THE REPUBLIC OF UGANDA

MAKERERE UNIVERSITY
RESEARCH AND INNOVATIONS FUND
(MAK-RIF)

MAKERERE UNIVERSITY

Mak-RIF Monthly
NewsLetter

November 2025

WORD FROM THE CHAIR

Dear Reader,

Welcome to Mak-RIF's latest newsletter.

In November 2025, the Makerere University Research and Innovations Fund made significant strides in strengthening evidence-based policymaking, advancing research-driven reforms, and promoting innovation for national development. A major highlight was the successful completion of a collaborative study between Makerere University and the Ministry of Public Service, assessing the impact of salary enhancement on the performance of secondary school teachers in Uganda. Supported by the Government of Uganda through Mak-RIF, the study generated critical insights into how salary disparities between science and arts teachers influence motivation, retention, student outcomes, and the overall stability of the education workforce.

In parallel, Mak-RIF supported the establishment of a Research and Innovations Academy at Muteesa I Royal University which is expanding Uganda's capacity for knowledge-driven development. By promoting multidisciplinary collaboration and aligning its mission with global and regional frameworks, the academy is further positioning research and innovations at the center of socio-economic transformation. Key lessons from its early implementation underscore the importance of strong governance structures, improved research coordination, targeted capacity-building, and strategic partnerships at all levels.

Several RIF funded projects are turning waste into valuable products across the country. In an article published by New Vision on 24th November, we demonstrate how tonnes of waste that could end up in landfills and open drainage/sewer channels and ultimately harm communities are instead being converted into creative and valuable innovations.

Nice reading!

Prof. Fred Masagazi-Masaazi
Chairperson, Mak-RIF Grants Management Committee

PROJECT OF THE MONTH

MAKERERE UNIVERSITY AND MINISTRY OF PUBLIC SERVICE STUDY REVEALS IMPACT OF SALARY ENHANCEMENT ON TEACHER PERFORMANCE IN UGANDA

Mak-RIF funded research highlights disparities between science and arts teachers and their implications for Uganda's education system.

The report titled, Impact of Salary Enhancement on the Performance of Secondary School Teachers in Uganda being presented to the Minister of Public Service, Hon. Wilson Muruli Mukasa.

A collaborative study by Makerere University and the Ministry of Public Service has shed new light on how salary enhancement affects the performance of secondary school teachers in Uganda. The study, titled "Impact of Salary Enhancement on the Performance of Secondary School Teachers in Uganda," was funded by the Government of Uganda through the Makerere University Research and Innovations Fund (Mak-RIF).

The research was prompted by the Government's 2018 pay policy that significantly increased salaries for science teachers, while arts teachers remained at a lower rate. By 2022, science teachers had achieved 77% of the approved pay target, while that of arts teachers remained at 12%.

Researchers, led by Makerere University's Dr. Cyprian Misinde, have noted that these disparities have far-reaching implications on the quality of education, the National Development Plan (NDP III Goal 5: Human Capital Development), the emerging NDP IV framework, and the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities).

Assessing the Effects of Pay Enhancement

The study set out to assess the impact of salary enhancement on teacher performance, focusing on motivation, retention, student outcomes, and perceptions of both science and arts teachers.

Using a mixed methods approach, researchers collected data from 1,352 secondary school teachers (617 science and 735 arts teachers) across 14 sub-regions. Additionally, 28 key informant interviews were conducted with head teachers, alongside 28 focus group discussions (FGDs) with students.

Key Findings: A Divided Teaching Workforce

The findings paint a stark contrast between science and arts teachers:

Science teachers reported high motivation (80.5%), strong perceived performance (76.5%), greater retention intent (39.1% planning to stay until retirement), improved student outcomes (64.5%), and enhanced morale (80.5%). Arts teachers, however, experienced lower motivation (25.5%), reduced performance (17.8%), lower retention (27.5%), weaker student outcomes (15.2%), and diminished morale (26.6%).

Across the board, 85.3% of all teachers agreed that higher salaries improve retention, reaffirming that pay remains a critical driver of teacher performance and commitment.

"While the pay policy has strengthened science education, it has unintentionally widened disparities that could undermine equity and holistic quality education in Uganda," the report reads in part.

The study also found that salary enhancement alone was not accompanied by proportional investments in other key performance enablers such as school infrastructure, teaching materials, and instructional resources which are equally vital for improved educational outcomes. Read more here.

USING A RESEARCH AND INNOVATIONS ACADEMY TO COORDINATE RESEARCH PRODUCTS FOR NATIONAL DEVELOPMENT.

Prof. Kasule Umar, Deputy Vice Chancellor Muteesa I Royal University, giving opening remarks during the project dissemination.

A new initiative hosted at Muteesa I Royal University (MRU) in Mengo, Kampala District has aimed to position research and innovation as catalysts for national and global development. Central to the project is the establishment of a Research and Innovations Academy which functions as a hub for coordinating research outputs including publications, innovative products, and patents and channeling them toward real-world problem-solving.

The Academy brings together experts from multiple disciplines, fostering collaboration between local and international researchers. By strengthening Uganda's capacity to generate knowledge-driven innovations, the initiative seeks to contribute to socio-economic transformation, inform policy, and promote sustainable development.

Lessons Learned

1. Strong Alignment With Global and Regional Frameworks Enhances Legitimacy
2. Multidisciplinary Collaboration Is Essential but Requires Structured Coordination
3. There Is High Demand for a Centralized Research Coordination Hub
4. Capacity Gaps Limit the Translation of Research Into Tangible Innovations
5. Infrastructure and Resource Limitations Slow Down Implementation
6. Partnerships and Networks Are Critical for Impact and
7. Awareness and Visibility Are Key to Attracting Researchers and Stakeholders

Researchers, led by Dr. Simon Nantamu have recommended the development of a Robust Institutional Framework for the Academy, continuous Investment in Capacity-Building for Researchers, and Enhanced Partnerships at Local, Regional, and International Levels.

UNIVERSITY RESEARCH FUND TURNS WASTE INTO VALUABLE PRODUCTS

By Joseph Bahingwire

In Uganda, where waste management is a growing concern, innovative solutions are emerging to turn trash into treasure. From turning plastic waste into construction materials to converting organic waste into biogas, Makerere University's research community is finding ways to reduce waste and create value.

Since 2019, researchers and innovators at the university have received funding from the Government through the Makerere University Research and Innovations Fund (Mak-RIF). The financial support is used to conduct feasibility and acceptability studies, as well as to develop innovations that turn waste into a resource.

Notable among them are projects that focus on upcycling plastic waste into usable products. Others turn agricultural waste into eco-friendly materials, while others use waste to create clean and safe water.

Tonnes of waste that could end up in landfills and open drainage/sewer channels and ultimately harm communities are instead being converted into creative and valuable innovations. These initiatives are designed to make waste an attractive raw material, contributing to environmental conservation, improved sanitation and economic growth.

President Museveni (wearing hat) inspects products made by Mak-RIF researchers. The Government has been funding university researchers since 2019

Eco-friendly tile created using rice husks

CLEANER CEMENT FROM CANE BAGASSE

Cement production continues to consume enormous non-renewable natural resources. It also contributes to anthropogenic carbon dioxide emissions through the clinker manufacturing process.

Green synthesis of silica nanoparticles (SiO2-NPs) from agricultural residues is a promising avenue for cementitious materials application. This creates improved resilience to negative environmental pressures, extending the service life of buildings (durability) and saving resources.

Nanoparticles as supplementary cementitious materials offer a promising solution to these challenges. Very little is known about utilising silica nanoparticles from sugarcane bagasse ash and applying them in cement-based construction materials.

This project, led by Eng. Safik Ainomugisha, reveals that incorporating ground or calcinated sugarcane bagasse ash and rice husk ash into cement production as a pozzolana. This could result in Portland Pozzolana Cement blends that meet performance standards.

"Cement manufacturing is one of the world's largest contributors to carbon dioxide emissions. But what if agricultural waste could make cement cleaner and more durable? We use sugarcane bagasse ash and rice husk ash as supplementary cementitious materials, hence lowering carbon emissions while maintaining high performance," Ainomugisha said.

SUSTAINABLE BIOPLASTICS FROM CANE BAGASSE

Sugarcane bagasse and sisal fibre are often discarded after agricultural processing. In a project led by Prof. Ruth Nsibirano, researchers aim to transform these materials into sustainable bioplastics.

Using cellulose extracted from these wastes, the team has produced sample bioplastic films. The materials are now undergoing rigorous testing to assess strength, thickness, moisture resistance and chemical composition.

"These innovative bioplastics have the potential to replace traditional plastics and significantly reduce Uganda's environmental footprint," Prof. Nsibirano says.

USING WASTE FOR AFFORDABLE WATER FILTERS

Access to clean and safe water remains a challenge in many rural and low-income communities. To address this challenge, researchers led by Dr Ibrahim Karume have developed a low-cost, eco-friendly water filtration system that uses carbon residues from waste to create activated carbon.

"This carbon, when combined with fibres obtained from used paper and other discarded carbohydrates, forms a carbon-cellulose membrane framework which is the key component of the filter system. The filter system is green, cheap and easy to use compared to conventional water treatment devices," Dr Karume explains.

Compared to other systems that rely on resins with complex organic molecules that are costly and hard to dispose of, this system is a simpler and sustainable alternative and provides a lifeline for communities without access to treated water, particularly in rural areas and hardship settings such as refugee camps. The potential to scale this low-cost prototype into a large-scale water purification system opens opportunities for integration into existing water treatment processes, promoting both environmental and economic sustainability.

HARNESSING NATURE TO PURIFY WASTE WATER

Under Sustainable Development Goal 6.3, countries must reduce pollution and improve wastewater management. Answering this call, Dr Patrick Ssebugere and team investigated the capacity of moringa oleifera and eichhornia crassipes (commonly known as water hyacinth) to remove endocrine-disrupting chemicals (EDCs) from wastewater.

These locally available plants provide a low-cost, sustainable alternative to expensive conventional methods such as oxidation or activated charcoal, making clean water more accessible for communities and industries.

The study team focuses on identifying the concentration levels of selected EDCs and exploring ways to remove them effectively using locally available biological materials. While moringa oleifera and eichhornia crassipes have been widely used to remove pollutants like metals and dyes, their application in removing EDCs is relatively new and innovative.

"The study shows that these plants offer cost-effective and sustainable alternatives to conventional water treatment methods," Dr Karume says.

ECO-FRIENDLY TILES MADE FROM RICE HUSKS

At Makerere and Busitema universities, Dr Vianney Yiga and his team have developed prototype ceramic floor tiles made from clay, rice husks and plastic waste. Strength tests show that these tiles are comparable to commercially available options.

"With support from the physics and chemistry laboratories at Makerere and the materials and metallurgy lab at Busitema, we have developed a prototype of green ceramic floor tiles using clay, rice husks and plastic waste. The tiles can match the quality of those available in the marketplace," Dr Yiga says.

The innovation not only diverts rice husks from mills in Busia and Tororo districts but also gives new value to plastic waste and clay from Buwambo in Wakiso district.

Local brick makers partnered with the team to understand the properties of the clay. The brick makers identified the best type for making these ceramic tiles, hence showcasing how community collaboration strengthens sustainable manufacturing.

A GROWING LEGACY OF INNOVATION

To date, Mak-RIF has supported 1,457 multidisciplinary research and innovation projects, sponsored 235 PhD students, and facilitated the publication of over 100 papers in peer-reviewed journals.

These achievements demonstrate Makerere University's growing role in producing cutting-edge research and practical solutions that address Uganda's socio-economic challenges.

FISH WASTE TO HIGH-VALUE PRODUCTS

In East Africa, Nile perch processing is a major producer of industrial waste, a significant environmental pollutant.

Dr David Kaahwa's team has discovered a way to turn this low-value residue into economically valuable, eco-friendly products.

The low-value products have the potential of being processed into biodegradable products of high economic value.

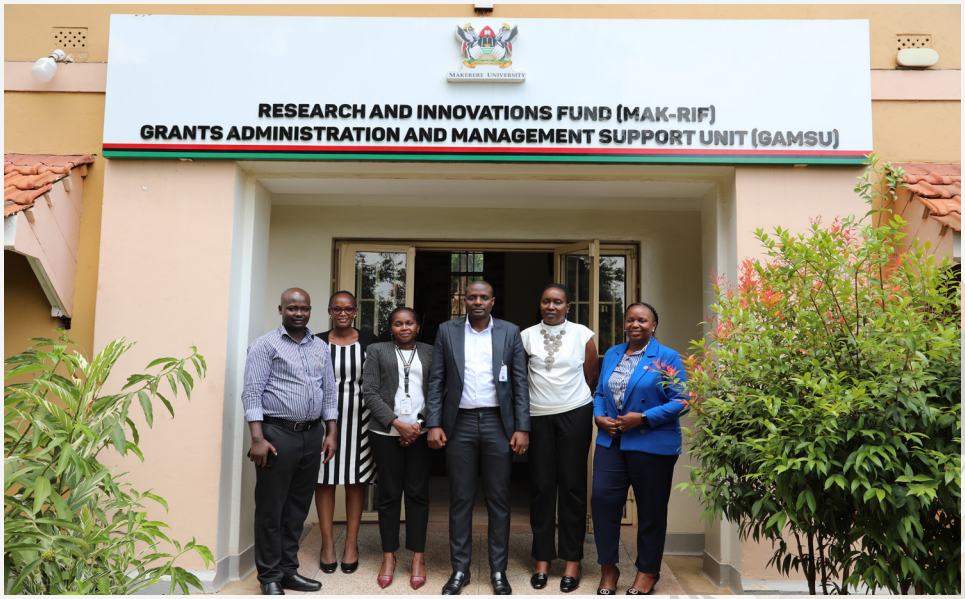
"We are converting low-value Nile perch industrial solid wastes into high-value commercial products, and also building capacity for the university staff in biorecycling," Kaahwa says.

The biodegradable and environmentally friendly products produced are:

- Encapsulated Nile perch oil
- Hydrolysate proteins for use in the food industry
- Protein concentrates for the animal feed industry
- Organic fertilisers

These innovations not only reduce environmental pollution but also create new commercial opportunities for Uganda's fisheries sector.

PICTORIAL



On 5th November 2025, Mak-RIF hosted a strategic engagement meeting with the Uganda Investment Authority (UIA). The meeting is a critical milestone in strengthening collabo ration between academia and industry to accelerate the commercialization of research and innovations emerging from Makerere University.

Mak-RIF participated in the 2025 Annual East Africa Public Relations Week in Arusha, Tanzania under the theme, "Strengthening Government and Citizen Trust in East Africa: The Strategic Role of Public Relations."

Editorial

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