SENEGAL

Population: 17.3 million (2022)

Research and development expenditures as a proportion of GDP: 0.58% (2015)

Researchers (in full-time equivalent) per million inhabitants: 564 (2015)

Scientific and technical journal articles: 396 thousand (2020)

Source: World Bank Data 2023

SENEGAL

Country Report 2023

Senegal's economy is expected to be among the fastest growing in the world in 2024 at 9.8% real GDP growth thanks to expected oil production and the start of hydrocarbon exports according to the African Development Bank. Highly qualified human capital is the driver for implementation of the plan for an emerging Senegal.

Contribution to PASET-Rsif

Senegal 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 2020 *(Figure 1)*. Its contribution of USD 2 million is through the World Bank supported Africa Centres of Excellence for Higher Education for Development Impact (ACE Impact) project and is to train Senegalese PhD students in selected African host universities and collaborating with international partner institutions.

Through PASET-Rsif Senegal will build strong institutions and future science leaders to drive a science and technology-led growth and development. Senegal is a founding member of PASET.

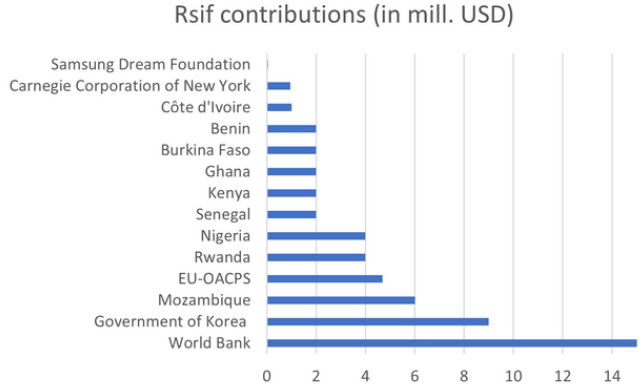


Figure 1: Rsif Contributing Countries and Partners

Rsif in Senegal at a glance

16 Senegalese awarded Rsif PhD scholarship (56% women)

17 Rsif PhD students hosted at Université Gaston Berger (UGB) (8 nationalities, 41% women)

26 research publications as of December 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

Strengthening research and innovation capacity in Senegal

The University Gaston Berger (UGB) is one of the 15 Rsif African Host Universities (*Figure 2*).

The PhD programme in Computer Science at the African Center of Excellence (MITIC) is hosting 17 Rsif funded PhD students (41% women, 8 nationalities).

UGB 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.

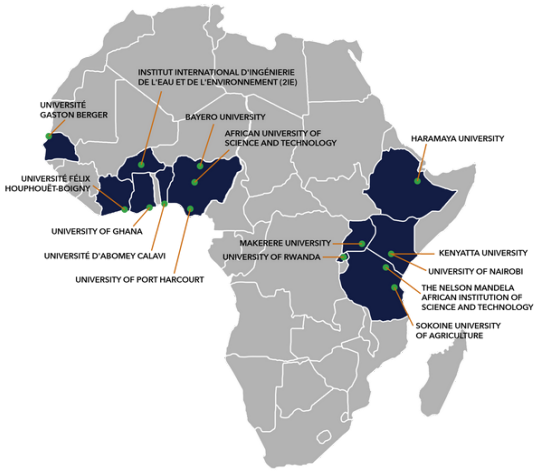


Figure 2: Rsif African Host Universities

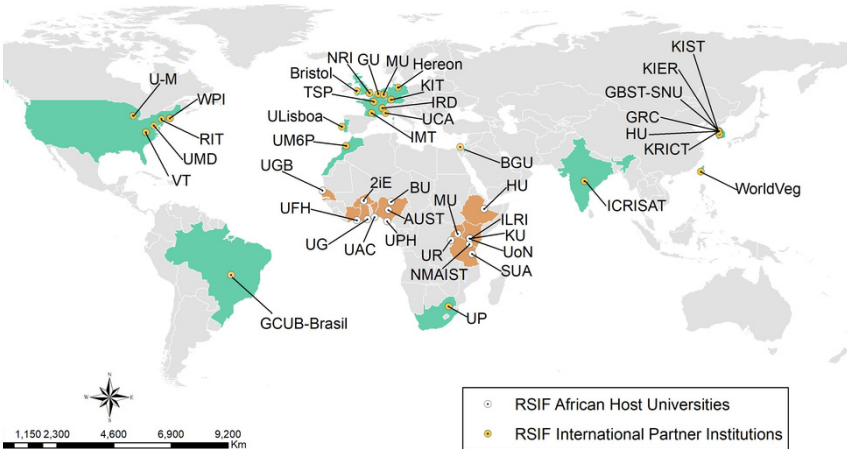


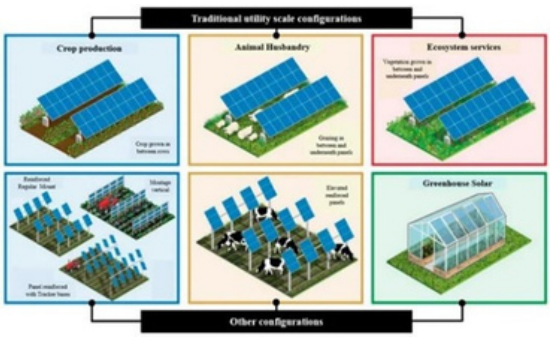
Figure 3: Rsif International Partner Institutions

> **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 Senegalese Rsif scholars

Solar Energy for Sustainable Agriculture

Rsif student, Aminata Sarr, won the My Thesis in 180 Seconds (MT180s) award at the 2023 Doctorials of the 2iE Institute.



The different agrovoltaic systems.
Source: https://doi.org/10.3390/pr11030948

Aminata Sarr (28 years) is an Rsif PhD student at Institut International d'Ingénierie de l'Eau et de l'Environnement (2iE) in Burkina Faso with research placement at Virginia Tech, USA.

Agrivoltaic systems, which consist of the combination of energy production by means of photovoltaic systems and agricultural production in the same area, have emerged as a promising solution to the constraints related to the reduction in cultivated areas due to solar panels used in agricultural production systems. They also enable optimization of land use and reduction in conflicts over land access, in order to meet the increasing demand for agricultural products and energy resulting from rapid population growth.

An optimization model can be developed to determine the optimal elevation, spacing, and tilt angle of the solar panels. This model would take into account factors that influence crop growth and yield, as well as factors that affect the performance of the photovoltaic system, with the goal of maximizing both crop yield and energy production. As part of her doctoral studies, Aminata Sarr will study the Implementation of an innovative agrivoltaic modular unit in the context of the water-energy-food nexus.

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

Internet of Things

Ndeye Penda Fall (30 years)

Rsif PhD student at University of Gaston Berger, Senegal.

Research placement at Telecom SudParis, France.

Research area: Optimisation in LoRaWAN mobility in IoT

Genomics

Aliou Ba (31 years)

Rsif PhD student at Makerere University, Uganda.

Research placement at the French National Research Institute for Sustainable Development (IRD), France (TBC).

Research area: Implementation of genomic selection of pearl millet [Pennisetum glaucum (L.) R. BR.] in Senegal

Artificial Intelligence

Abdou Karim Kandji (35 years)

Rsif PhD student at Université Gaston Berger, Senegal.

Research placement at Université Côte d'Azur, France.

Research area: AI and voice recognition applied to local African languages

Land Restoration

Khadidiatou Ba (32 years)

Rsif PhD student at Bayero University Kano, Nigeria.

Research placement at Virginia Tech, USA.

Research area: Restoration of agricultural land degraded by salinization in Kaolack, Senegal

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.

Strenghening capacities for robust and affordable smart agri-IoT technology

Dr Emmanuel Effah

Project title: Robust and Affordable Smart Agri-IoT Technology

Project leader: Dr Emmanuel Effah, Rsif PhD graduate from University Gaston Berger (2022). Lecturer at the Department of Computer Science and Engineering, University of Mines and Technology (UMaT), Ghana.

International partner: Prof. Ousmane Thiare, University Gaston Berger, Senegal

The PhD studies of Dr Emmanuel Effah at University Gaston Berger uncovered novel scientific foundations for building context-relevant Agri-IoT solutions with custom-built prototypes proven to be operationally robust, affordable, fault-tolerant, infrastructure-less, adaptive/scalable, and simple to deploy and manage anywhere by non-experts. The initial testing of this novel Agri-IoT Tech excluded the end-users (farmers) and relied on inadequate testing nodes and duration due to time and financial constraints, which invalidated the commercial viability of this solution.

The objectives of this project, that was selected for an Rsif Junior Investigator Research Award (US$ 80,000), include capacity-building for scientists to be able to develop adequate sampling devices for large-scale field testing to validate their scientific propositions; build capacity for end-users (farmers) in water-stressed communities in Northern Ghana to be able to deploy and manage this technology on their farms and evaluate the performance of this technology against their expectations (end-user cost/end-user benefit).

> I travelled with two UMaT PhD students from Ghana to Senegal for a 21-day training in LoRa base station development provided by our international partner University Gaston Berger. Besides the travel and cultural experiences as well as knowledge acquired through the workshop, the UGB partner tasked the three of us to produce one journal manuscript each before we left Senegal, which we did. It was an amazing experience for us
>
> *Dr Emmanuel Effah, Rsif alumnus from UGB*

With the support of UGB, one tutorial paper, "A Tutorial on Agricultural IoT: Fundamental Concepts, Architectures, Routing, and Optimization", has been published by IoT-MDPI (https://doi.org/10.3390/iot4030014).

Three other manuscripts have been produced and submitted to different reputable journals for review.

Contact us

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