Fabrication and characterization of methylammonium iodide (CH ₃ NH ₃ SI ₃) perovskite solar cells	
Mwende Mbilo	Morphology control of caesium halide perovskites: A pathway towards increasing ion migration barrier for photovoltaic applications	
Fredrick Mwange Mulei	Optimization and integration of variable renewable energy sources in the development of affordable decent smart green buildings in Kenya	
Kay Nyaboe Nyakundi	Geothermal Energy system integration:- Combined Flash and binary power plants for Kenya	
Alice Achieng Kasera	Design and construction of an automated biogas system (Mini- Factory) from hyacinth plant in Lake Victoria regions in Kenya	University of Nairobi (UoN), Kenya
Jacinta Okwako	Fabrication and characterization of Al doped zinc oxide nanoparticles for dye sensitized solar cells application	
Hellen Ngunya Mutua	Investigation of the effect of MN-doping with TiO ₂ on electrical and optical properties of perovskite (CSPB(SCN) ₂ CL) photodetector solar cell	
Sarah Anyango Odera	Development of an integrated energy planning system for Kenya	
Judith Chebwogen	Performance evaluation of Cobalt pigmented ZnO in organic pollutants degradation in water	
Margdaline Ligavo	Modelling and performance characterization of a photovoltaic system for power generation	
Bethwel Kipchirchir Tarus	Beaded electrospun nanofibers for ultra- and micro-filtration in wastewater treatment	Nelson Mandela African Institution of Science and Technology (NM-AIST), Tanzania
Alvin Asava Sasia	A study of gelatin nano-particles for novel application in leather processing	Kenyatta University, Kenya
Grace Akinyi	Using machine learning-based group models to support self-regulated learning in collaborative e-Learning; A case of Kenyan public universities	Université Gaston Berger, Senegal, Africa Centre of Excellence for Mathematics, Informatics and ICT (MITIC)

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

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.

Kenya is encouraged to continue its leading role in PASET through continued contribution

to RSIF and investment in the RSIF endowment fund for lasting returns.

Kenya 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, Kenya will be in alignment with its commitment to PASET's vision.



**HE President Uhuru Kenyatta spoke about RSIF on the occasion of *icipe*'s 50th anniversary, 20 November 2020⁵.
[See video statement here.](#)**

The International Centre of Insect Physiology and Ecology (*icipe*), founded by Prof. Thomas R. Odhiambo, headquartered in Kenya, and with a 50-year history of contributing to science and innovation in sub-Saharan Africa, was competitively selected to implement RSIF. Considering its strong processes and systems, governance and demonstrated experience in PhD capacity building and research commercialization, *icipe* was appointed the Regional Coordination Unit (RCU) of the RSIF in 2018.

Connect with us

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


PASET Regional Scholarship and Innovation Fund (RSIF), Regional Coordination Unit (RCU)


The International Centre of Insect Physiology and Ecology (*icipe*),
Duduville Campus, Kasarani

P.O. Box 30772-00100, Nairobi, Kenya

Regional Coordination Unit



 +254 20 863000

 dg@icipe.org
icipe@icipe.org

⁵ <https://www.Rsif-paset.org/president-kenyatta-calls-for-increased-investment-for-research-and-development-in-africa/>



Rsif@icipe.org



[Facebook/ TheRsif](https://www.facebook.com/TheRsif)



[LinkedIn/company/ paset-Rsif/](https://www.linkedin.com/company/paset-Rsif/)



[Twitter/ @pasetRsif](https://twitter.com/pasetRsif)



[Instagram/ @pasetRsif](https://www.instagram.com/pasetRsif)



www.Rsif-paset.org

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

Regional Coordination Unit



icipe