



# MAKERERE UNIVERSITY

## RESEARCH AND INNOVATIONS FUND (MAK-RIF)

Half Financial Year 2022/2023



MAKERERE UNIVERSITY

## BULLETIN



## Welcome Note

### Dear Reader,

Welcome to the 2<sup>nd</sup> Issue of the Mak-RIF Bulletin. Makerere University has continued to receive funding from the Government of the Republic of Uganda, earmarked to support faculty members to conduct high impact Research and Innovations that contribute to national development.

The current financial year (2023/2024) is the 5<sup>th</sup> year of funding, which started in the FY 2019/2020. Each financial year, Makerere University expects to receive 30 billion Uganda Shillings (equivalent to about US\$ 8,100,000) under the fund. The funding, however, has varied in some of the financial years, affected by availability of funds. Funds for each Financial Year are obligated to be spent within that fiscal year.

In this issue of our Bulletin, we share about how the Mak-RIF Research Agenda and themes highlighted there in are guiding and contributing to our operations, awards made in the past financial years, a highlight of the research achievements, impact to-date, and a flash back to some of the fund activities among others.

Thank you, all dear stakeholders, for the continued support and funding to research and innovations at Makerere University.

The 1,060 multidisciplinary research and innovation projects have potential to positively transform the communities in which we live and serve. Let us join efforts to further support these projects but above all, scale those ready for the market in an effort to further contribute to Uganda's

development efforts.

Enjoy reading.

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

### The Mak-RIF robust and dynamic Research Agenda guiding operations

To transition to middle-income status, low-income countries must increasingly invest in research and innovations that provide solutions to persistent development challenges. Universities should be at the forefront of driving the Mak-RIF Research Agenda. The Government of Uganda is currently implementing the 3<sup>rd</sup> National Development Plan (NDP III) (2020/21 – 2024/25).

However, the NDP and sector specific plans require research to fill evidence gaps. The main objective of Mak-RIF is to support R&I initiatives that contribute to better delivery of National Development initiatives in all sectors critical to the economy. The Mak-RIF's terms of reference require the GMC to develop an instructive Research Agenda as the basis for identifying its funding priorities. During the Mak-RIF inception, the GMC conducted a comprehensive stakeholder consultation to identify priority research areas of interest for national development. Meetings were held with representatives from key government sectors, semi-autonomous government agencies, the private-for-profit sector, and civil society. The GMC triangulated this information with the NDP III, the Makerere University Strategic Plan and Research Agenda, the critical areas in the National Budget, and the Sustainable Development Goals. 14 priority thematic areas emerged as follows:

**Theme 1:** Transforming the agricultural sector to drive development.

**Theme 2:** Achieving Sustainable health as a means to sustainable development.

**Theme 3:** Re-imagining Education to unlock capacity for economic development.

**Theme 4:** Water, sanitation, and the environment: A prerequisite to sustainable development

**Theme 5:** Harnessing the social sector, culture and arts to drive development.

**Theme 6:** Harnessing tourism, wildlife and heritage to drive development.

**Theme 7:** Sustainable Planning, finance and monitoring as catalysts for growth.

**Theme 8:** Leveraging public service and local administration for efficient service delivery.

**Theme 9:** Defense and security: Achieving sustainable peace and stability.

**Theme 10:** Strengthening law, governance, human rights, and international cooperation as prerequisites for development.

**Theme 11:** Harnessing Information and Communication Technology to drive development.

**Theme 12:** Works, manufacturing, science, and technology as tools to accelerate development.

**Theme 13:** Solutions to catalyze business and enterprise.

**Theme 14:** Energy and Minerals as drivers of rapid economic development.

## Awards made in the past Financial Years

The 1,060 awarded projects have been categorized under different thematic areas. The Table below shows the Applicants and awardees by Thematic area.

**Table 1: Applicants and Awardees per Thematic area across the Financial Years**

	FY 2019-20		FY 2020-21			FY 2021-22			FY 2022-23		
Theme	RFP Awards	Awards (Covid19)	Applied	Awards	%	Applied	Awards	%	Applied	Awards	%
<b>RFP Track</b>											
Theme 1	64	NA	66	28	42.4	70	28	40.0	85	36	42.4
Theme 2	82	NA	134	60	44.8	179	72	40.2	150	77	51.3
Theme 3	33	NA	41	11	26.8	88	41	46.6	70	31	44.3
Theme 4	25	NA	30	9	30.0	45	16	35.6	24	10	41.7
Theme 5	24	NA	9	3	33.3	22	8	36.4	25	8	32.0
Theme 6	6	NA	11	4	36.4	13	4	30.8	15	6	40.0
Theme 7	6	NA	8	3	37.5	17	5	29.4	15	4	26.7
Theme 8	2	NA	15	7	46.7	8	0	0.0	18	6	33.3
Theme 9	0	NA	4	2	50.0	5	1	20.0	8	2	25.0

Theme 10	8	NA	8	3	37.5	6	2	33.3	6	2	33.3
Theme 11	23	NA	14	6	42.9	41	16	39.0	43	23	53.5
Theme 12	4	NA	11	5	45.5	9	2	22.2	11	7	63.6
Theme 13	8	NA	24	12	50.0	27	5	18.5	25	7	28.0
Theme 14	7	NA	16	7	43.8	14	6	42.9	27	16	59.3
Needs Responsive Track	3	16		11			14			14	
Total	289	128	391	171	43.7	544	220	40.4	522	249	47.7

## A highlight of the Achievements to-date

Research and Innovation project outputs include but are not limited to; Policy/Knowledge Briefs, Training Manuals/Modules, Guides, Manuscripts, Publications, Research Ethics Committees, Patents, Prototypes, Reports and Documentaries among others.

**Table 2: Research and Innovation outputs per Thematic area over the last four Financial Years**

Themes	Policy Briefs	Technical Reports	Publications	Prototypes	Training modules	Products	Database	Apps	Audio visuals	Patents	Conferences	Frameworks
Theme 1	37	15	27	8	5	9	2	0	1	2	0	0
Theme 2	42	51	60	9	10	0	1	3	0	1	17	3
Theme 3	13	3	4	3	15	0	0	6	0	0	0	0
Theme 4	7	0	12	9	1	0	0	2	0	0	0	0
Theme 5	11	6	10	0	3	0	0	1	16	0	2	2
Theme 6	2	2	4	0	0	0	1	0	0	0	0	0
Theme 7	4	4	2	0	1	0	0	1	0	1	0	0
Theme 8	0	1	2	1	0	0	0	0	0	0	0	0
Theme 9	0	0	0	0	0	0	0	0	0	0	0	0
Theme 10	1	0	1	5	0	0	0	0	0	0	0	0
Theme 11	10	12	0	5	0	0	0	0	0	0	0	0
Theme 12	2	3	0	0	0	0	0	0	0	0	0	0
Theme 13	3	2	3	0	1	0	0	0	0	0	0	0
Theme 14	3	0	3	1	0	0	0	0	0	0	0	0
S/TOTAL	135	99	128	41	36	9	4	13	17	4	19	5
Total												

## A Highlight of the Research Impact to-date

Several Mak-RIF research and innovation outputs have continued to inform policy, build institutional capacity for Makerere University which is having a spillover effect with other public universities on creating knowledge and creating change in the communities in which we serve and live. The following projects have yielded impact in the community, highlighted according to the thematic areas.

## Theme 1: Transforming the agricultural sector to drive development

- **An automatically controlled commercial solar dryer:** A prototype of this solar dryer fabricated using local materials has been set up in Kayunga where 5 people were trained to set it up locally, thus jobs created. Entrepreneurs are using this Hybrid Solar Dryer (HSD) to dry cassava, amaranth seeds, ginger, and vegetables. The project has partnered with Lutheran World Relief (LWR) which has adapted the HSD for Arabica coffee drying in Kasese, Uganda, which has led to the commercialization and adoption of the Dryer.



*Assembled seed cleaners ready for use in Kamuli District, Uganda*

- **Fabricated Pedal Operated Seed cleaners:** Five prototypes of seed cleaners were fabricated using local materials and distributed in 5 villages in Kamuli district to improve post-harvest handling for cereals. Notably, time needed and taken to clean cereals (especially for women and children) has been reduced – the saved time can be allocated to studying and other activities.
- **Development and promotion of solar powered energy-saving smart electric cook stoves to reduce the cooking carbon footprint in households, institutions and industries:(SE-Cookers):** Environmental conservation through the use of renewable energy. Safer and cleaner cooking that reduces the risk of burns and risks due to emissions.

- **Developing aquaculture systems for Mukene for increased food security and income:** Enhanced income for people involved in the Mukene value chain.
- **Assembling and evaluation of a blood based lateral flow rapid diagnostic test to discriminate between early and late-stage human African trypanosomiasis patients:** This study addresses a current problem in that disease staging is currently based in the examination of cerebrospinal fluid after a lumbar puncture. A lumbar puncture is invasive, requires trained personnel and relies on equipment with power demand to analyze. Our innovation is cheaper, rapid, is less invasive, required limited training and is ideal for rural Africa with power problems where the disease is endemic.

## Theme 2: Achieving Sustainable health as a means to sustainable development.

- **Fabricated Solar Autoclave:** The solar autoclave is a machine used to disinfect reusable medical tools and waste before disposal. Rural health centers use charcoal or firewood to boil water for sterilizing reusable medical equipment which is neither effective nor sustainable. These sterilization processes do not meet the WHO temperature requirement of at least 121°C. This study developed a prototype that found to be effective in the local context. This solar autoclave will ensure effective sterilization processes hence elimination of health facility transmitted infections.
- **Virtual Innovation for sustainable health training program for university faculty:** This self-directed online learning course could improve institutional capacity on how to effectively work to apply an integrated multi- sectoral and innovative approach to contribute to achieving sustainable health and Agenda 2030 in Uganda.





*The Makerere University (Mak) Solar Cooker Ready For Scaling*

*Launch of the Makerere University Solar Cooker (MakSOL) on June 14<sup>th</sup>, 2023 at Makerere University*

- **Effects of Music Therapy on Emotional Distress of Cancer Patients:** A Case of Uganda Cancer Institute.
- **Evaluating the biological and chemical contaminants in herbal medicinal products sold in Kampala, Uganda:** Towards improving the quality of herbal medicine.
- **An alcohol, drugs, and addictions surveillance system:** Mental health among young people continues to be a public health problem. This team designed a surveillance system for caregivers such as Uganda's Butabika Hospital to monitor and better support their clients. This project will yield improved management for people that need re-establishment, and it will reduce relapses, increase employability, and reduce the crime rates. Proper management of addiction will also reduce the opportunistic health conditions associated with alcohol and substance abuse.
- **The Early Preeclampsia Detection (EPED) Strip:** The EPED Strip is a rapid diagnostic test strip for pre-eclampsia among women. For women in the rural and low resource areas, who have no regular access to prenatal care, this low-cost, point-of-care diagnostic test provides a home-based method for self-diagnosing preeclampsia, thereby contributing to early care seeking and reduction of Maternal and neonatal mortality as per SDG3 sections 1 and 2.
- **A Smart Postpartum Hemorrhage (PPH) Volumetric Drape:** PPH is one of the leading causes of maternal mortality in Uganda. There has been no specific technique to measure PPH. This research team designed a smart postpartum hemorrhage Volumetric Drape which is used for measuring the amount of blood lost by a mother during delivery and postpartum, supporting prompt management.
- **Fabricated modified sturdy Spinal Brace:** The team used local materials to fabricate the modified sturdy spinal brace, providing a solution for many adults with lower back pain. The brace will facilitate movement and improve the quality of life for people with low back pain at a relatively cheaper cost compared to imported options.
- **eHealth Adoption Framework for Uganda:** This framework highlights the key aspects needed for successful eHealth adoption. Currently, the MoH is in overdrive to have the 2016 national eHealth policy implemented. The framework will facilitate the successful implementation of the eHealth policy and enhance operationalization and scaling of stagnated innovations. It will promote lobbying for standardization for data quality, security, and interoperability of the fragmented, siloed eHealth systems to increase their potential of improving health outcomes if they are integrated.

- **Framework for integration of refugees into the national health system:** Uganda hosts over 1.5 million refugees and asylum seekers. Several partners work with the Government to deliver health care services to refugees. This framework will enhance the integration of refugees into the national health system while enabling host communities to benefit from refugee health services, saving costs, enhancing service delivery, and guiding District Local Governments in managing refugee health facilities.
- **Resilient Communities for Quality Primary Education in Uganda (ReCoPE):** Uganda faces the challenge of low parent participation in Universal Education programs. Through collaboration with the National Curriculum Development Center (NCDC) and the Ministry of Education and Sports, the project identifies approaches for strengthening community support of primary education. The project has demonstrated positive attitudinal, and values change among parents and communities in Mayuge district.

### Theme 3: Re-imagining Education to unlock capacity for economic development.

- **Re-imagining Real Estate Education in Uganda:** The Ministry of Lands, Housing and Urban Development has taken up this project's findings in the development of its strategic plan and the Real Estate Bill. This project has helped the public, real estate industry and academia to learn more about the state of the brokerage industry. Recommendations from this project will lead to a real estate law that improves regulation of brokers and agents in Uganda, and an ethical code of conduct. Development of this industry will ultimately lead to economic growth through the investor confidence that comes from a more organised real estate industry.
- **Unlocking Capacities to Transform Language Learning in Uganda:** This project developed and piloted a Radio-based platform to improve French Language teaching in Uganda.
- **Enhancing Capacities for Integration of Patriotism in the Training of Early Childhood Teachers in Uganda (PATI Project):** Uptake of this project's recommendations could influence policy for provision of continuous capacity building training for in-service and preservice teachers, tutors, and caregivers, and facilitate learning of Patriotism through the Educational Perspective, and its integration into school curricula.
- **An online bilingual English-Luganda Linguistics dictionary and a mobile App:** This App led to improved learning of Luganda in Secondary and Tertiary institutions due to availability of the dictionary as a resource book. It provides a more harmonized way of mother-tongue teaching as a language of instruction. The dictionary serves as a model for other indigenous languages. Language teachers, linguists and graduate students trained through the proposed capacity building activities will help in continuous improvement and development of other language dictionaries.
- **Capability Enhancement Project for Innovative Doctoral Education at Ugandan Universities (CEPIDE):** The envisaged impact of CEPIDE is the development of a critical mass of doctoral supervisors able to undertake translatable research and train innovative researchers who can contribute to improving Uganda's innovation capacity in the global economy and provide solutions to local development challenges.
- **Strengthening Science, Technology, Engineering, and Mathematics (STEM) Using Gamification in Primary Schools (GamePlus):** The project has led to increased uptake of game-based learning tools and games in general for learning purposes, resulting in better STEM outcomes where the project has been piloted.

## Theme 4: Water, sanitation and the environment: A prerequisite to sustainable development

- **Capacity of Moringa oleifera and Eichhornia crassipes in removal of Endocrine Disrupting Chemicals from wastewater:** Towards improved water quality specifically wastewater. This project is providing an alternative low cost house-hold water purification technology.
- **Development and optimization of a biodegradable packaging solution for liquid-based cosmetics using response surface methodology:** This project will contribute to the reduction of plastic waste from cosmetic packaging once the technology is adopted and integrated into the cosmetics value chain.
- **Building Stewardship and Resilient Ecosystems through Participatory Integrated Planning Approaches.** The Case of Manafwa Watershed, Eastern Uganda: The project aimed at not only strengthening competitiveness for sustainable wealth creation, but it has also led to employment creation particularly for the youth and spurred inclusive growth through landscape restoration, led by intrinsically motivated farmers.
- **Up-cycling plastic wastes by incorporation of agricultural residues for the development of environmentally friendly packaging products:** The project enables utilization of plastic wastes and agricultural residues to produce novel up-cycled plastic packaging products. This impacts waste management to achieve a circular plastics economy that is environmentally sustainable. Local farmers can earn extra income from the up-cycling value chain. Jobs can be created in aspects of collecting agricultural residues and plastic wastes. The up-cycled packaging products have enhanced mechanical, thermal, biodegradability and bio-chemical properties.

- **Development of a behavioral intervention to foster proper urban waste management in Kampala City- Uganda:** Findings from this study will guide KCCA and other stakeholders in developing strategies for solid waste segregation and recycling in Kampala slums.

## Theme 5: Social sector to drive development

- **Determinants of Death Registration Uptake;** National Identification and Registration Authority adopted the project's recommendation and involved them in revising their strategy for death registration towards better coverage. This will improve availability of mortality data, contributing to SDGs 3, 11 and 16.
- **Embracing Soft Skills as the Building Blocks for the Realization of Decent Employment among Youth in Uganda:** With the findings from this study, the Project team was co-opted by the Regional Education Learning Initiative (RELI) to support the "Assessment of Life skills and Values in East Africa (ALiVE)" initiative in designing instruments for assessing life skills and soft skills among adolescents in Kenya, Tanzania, and Uganda.
- **Using Video Jockeys (VJs) To Promote Public Engagement and Awareness of Makerere University Science:** Four documentaries were produced, in 4 different languages highlighting the research arising out of the University. There has been increased visibility for Makerere University Research.
- **Use Of Theatre in Social Mobilization for Development:** The project team has partnered with the National Environment Management Authority (NEMA) to mobilize communities to protect the environment.

## Theme 6: Tourism, wildlife and heritage

- **Improving access to biodiversity data for conservation decision making:** By creating a National Biodiversity Data Bank at Makerere, data is now accessible to stakeholders for use in policy formulation and decision-making. For example, the Uganda Wildlife Authority has used the NBDB data to update the state of wildlife resources in Uganda. NEMA's CONNECT Project in partnership with the World Climate Monitoring Center (WCMC) and South African National Biodiversity Institute (SANBI) have used this data to map biodiversity hotspots in Uganda, while NEMA in partnership with UNDP and the NBDB have developed a tool for mapping essential life support areas (ELSA) in Uganda, under a project titled 'Mapping Nature for People and Planet'.
- **Harnessing chimpanzee ecotourism for enhanced conservation and improved livelihoods in Uganda:** Staff capacity in the production and usage of training manual, collaboration with non-academic actors and expanded outreach platform has been enhanced. Through the trainers of trainers (TOTs), increased professional tourism service providers within the community are available to balance tourism, conservation and livelihoods. There is improved local community knowledge and skills in tourism enterprises planning, development and management, greater tourism product knowledge, greater business networks, improved marketing, enhanced access to information, quality service provision, better conservation practices, enhanced community-based tourism brand among others. In addition, there is increased enthusiasm among local community groups to invest in tourism businesses that create broader economic opportunities and enhanced livelihoods for the community.

## Theme 7: Sustainable Planning, finance and monitoring as catalysts for growth

- **Harnessing geospatial technologies for sustainable urban planning in the newly created cities in Uganda using Rapid Physical Planning Approach (RAPPA):** Following the project's successful pilot, the Ministry of Lands, Housing and Urban Development will be persuaded to support Local Governments to prepare Physical Development Frameworks (PDFs) on their own. The study revealed that it is possible for LGs to team up and prepare PDFs with minimal external technical support. If adopted, planners in the new cities would be able to prepare PDFs for all neighborhoods in their cities as tools for decision making, ensuring orderly and sustainable urbanization in the country.
- **Assessment of The Practicability of Extended Producer Responsibility in The Sustainability of Electronic Waste Management in Uganda:** The project led to establishment of a viable Extended Producer Responsibility (EPR) system to manage E-waste sustainably in Uganda. This will lead to easier waste management such as domestic waste, medical wastes etc. Clean cities and a clean environment will promote growth.
- **An assessment of the drivers of the shadow economy and tax implications in Uganda:** Through this project, URA designed a new tax education strategy specifically for the informal economy and it has adopted USSD technology for use in EFRIS system.
- **Urban Revenue Mobilization and Service Delivery in Uganda: A case of Municipal Local Governments:** The impacts of the study are: Enhanced revenue, better capacity to finance their planned priorities, addressing capacity gaps, improved service delivery to residents, and use of modern information technologies to improve revenue tracking.



- **Effectiveness of financial inclusion on households' welfare in Uganda: A case study of Busoga Region:** The project generated policy recommendations about application of financial inclusion including financial literacy in enhancing households' welfare in Busoga Region. It has enhanced operations for Uganda Development Bank, Microfinance Support Center, and private institutions like Finca Uganda and Uganda Finance Trust.
- **Methodology To Inform Compensation on Road Infrastructure Projects:** The project consulted a large number of stakeholders from key departments and ministries with the following impacts: Establishment of drone operation policies, informing procedures for valuation audits, innovative ways of periodically informing stakeholders on infrastructure development schedules and compensation analysis. It has contributed to increased usage of drones for scientific studies beyond photography.
- **Strengthening Local Governance through adoption of E-Governance Digital applications for sustainable transformation and prosperity of Uganda's societies:** Online E-Governance is being used in Kasangati and other town council offices in Wakiso district. It has improved citizen participation and knowledge of public services in their area. They have received a patent for the system and are now rolling it to other town councils.

## Theme 8: Leveraging Public Service and Local administration for service delivery.

- **Digitization of land archival documents in Makerere University library (1830-1995):** The project enhanced the availability and access of land archival documents for the period 1830-1995. The project has also sensitized stakeholders about the availability and access of land archival documents in Makerere University.

## Theme 10: Strengthening law, governance, human rights and international cooperation

- **Exploring the feasibility for strengthening Uganda's Health system through standardizing digital health:** Architecture, standards and knowledge products (e-Registration): The project has facilitated the MoH and their Partners to gain self-reliance in implementing the controlled DH-ASK that will facilitate standardized collection, analysis and exchange of health information across Uganda.
- **GIS Backed Big Data Analytics for Land Value Prediction for Compensation and Taxation Purposes:** The project sets a precedent in deployment of Big Data for land value prediction in Uganda. This will speed up land valuation so that projects are not delayed by compensation processes and project affected persons are not cheated.
- **Eco system for Telecommuting in Higher Education Institutions in Uganda:** The project has made it easy for students and staff of higher institutions to work remotely and creating a shared learning platform for students.
- **The Multimedia Production Hub: Harnessing Digital Media for Increased Uptake and Visibility of Makerere University Research and Innovations:** Researchers have gained skills in increasing visibility of their work through multimedia. 20 videos are readily available on YouTube highlighting different innovations and research outputs from Makerere. Mak-RIF visibility has increased and thus Makerere University visibility.

## Theme 11: Harnessing ICT to drive development

- **The Makerere E-Human Resources system is operational to support data digital transformation at Makerere University:** This system has changed the operations of keeping staff records, such as

publications, promotions and retirement due date. This system can also be adopted for use in government Ministries and other institutions.

- **The University wide timetabling system developed to cater for varying requirements of all the university departments:** This system provides data on the teaching load of staff and it is easy to use, robust, expandable and provides information in a snapshot. This is currently being rolled out to three other Public Universities in Uganda
- **Digitalization of Academic Records and Processes to keep academic records safely, and minimize losses associated with manually keeping records and processes:** This has been adopted and is currently in use at Makerere University.

## Theme 12: Works, manufacturing, science and technology as tools to accelerate development.

- **Linking the Artisanal Industry with Academia:** A Multidisciplinary Design and Technology Approach for Innovation and Industrial transformation in Uganda: The fieldwork industrial linkages and the practical 3-Dimension modeling and printing workshop greatly impacted the students.
- **Investigation into modification of Black Cotton Soil by Application of Biochar and Sand to improve Road Subgrade in Karamoja Region:** There has been a modification of Black Cotton Soil by Applying of Biochar and Sand to improve Road Subgrade in Karamoja Region. This can be scaled to work in other regions of Uganda. I will greatly improve the roads and hence the safety will be using these roads.

## Theme 13: Solutions to catalyze business

- **Integrating Refugees into Economic Activities through Mobile**

**Entrepreneurship Skilling:** This project equipped urban refugees with entrepreneurial skills. Participants who attended the training were motivated to start some small businesses which are income generating thus improving livelihoods as well as paying taxes to the government.

## Theme 14: Energy and Minerals as drivers of rapid economic development:

- **Assessing Uganda's Oil and Gas players' Corporate Social Responsibility Readiness for Social Compliance in the Albertine region:** Uganda's Ministry of Energy and Mineral Development (MoEMD), Petroleum Authority of Uganda (PAU) and Uganda National Oil Company (UNOC) in devising policy shifts in Gas & Oil subsector. Specifically, it has proved a need to shift from over dependence on Environmental Impact Assessment (EIA) as the only major prerequisite to be granted license to operate in Uganda's O&G subsector, to also demanding for comprehensive & operationally relevant integrated CSR plans which deliver Social Compliance in support of realizing SDGs (12, 8, 7, 5,1).
- **Electricity Access for All: Exploring alternative options for electricity accessibility in Uganda:** We have developed a new model for electricity access in Uganda, which is expected to impact policies that enhance individuals' incomes to increase their electricity affordability.

## The following projects have enhanced institutional capacity.

- **Enhancement of the Intellectual Property office:** This has been equipped with infrastructure needed to support researchers obtaining patents for their creations. This will enhance support to researchers. So far, two patents have been registered.

- **Three Institutional Review Boards established:** Three Colleges received support to establish and operationalize their Institutional Review Boards: These are the College of Veterinary Medicine Animal Resources and Biosecurity, the College of Natural Sciences and College of Business and Management Sciences. This has enhanced ethical research in the university.

## A highlight of Mak-RIF recent activities



### Makerere University's Innovation emerges 'BEST INNOVATION' at the Appropriate Technologies 2023 Expo

Makerere University faculty, students and administrative staff diversely engaged at the Appropriate Technologies Expo. One of the over 850 multidisciplinary projects funded by the Government of the Republic of Uganda through Makerere University's Research and Innovations Fund (Mak-RIF) <https://rif.mak.ac.ug/> emerged 'BEST INNOVATION' (out of 46 showcased innovative solutions) at the Expo. This was Uganda's Ministry of Water and Environment - Appropriate Technology Centre (ATC) 2023 Expo organized in partnership with Makerere University and United Nations Children's Fund (UNICEF). It was the second Expo held at Kololo Ceremonial Grounds; Thursday February 2<sup>nd</sup> through Saturday February 4<sup>th</sup>, 2023 guided by the Theme: "Showcasing Appropriate Technologies that can be adopted to improve health, hygiene, social wellbeing, agriculture and environmental conservation". Seven projects funded by the Government of the republic of Uganda through Mak-RIF participated in this Expo.

The Winner and Best Innovation at the Expo is Makerere University's project titled: Valorization of Waste Chicken Feathers for Water Purification: Designing and Constructing Low-Cost Keratin Based Nanofilters as Adsorbents of Heavy Metals and Nanosized Contaminants (MAK-RIF/CH/02/21).

This project is being incubated at Makerere University College of Natural Sciences (CoNAS) under the leadership of Dr. Alice Nabatanzi, the Principal Investigator.

"This is very exciting news, it is evident that innovations start small, just think without the box, explore and leverage readily available resources and put these into use to propose solutions to address community challenges. Thank you so much Government of Uganda for the funding. Thank your Makerere University management for the enabling environment and thank you team at Mak-RIF for the opportunities for us to showcase our solutions. We pledge our best", said Dr. Nabatanzi. She added that the efforts at hand currently are geared towards scaling the project for wider reach and in saying this she called upon potential partners, donors including the government of Uganda to embrace further supporting such innovative solutions to scale. Other team members include; Mr. Stanley





*Waste chicken feather processing*

Ofwono, Project Technician and Ms. Irene Achede, Project Administrator. Like other supported project teams, this team is engaging external stakeholders; Mr. Samson Okwir from Ugachick Poultry Breeders Ltd supports project implementation. In addition, mentorship of students is key at a higher learning institution like Makerere University and for this reason Mr. Thomas Wanyama and Tropher Ssali; Bachelor of Science Biotechnology students at CoNAS are team members of this project and they greatly supported at the Expo.

This project developed a keratin-based nanofiller using waste chicken feathers. This is a new technology and one of its kind in Uganda and Africa at large. The project aimed at efficiency and sustainability while promoting a circular economy. The developed filter is able to clean and purify water through removal of micro-organisms, heavy metals and other nano contaminants. The filtered water is safe and ready for use and even drinking. This project purposes to control environmental pollution through recycling of waste chicken feathers as it contributes to improved health, food safety, food security and environmental safety. This project majorly contributes towards SDGs 3, 6, 9, 13.



*Project Team pitching the innovation to Hon. Silas Aogon (in a grey suit speaking on the microphone), Uganda's Member of Parliament for Kumi Municipality, Kumi District and Chairperson Water Sanitation and Hygiene (WASH) Parliamentary Committee.*

The second-best Innovation was the Trenching Machine that eases excavation of trenches during laying of water pipes and the third was an application used in the operation and maintenance of a water supply system both by teams from Busitema University. Congratulations!

### **Other Mak-RIF projects showcased at the Expo include the following;**

- Green synthesis of graphene from Agro waste for energy storage devices – Dr. Nobert Mukasa – College of Engineering Design Art and Technology (CEDAT).
- Towards a Food Secure Uganda Under a Changing Climate – Dr. Isaac Mugume, College of Agricultural and Environmental Sciences (CAES).
- Environ e-Watch App for increased community surveillance in environmental monitoring catchment degradation and restoration – Dr. Patrick Musinguzi, College of Agricultural and Environmental Sciences (CAES).
- Functionalized XEROGEL – Carbon Water Filters – Dr. Ibrahim Karume, College of Natural Sciences (CoNAS).



- E-Participatory Innovation Platforms for Improved Access to Forestry Extension Services – Associate Prof. Justine Namaalwa, College of Agricultural and Environmental Sciences (CAES).
- Green Low-Cost Touchless Handwashing Technology (TW-20 Kit) For Public Shared Spaces, Dr.



*Project Teams pitching the innovation to Hon. Silas Aogon (in a grey suit speaking on the microphone), Uganda's Member of Parliament for Kumi Municipality, Kumi District and Chairperson Water Sanitation and Hygiene (WASH) parliamentary committee at the ATC 2023 Expo*

Dr. Joshua Wanyama, College of Agricultural and Environmental Sciences (CAES). Details about the launch of these kits are shared on <https://rif.mak.ac.ug/mak-unveils-a-touchless-handwashing-kit-for-public-shared-spaces-in-response-to-covid-19-pandemic/>

Upon receipt of this exciting news, Prof. Fred Masagazi-Masaazi, the Mak-RIF Chairperson Mak-said "Wow, Congratulations to all exhibitors at the just concluded ATC 2023 Expo and specifically to Makerere University's Dr. Nabatanzi and your project team. I am happy that the adjudicators at the Expo identified this project and recognized it as the 'BEST INNOVATION'. Indeed, we have many more potentially transformative projects being supported under the Mak-RIF initiative with funding from the

Government of the republic of Uganda". "We are forever grateful to the Government of Uganda for supporting research and innovations at Makerere University. This fund has continued to have spillover effects to other institutions of learning and organizations with whom our researchers and innovators have continued to work" Prof. Masagazi added. The Appropriate Technologies 2023 Expo was an opportunity for Ministry of Water and Environment in partnership with Makerere University and United Nations Children's Fund (UNICEF) to showcase 47 innovative solutions directed towards positively impacting communities in which we live and serve. It was also at this Expo where the general public received various health services including HIV and Aids Counseling and Testing, Vaccination, testing for lifestyle diseases and Safe Male Circumcision etc. from Makerere University Hospital

team. The Expo was attended by Members of Parliament, government officials including commissioners and assistant commissioners, private sector, researchers, innovators, entrepreneurs, the Media, Higher Education Institution faculty and students among others. Details about the Appropriate Technology Centre (ATC) are shared on <https://atc.mwe.go.ug/>

Engineer Christopher Tumusiime, Commissioner of the Water Utility Regulation Department at Uganda's Ministry of Water and Environment welcomed all participants to the Expo noting that the Expo was an opportunity to showcase water supply, sanitation and environmentally appropriate technologies to spur social economic development in Uganda. "We are using this Expo to show that science and technology can be used to adjust effects of climate change, improve access to

safe water, improve data management among others”, Engineer Tumusiime added. He thanked Makerere University Hospital team for providing health services during the Expo. He also thanked Prof. William Bazeyo, the ATC Chairperson for mobilizing Expo participants noting that he was also grateful to the Expo partners for all the support which enabled it to happen.

Mr. Yakubu Al Hassan Kassim, WASH Officer at UNICEF commended all stakeholders for a job well done at the Expo. He noted that the theme was well thought out especially in this era of socio-economic development efforts. “Let us give all these technologies support to scale. UNICEF focusses on sustainability of these technologies because this is authentic for home grown solutions. We are proud to be part of this and please, whenever there is an opportunity, call on us” he added.

Prof. William Bazeyo, the Appropriate Technology Centre Chairperson called upon all stakeholders to support Uganda’s innovations to get into the different markets. He said “Our people in the communities deserve even more especially using some of the simple technologies for example purification of water”. Prof. Bazeyo thanked Hon. Aogon for sparing time to engage with each exhibitor while offering guidance. He requested Hon. Aogon to please take the message to the committee he is leading that what they are looking for is all at the ATC Expo. “One day, Uganda will be a source of what the region requires for example employment of the youth” he added. He also thanked Makerere University and UNICEF for the partnership noting that he is always proud to be part of Makerere University and would continue working with the teams to spur research and innovation.

Honorable Silas Aogon, Uganda’s Member of Parliament for Kumi Municipality, Kumi District and Chairperson Uganda Parliamentary Forum on Water Sanitation and Hygiene (WASH) graced the expo as Chief Guest. He commended Ugandans who are researching and innovating including those embracing research and innovation. He called upon all to make technology and its aspiration viral. “Let new circles influence upcoming circles to grow technology” he noted. “We need appropriate technologies to save our

natural bodies, control pollution, and reduce carbon emission” Hon. Aogon added. He also said that appropriate technologies need to trickle down to the last mile communities and thus the need to continue supporting the growth and development of technology. “On behalf of Government of Uganda, we pledge to continue supporting technology growth in Uganda and beyond. Let us all accord technology and innovation a priority so that we all benefit in one way or another” he said. He applauded the two Professors; Prof. William Bazeyo, the ATC Chairperson and Prof. Sylvia Nannyonga Tamusuza, Chairperson Makerere University Grants Administration and Management Unit and Head of Department Makerere University Department of Performing Arts and Film who joined in the Expo. He also appreciated the Makerere University Department of Performing Arts and Film for entertaining the Expo participants noting that when people sing properly then one is able to even work properly. He concluded by noting that by the time someone carries out research by him or herself, then that is a calling from God and may God continue to bless all researchers and innovators.

This Expo was also livestreamed online Day 1 of the Expo - Follow the engagement on <https://www.youtube.com/live/LI2z4hKCWvA?feature=share>

Day 2 - <https://www.youtube.com/live/qL8OcMJ00vQ?feature=share>

Day 3 - <https://www.youtube.com/live/NjrK2s3FQak?feature=share>

## Engagement with UN Women Uganda Office

Makerere University Research and Innovations Fund (Mak-RIF) is grateful to the UN Women Uganda Office for hosting some of their staff members on March 13th, 2023. It is fulfilling that this initial engagement culminated into a deep discussion on how the two entities could collaborate and is likely to birth a strong working relationship between Mak-RIF and UN Women.



*The UN Women and Mak-RIF team joined in a group photo after the engagement*

### Discussion areas and actions points

It was evident from the discussions that operations within the two institutions are being guided by similar thematic areas geared towards contributing to development. It was also noted that, Mak- RIF researchers and innovators have generated several multidisciplinary innovations which are ready for scale and commercialization to drive development in Uganda and beyond. Therefore, by leveraging synergies with UN Women programs, Mak-RIF can help to provide insights towards strengthening implementation of the UN Women programs as they support Mak-RIF through their networks to disseminate and explore how to have the targeted populations reached with relevant research and innovations.

“Throughout our discussions, we learned that Mak-RIF can plug into various UN Women opportunities” noted Evelyn Nyachwo, Mak-RIF Research Support Officer. In particular, we hope to plug into 4 opportunities:

- 1) We plan to have capacity-building training sessions on gender equality and women empowerment. All these perspectives should be embedded in the programming

of Makerere University 's Research and Innovations Fund.

- 2) We also plan to have a training on intergovernmental collaboration which will contribute to Mak- RIF's visibility efforts and enhance its relevance and longevity
- 3) Through the UN Women Networks, the outputs of the Makerere University Research and Innovations Fund will be widely disseminated to the targeted population. This could be through leveraging already existing structures established by Mak-RIF.
- 4) With UN Women as an implementing partner, the Research and Innovation Fund will focus on scaling and commercialization of innovations with proven transformative potential, especially in UN Women areas of interest including: Gender Equality and Women Empowerment with the perspective of Care Economy.
- 5) Since the UN Women is mainly an implementing agency, we hope to leverage their buy-in on very specific research questions that directly inform the implementation of Mak-RIF's programs while fostering learning and adaptation for better service delivery. We have therefore remained open to receiving specific research questions from UN Women on areas where they need to obtain evidence rapid assessments that would improve their programming e.g. On Gender statistics, Gender Equality, and Women Empowerment among others. Since the Research and Innovations Fund is aimed at providing solutions to accelerate development, it is our wish that we can plug into the information needs of key development actors in areas that intersect with the national research agenda that we developed. Details are shared on [rif.mak.ac.ug](http://rif.mak.ac.ug)



## Mak-RIF at 12th Academia-Public-Private-Partnership Forum

Makerere University Research and Innovations Fund (Mak-RIF) participated in the 12th Academia-Public-Private-Partnership Forum (APPPF) organized by the Inter-University Council for East Africa. This Forum was held on the 15th to 17th of March 2023 at the Julius Nyerere Convention Centre, Dar es salaam Tanzania under the Theme: Nurturing Sustainable skills development for graduate employability through Academia-Industry partnerships. APPPF is held every two years and it brings together academia, private sector and Government to deliberate on how to foster joint dialogue and enhance the linkage between the private sector and higher education institutions, as well as engagement with the public sector. The forum was attended by several universities in Eastern and Central Africa.

Discussions during the forum highlighted the role of universities in economic and social development; focusing on training, innovations and generation of scientific data to support industry. It was also an opportunity to pass on a caution to universities for the need to understand that development changes are happening so fast necessitating universities to adapt quickly in order to keep up with the pace. The need to strengthen the innovations and research ecosystem was also emphasized and different recommendations such as involvement of the private sector for achievement of sustainable development through-out the innovation ecosystem, encouraging researchers and innovators to register and open companies, defining the roles of different stakeholders in the ecosystem (Promote collaboration to realize an operational conveyor belt) and encouraging researchers and innovators to strive and move beyond disseminations and exhibitions to registration of Intellectual property and commercialization and scaling up of products. The Makerere University Research and Innovations Fund Team was recognized for their outstanding contribution the APPPF Conference. The Certificate of Recognition is shared on \Mak-RIF Stakeholder Engagement Strategy\certificate of recognition at the APPPF Conference.pdf

## Engagements at the 12th Academia-Public-Private-Partnership Forum (APPPF) in Pictures

The Mak-RIF also participated in the exhibition arm of the 12<sup>th</sup> Academia-Public-Private-Partnership Forum. It is in the exhibition where different Mak-RIF activities and projects were showcased largely using video footage. This exhibition stall was managed by Mak-RIF Engagement Officer and Research Support Officer who participated in the Forum.



*Prof. Patrick Engeu Ogwang, Mbarara University of Science and Technology at the Mak - RIF stall. He appreciated the capacity building activities of the Mak-RIF which yielded Government Support and Funding for Mbarara University of Science and Technology*

## Our own Badaye Technologies Limited wins two awards at the BIG BANG! University of California Davis Business Competition

The University of California (UC) Davis Big Bang! Business Competition provides a forum for innovators to collaborate as they develop and test business ideas.

Badaye Technologies Limited participated in the UC Davis Big Bang! Business Competition March through May 2023 and was selected to the finals. Congratulations! The team at Badaye Technologies Limited won two prize awards: Food + Agriculture Sector Award (worth \$10,000), and Energy + Sustainability Sector Award (Worth \$10,000). Speaking to Mohamad Oceger, Chief Executive Officer at Badaye Technologies Limited, he said "We are a Ugandan company located at Nansana Kyebando Jupiter Estate. We





*Makerere University's, Deputy Vice Chancellor; Prof. Henry Alinaitwe engaging at one of the stalls at the 12th The Academia-Public-Private-Partnership Forum (APPPF)*

are grateful for the funding from the government of the Republic of Uganda through Makerere University Research and Innovations Fund, United States Agency for International Development through ResilientAfrica Network(RAN)among other funders. Without this SEED funding and initial support, we would not have been in position to leverage an opportunity to get out here and even participate in the UC Davis Big Bang! Business Competition”.

What drives the Badaye Technologies Limited team is the urge to “transform agriculture in Africa, one machine at a time”. How it started: As an undergraduate at [Makerere University](#) completing an internship at Iowa State University – Uganda Program (ISU-UP) in eastern Uganda, UC Davis biological systems engineering Ph.D. candidate [Ismael Mayanja](#) observed the laborious, time-consuming processes that smallholder farmers and maize processors used to clean harvested maize grain, with sub-optimal results. Knowing there had to be a better, affordable alternative to screening, hand sorting and winnowing the maize, he designed a prototype for a seed cleaner that operates through a simple pedal system and requires no electricity or fuel.

Today, Mayanja and [Isaac Oluk](#), a doctoral student in environmental engineering at the University of Kentucky, are co-founders of a fabrication company [Badaye Technologies Ltd. \(BTL\)](#), based in Kampala, Uganda. Our vision is to develop innovative solutions that address the unique challenges faced by farmers and processors in Uganda and

beyond. We want a transition to a future where no agricultural food is lost in Africa, one that is powered by autonomous, clean and transformative AgTech built in Uganda.

Badaye Technology Limited's flagship product, the SUNSULA, uses rotary sieves to efficiently clean maize in seconds and produce quality grain for safe and longer storage, easy processing into other foods, and healthy consumption. It is customizable, offering smallholders in rural areas a pedal-powered mechanism with low initial and maintenance costs, and urban maize processors a motorized option, available in three sizes.



*Local fabrication (using locally available and accessible materials) of the SUNSULA Maize cleaning equipment in Kampala, Uganda*





*The SUNSULA equipment in use in one of the maize cleaning units in Kampala, Uganda*

Excitingly, BTL brought home (to Uganda, the Pearl of Africa) the Food + Agriculture Sector Award—primary sponsor: HM.CLAUSE; supporting sponsor: UC Davis Innovation Institute for Food and Health—and the Energy + Sustainability Sector Award, primary sponsor: SMUD and supporting sponsor Reza Bayati MD. The startup will use the prize money to provide SUNSULA training and product demonstrations to smallholder farmers in remote areas of Uganda.

Currently, the SUNSULA equipment is being used by farmers in Eastern Uganda

specifically Kamuli District (one of Uganda's biggest maize growing community). The team anticipates selling 100 SUNSULA machines over the next year. In five years BTL plans to expand its product line to include a model that can simultaneously clean seeds of different sizes in addition to maize grain, and also build a suite of product lines in the postharvest handling chain for several agricultural foods.



*Capacity strengthening and building: Showcasing SUNSULA to young learners in rural Uganda*



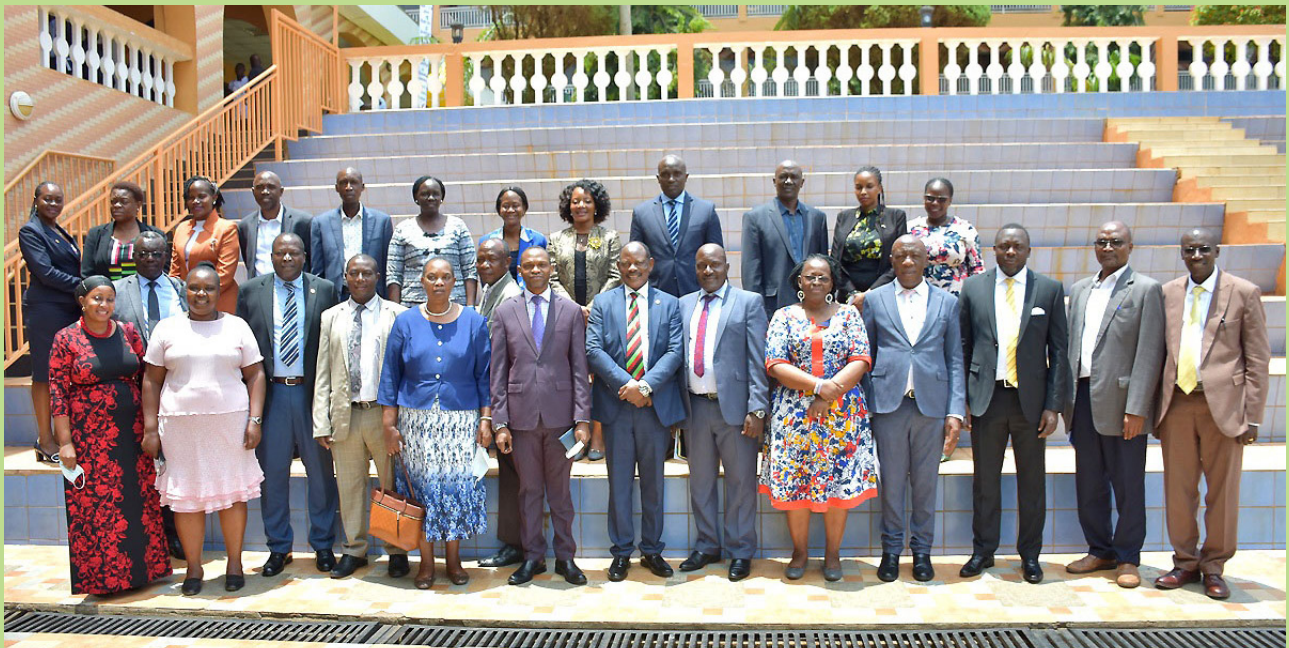
*SUNSULA for improved community livelihoodAdditional research projects and innovations*



## A Highlight of some of the Mak-RIF Engagements in Pictures



*Mrs. Lorna Magara, Makerere University Chair Council (Centre in an African cloth jacket) approving and launching one of the Mak-RIF awards. Engagement of University Leadership and Management team is vital in the operations of the Mak-RIF initiative*



*Participants with Prof. Barnabas Nawangwe, Makerere University Vice Chancellor (Centre in a blue suit with a Makerere University necktie) at one of the Mak-RIF Makerere University Management-Consultative-Meetings. This one was held at Hotel Africana, Kampala Uganda, April 2022*





*Group Photo with Makerere University Management, external stakeholders including parliamentarians after an engagement to share Research and Innovation outputs at Makerere University, November 2022*



*Group Photo with Prof. Fred Masagazi Masaazi, Mak-RIF Chairperson (Centre in Grey Suit) after a Dissemination Session of the Project on Gender and Utilization of Briquettes as a replacement fuel for charcoal and firewood in Uganda, February 2023.*

Some of the participants including in no specific order Hon. Denis Hamson Obua, Government of the Republic of Uganda Chief Whip (Center in a black suit and blue neck tie); Amb. Maria Håkansson, the Swedish Ambassador to Uganda (fourth from the right-hand side); Mrs. Jane Barekye, State House Comptroller (first from the left – hand side at the front); Hon. Monica Musenero, Minister of Science Technology and Innovation; Prof. Barnabas Nawangwe, Makerere University Vice Chancellor (far right in a blue suit); Prof. Fred Masagazi Masaazi, Mak-RIF GMC Chairperson (next to the Government Chief Whip); Dr. Sabrina Kitaka, Mak-RIF GMC Co-Chairperson (front line in a green and white dress) and Members of Parliament representing different committees of Parliament at the Mak-RIF stakeholder engagement during a high-level breakfast meeting at Mestil Hotel, Kampala Uganda, April 2023. This engagement provided a platform for Mak-RIF to share its achievements.





Benefiting from the Kampala Ghetto Youth Training for Entrepreneurial Promotion project, the Ghetto youths received funds for small - scale businesses and entrepreneurship. The pictures below (taken in May 2023) show some of the ventures the youth are pursuing with the modest income provided.



*Makerere University team engagement with Uganda Police Officers at Police Senior Command and Staff College- Bwebajja to design the Soft Skills Taxonomy needed to design a framework for integrating soft skills in Uganda Police Training Program under the Soft Skilling Initiative for Effective Community Policing Project (SSIECP), July 2023*





Participants at the Uganda HIV/AIDS Research Agenda Engagement at Hotel Africana, Kampala Uganda, August 2023. Dr. Eddy Walakira (front line at the center in a grey suit representing the Mak-RIF GMC Chairperson at the launch)



Part of the Mak-RIF Grants Management Committee Members and the Mak-RIF Secretariat at the High-Level Stakeholder Engagement Breakfast Meeting, Mestil Hotel Kampala Uganda, April 2023



Mak-RIF Secretariat members with the Mak-RIF GMC Chairperson, Prof. Fred Masagazi Masaazi (Centre in a grey suit) and the Mak-RIF GMC Deputy Chairperson Dr. Sabrina Kitaka (Left hand side in a pink dress) at one of the Half Year Review Meetings, July 2023





# Editorial

By: Harriet Adong,  
Mak-RIF Communications Officer

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Thank you to the Mak-RIF Grants Management Committee and Secretariat members for all the input to this Issue.



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