DECEMBER 2025

ACE II MAGAZINE

Shaping Africa's Knowledge Economy: Reflections from the Frontlines

ACEITLMS' Decade of Strengthening STEM Education

APA has strengthened agricultural policy analysis and informed decision-making

Transforming Africa's Food systems through insects for Food Security

Bridging Modern Public Health and Traditional Herbal Medicine

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On the Cover:

Students explore science firsthand during a lab visit to CDT Africa under the NEGAT (Next Generation Scientists for Africa's Transformation) program - an immersive five-day drug discovery experience introducing 13–15-year-olds to research on traditional medicinal plants.

Editor's Note

From Kenya to Malawi, Mozambique to Rwanda, the African Centres of Excellence (ACE) initiative is steadily transforming universities into engines of industrial growth, energy transition, and food security.

At Moi University, ACEII–PTRE exemplifies how strategic investment can link phytochemistry, textiles, and renewable energy with industry and communities. Nearly 200 postgraduates from nine countries, internationally accredited PhDs, and over $3.9 million in external grants underscore its academic credibility.

Meanwhile, village biogas systems and a nascent renewable energy park highlight its tangible impact. In Malawi, LUANAR's TACE has sprinted from concept to commercialization in three years, spawning agri-startups, financing products for youth, and incubation infrastructure - an inspiring lesson on how fast universities can move when milestones are clear and firm.

CRAFS at the University of Malawi pushes the model further downstream. Its weather-index insurance tools, digital farmer registers and food innovation hub blend data science with smallholder realities. In Mozambique, CS-OGET aligns oil and gas engineering with environmental safeguards and industry needs, training hundreds of specialists to support the energy and extractive sectors. Rwanda's ACEESD is preparing the workforce for what comes after fossils: smart grids, solar, hydropower, and energy storage, supported by good laboratories and an active innovation hub.

The pattern is consistent. These centres thrive where three forces meet - regional collaboration, which deepens talent pools; industry partnerships, which ensure curricula remain relevant; and disciplined governance, which sustains donor and government confidence. The weaknesses are also shared. Women remain underrepresented. Timelines rewarded speed over institution-building. And sustainability beyond donor cycles remains uncertain.

Still, the broader verdict is undeniable. The ACE model has shifted Africa's universities from commentators on development to active participants in it. If governments now match donor ambition with long-term funding, regulatory support, and deeper industry co-investment, the returns could compound. Africa's quiet revolution in higher education is underway; the task now is to make it irreversible.

It has been a great privilege to coordinate communications for the ACE II project over the past decade. The relationships we have built, the stories we have shared, and the milestones we have achieved will remain with me long after this chapter closes. As ACE II winds down, this marks my final issue as editor. I leave with gratitude and pride in what we have accomplished together.

Agnes Asiimwe

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Establishment of a Technology Transfer Office at LUANAR in 2024

Dr Sera Gondwe and Prof Grivin Chipula

As we reflect on the journey of leading the Transformative Agriculture Commercialization and Entrepreneurship (TACE) Centre at LUANAR, we are reminded that excellence is not a single milestone—it is a continuous pursuit. The work of nurturing a Centre of Excellence is shaped by people, opportunities, challenges, and lessons that will continue to guide us long after the project closes.

Learning to Lead for Transformation: Reflections from LUANAR TACE journey

Over the past two and a half years, especially under the ACE II Additional Financing (ACEII-AF) programme, we have had the privilege of guiding and being guided by committed teams at different levels—teams passionate about transforming research, innovation, and agripreneurship at LUANAR and beyond. This reflection highlights key achievements, lessons learned, and recommendations for policymakers and development partners supporting the ACE model.

Key Achievements

Our most significant achievement has been establishing TACE as a visible, functional, and trusted platform for innovation and commercialization at LUANAR. Despite tight timelines and demanding performance indicators, the team built systems that connect research, agribusiness development, technology transfer, and youth entrepreneurship. More than **10 partnerships** with public and private sector actors were signed and implemented, enabling ongoing initiatives such as:

- Established a university supported start up (Trade mark being filed) offering Livestock Insurance product and researching Digital Cattle ID, one of its kind in the sector
- Designed a Financial Product targeting youth graduating from incubation spaces, co-developed with a commercial bank and NGO partners, and launched on 10 June 2025 to support start-ups emerging from the incubation programme.
- Intellectual Property and Technology Transfer Support systems - a researcher supported to file a trademark and ongoing discussions to commercialize microbial innovations.

Through partnerships, TACE secured access to 60 hectares of private-sector-supported land for experiential learning, research, and revenue generation. Part of this is now a 10-hectare macadamia orchard, and sorghum field

In terms of delivery and capacity strengthening:

- **On track to have 100% of** ACE committed funds disbursed as planned.
- **180+ students were sponsored**, and **315+ individuals trained** through short courses.
- **91+ staff and students benefited from exchange visits**.
- **83+ research publications** were produced under the programme.
- **150+ youth were engaged**, generating **50+ jobs**.
- Teaching and learning infrastructure was upgraded—computers, vehicles, drones, a tractor and implements, laboratory tools—supporting LUANAR's application for **regional accreditation of three programmes**.

These achievements highlight the power of a motivated, capable team. Despite pressures, the implementation team consistently exceeded expectations, benefiting from teams from other Centres who offered crucial peer support, shared tools, and practical advice that strengthened our delivery.

Lessons Learned

The ACE model offers a powerful, results-oriented approach to strengthening higher education institutions. Milestone-based performance drives efficiency, accountability, and clarity. However, the ACEII-AF experience revealed an important lesson: while milestones accelerate delivery, they must be balanced with timelines that allow institutions to build sustainable systems. The compressed timeframe sometimes forced leadership to prioritize performance-based indicators over deeper, transformative processes.

In certain moments, this pressure made the environment feel adversarial—deadlines were tight, expectations high, and feedback frequent. But over time, we realized that no one was "out to get us." Every alert—from the implementation team, LUANAR management, IUCEA, the Government through the National Steering Committee, and the World Bank team—was intended to help us prepare for the bumpy road ahead. These experiences sharpened our resilience, strengthened our planning capacity, and taught us to communicate proactively.

Another key lesson was the importance of **internal alignment**. Success required not only a competent team but also strong institutional support, responsive systems, and coordinated engagement across departments. Where alignment was strong, progress accelerated; where it lagged, delivery slowed. This reinforces the need for continuous institutional strengthening as the foundation for externally funded programmes.

Recommendations for Policymakers and Development Partners

First, programmes aimed at advancing institutional excellence should balance milestone-based deliverables with **realistic implementation timelines**. Short cycles drive speed but can unintentionally constrain the development of sustainable

TACE is in a collaboration with a local farm to promote macadamia production.

institutional structures.

Second, the ACE model's focus on leadership strengthening is crucial and should be enhanced. Centres need not just resources but also autonomy, mentorship, and space to innovate.

Third, cross-centre collaboration is one of the strongest features of the ACE approach and should continue to be emphasized. Peer learning accelerates adaptation, reduces duplication, and creates a continental community of practice.

Finally, monitoring and support systems should maintain a **partnership mindset rather than a policing mindset**. When feedback is framed as collective problem-solving, teams remain confident, open, and solution-focused.

Closing Reflections

The insights gained on this journey are truly priceless. We are deeply grateful to our implementation team for their commitment; to fellow ACEs for their solidarity; to LUANAR leadership for enabling the vision; to the Government of Malawi for its steady support; to IUCEA for tireless guidance; and to the World Bank team for both pushing us and walking with us.

Our journey of excellence continues—motivated by lessons, strengthened by community, and inspired by the possibilities ahead. TACE is more than a centre; it is a platform for transformation and a reminder of what African institutions can achieve when empowered to lead with purpose.

Dr Sera Gondwe

Prof Grivin Chipula

Establishing the Centre of Excellence in Water Infrastructure and Sustainable Energy Futures:

Looking back and looking into the Futures

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Background

The African centre of excellence in Water Infrastructure and Sustainable Energy Futures (WISE - Futures) of the Nelson Mandela African Institution of Science and Technology (NM-AIST), was established in 2017 to contribute to attaining water, sanitation and energy security for all in East and Southern Africa. Four interlinked objectives were set, namely: 1) to establish excellent learning environment for training top-notch Masters and PhD graduates specializing in water and energy related fields; 2) to provide a stimulating research environment for early career researchers to enable them contribute to solving pressing problems related to water and energy; 3) to strengthen regional and international research collaboration in order to promote the development of cutting edge solutions to water and energy

Water Purifier System

challenges in the region; and 4) to promote inclusive socio-economic transformation in the region by turning research findings into usable and accessible products for the benefits of society, industry, and the environment.

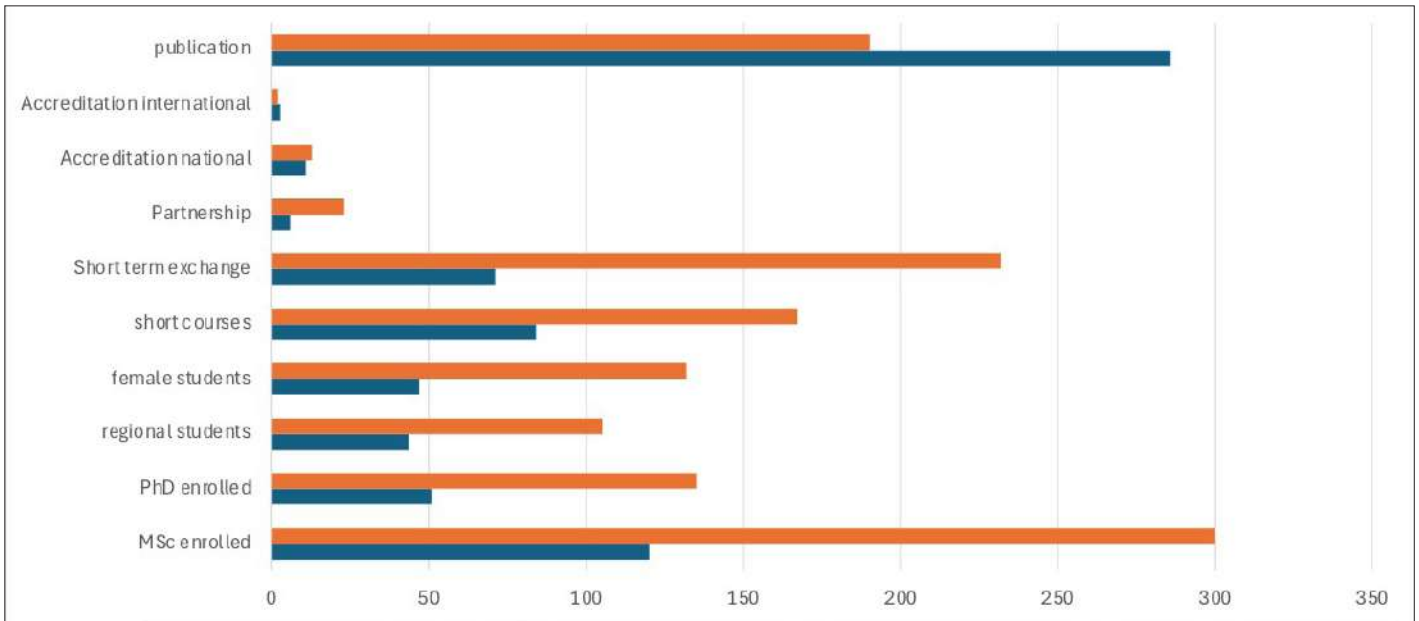
Specifically, WISE – Futures was proposed as a unique regional hub for the development and dissemination of cutting-edge disciplinary, interdisciplinary, and transdisciplinary knowledge in water, sanitation and energy. The centre target was to equip 120 Masters, 51 PhDs, and 167 policy makers and practitioners with advanced skills to effectively contribute to solving water, sanitation, and energy security challenges in the region.

WISE – Futures achievements

By the end of the ACE II programme in December 2023, WISE – Futures had successfully developed its sustainability plan and achieved all its set targets. (Figure 1. Key WISE – Futures achievement). Some of the key and notable results are highlighted in Figure 1.

Target 1. Excellent learning environment: Successfully accredited thirteen Master and PhD education programs with Tanzania Commission for Universities. Two programs (Master and PhD in Materials Science and Engineering) were internationally accredited. In total 300 Master and 135 PhD students were enrolled by the end of the ACE II project. A total of 88 master and 17 PhD students were regional students. Accredited programs are now under the School of Materials, Energy, Water and Environmental Sciences at NM-AIST. The internationally accredited program has contributed to the success of Partnership for skills in Applied Sciences, Engineering and Technology (PASET) PhD scholars enrolled at the NM-AIST. Alumnae are solving development challenges, they are employed in universities, water and energy utilities, river basin water boards and government ministries in Tanzania and the region.

Target 2. Stimulating research environment: WISE – Futures successfully established specialized materials and water purification research unit to support its focus on industry driven discovery and innovation. The centre can conduct materials science research using advanced equipment, and test innovative products such as water purification and energy materials. To be able to test commercialization of new developed materials for water purification, the centre established a mini drinking water production facility at NM-AIST.



	MSc enrolled	PhD enrolled	regional students	female students	short courses	Short term exchange	Partnership	Accreditation national	Accreditation international	publication
Achieved	300	135	105	132	167	232	23	13	2	190
Target	120	51	44	47	84	71	6	11	3	286

Figure 1. Key WISE – Futures achievement

Target 3. Regional and international research collaboration: A total of 23 partnerships was signed for collaboration in applied research and training. The collaboration led to over 1.8 million USD of research grants.

Targe 4. Promote inclusive socio-economic transformation: WISE – Futures carried research and innovation that benefited society, industry, and the environment. WISE-Futures developed five city-wide inclusive sanitation plans for small towns in Tanzania. The plans helped increase access to safely managed sanitation in Tanzania, which is a key requirement of the UN Sustainable Development Goal 6.

The Centre developed and patented two innovations which are in the stage of commercialization. One innovation is on the Method for production of Portland pozzolana cement using activated Bentonite (Patent No: TZ/P/2023/00152). The use of this type of clay enhances cement strength, reduces CO2 emission (one of the greenhouse gases), minimizes energy consumption, and most importantly is that it can reduce the cost of production. The second innovation is on Household Water Purifier System (Patent No: TZ/P/2024/00186). This invention uses an emerging water desalination technology, capacitive deionization, which has many benefits compared to conventional systems, i.e., reverse osmosis and thermally based approaches. It uses less energy consumption in treating brackish water.

In addition to achieving all ACEII project targets, WISE – Futures acquired funding to establish a Centre of competence in Digital Education (C-CODE). The C-CODE initiative at NM-AIST promotes blended learning, and it is now integrated with the Nelson Mandela FM Radio, which aims to disseminate research and innovation knowledge to society and industry.

Lessons Learned in Pursuing Excellence

While WISE-Futures achieved all its ACEII targets, the project design limited its capacity to focus on industry driven innovation. ACEII indicators were too diverse - curriculum development and accreditation, number of students enrolled, partnerships, mobilities etc. Additionally, there was a significant disparity in the understanding of what constituted a centre of excellence among the majority of stakeholders. If WISE – Futures had prioritised research and innovation in water, sanitation, and energy, with learning and teaching excellence as a secondary focus, the development impact would have been substantially greater.

Finally, the ACE II Project also emphasized results-based management which focused on tracking results and how these fed into achievement of project goals. The discussion on sustainability came much later. Although WISE – Futures was able to get is sustainability plan approved, it came at the time when ACEII program was ending.

Looking Forward

Looking into the future, a robust financing mechanism is imperative to support the centres. Sustained financing is essential for research and innovation development. Without it, we risk losing all the progress made by the various ACE II centres. We posit that the World Bank, IUCEA, and the respective countries should provide bridging financing to all the Eastern and Southern Africa Higher Education Centres of Excellence to facilitate the implementation of certain components of their sustainability plans.

Prof Hans C. Komakech

Prof Yusufu Abeid Chande Jande

CDT-Africa: Journey of Learning, Excellence and Innovation

Prof Abebaw Fekadu

The Centre for Innovative Drug Development and Therapeutic Trials for Africa (CDT-Africa) was established to develop Africa-based know-how for producing essential medicines, including drugs, vaccines, and diagnostics within Africa. Our goal is to ensure improved and sustainable access to these critical resources for populations across the continent. With a commitment to excellence and innovation, CDT-Africa has made significant strides in drug substance synthesis, novel product development, clinical trials, and system and policy innovations. Despite its short existence, CDT-Africa has become a recognisable regional brand with early evidence of impact.

Students being trained by Dr Belete Adefris.

Building a Strong Foundation

Excellence as a Practice

CDT-Africa's first task was to leverage the concept of excellence to guide its mission and activities. To do this, the team attempted initially to understand what excellence as a construct meant and how operational systems could be put together to establish a centre of excellence (CoE). The centre has published its learnings on the concept of a CoE in two academic papers setting the processes of excellence as critical ingredients for establishing academic centres of excellence.

Thus, guided by the belief that excellence should serve as an enduring compass, we've focused on building both knowledge and leadership capacity to implement CDT-Africa as a true Centre of Excellence. This intellectual foundation culminated in the development of the Excellerate (Excellence for Accelerating Change) programme—a strategic framework designed to guide institutional (CDT-Africa's) excellence and develop mechanism to deliver on our commitment for national and continental impact through excellence.

Two sub-programmes were developed under *Excel*erate, along with five-day training packages.

- **Project Elevate**: This aimed at strengthening internal systems, leadership, and institutional culture for excellence and impact.
- **GREAT *M*omentum** (Creating momentum for *Grassroots Excellence for Africa's*

Transformation): This was developed to encourage broader embrace of grassroots excellence as a tool for institutional, societal, and national excellence.

These frameworks have shaped CDT-Africa's footprints through capacity building, community engagement, and leadership development.

System Improvement: A Modified Backward Design Framework

Our team began by identifying desired outcomes and major systemic barriers, such as weak clinical trials capacity and unfavourable structures in the path to local biomanufacturing. Using a Modified Backward Design Framework, we have built substantial clinical trials capability and analysed the innovation ecosystem and policy requirements to support biomanufacturing of essential medicines.

Organisational Impact

Infrastructure**:** We have established a state-of-the-art medical discovery and development laboratory facility that is already synthesising active pharmaceutical ingredients (APIs) for neglected tropical diseases and top imports. Our equipped facilities include Immunology, Molecular, Cell Culture, Microbiology, and Analytical Laboratories, among others. Additionally, we have established a Phase 1 Clinical Trial Unit, Innovation Café, and secured large field study sites.

Partnerships**:** CDT-Africa has built an extensive network of partners nationally, continentally, and globally, ensuring a collaborative approach to our mission.

Health and Economic Impact

Medicinal Product

Medicinal Products Prototype

Development: We have developed lab-scale prototypes for over 20 potential products and submitted patent applications for five medicinal products. Our economic evaluation for two topical products estimates an annual turnover of about 400 million ETB. We are also working on a pesticide for pest control, which can replace imported and more toxic alternatives, saving close to USD 10 million.

Knowledge Translation and Guideline Development: CDT-Africa has supported the development of primary care guidelines adopted by the Ministry of Health and contributed to COVID-19 control efforts. We are also working with the Policy Studies Institute to define policy inputs required for local biomanufacturing.

Other Economic Impact: Over the past seven years, CDT-Africa has secured USD 17.1 million in funding and employment opportunity for over 500 people, with 100 continuously employed with attractive wages.

Contribution to Knowledge Creation: We have implemented over 25 research projects with close to 600 scientific publications in diverse international journals, including high-impact journals like The Lancet and Nature Group.

Human Capital Impact

Training and Education: We have trained over 1,300 students from 19 African countries and established new academic programmes, including postdoctoral fellowships, PhDs, and MScs in Clinical Trials. Our eLearning portal, supported by the Gates Foundation, has been instrumental in our educational efforts.

Programme Accreditation: Two of our programmes have received international accreditation, and CDT-Africa has been selected to be part of an important initiative, the Africa CDC's East Africa Regional Capacity and Capability Network for vaccine biomanufacturing.

System Impact

Clinical Trials Ecosystem: CDT-Africa has catalysed changes in the clinical trial system through the establishment of the national Advisory Committee on Clinical Trials (ACT) and capacity-building initiatives. Since the celebration of the International Clinical Trials Day (ICTD) in Ethiopia, facilitated by the precursor of CDT-Africa,

Summary of knowledge outputs and impact of CDT-Africa

Outputs	Impact	Partnerships	Economic
Students trained: 1300+ Publications: 644 articles Programmes accredited: 2 Patent applications: 5 Trademark: 1 Lab infrastructure: 14 new equipped facilities	Citations: 57,000+ Improved clinical trials ecosystem Policy influence: NTD & Primary care Guidelines	New Academic Partnership model developed Strong national, regional & global networks established Member of the East RCCN Network-Africa CDC	Funding: $USD 17 million+ New jobs: Over 500 employment opportunities with an average of 100+ well-paying jobs sustained since 2018 New business platforms & networks created

clinical trials registered from Ethiopia have increased about five-fold (View of Ethiopia's Clinical Trial Landscape: Analysis of International Registry Platforms | Ethiopian Medical Journal).

Innovation Ecosystem: We have systematically assessed and described the challenges and opportunities of Ethiopia's innovation ecosystem, outlining what must be done to support innovation-led economic growth.

Social impact:

Recognizing the importance of building a sustainable pipeline of medical discovery scientists, CDT-Africa launched the NEGAT program—Next Generation Scientists for Africa's Transformation. This initiative engages students aged 13–15 (grades 7–8) in a five-day, immersive drug discovery experience, by researching on traditional medicinal plants.

By testing the antibacterial properties of commonly used plants, students gain hands-on exposure to science as a tool for societal problem-solving. These efforts are part of CDT-Africa's broader commitment to public engagement—fostering a culture where science is embraced as a way of life. Through NEGAT, the center also aims to elevate science education and strengthen Ethiopia's innovation ecosystem.

Sustainability: Building for the Long Term

CDT-Africa adopted "The Thriving Sustainability" model, a comprehensive and integrative approach to sustainability, with the core principle of sustaining CDT-Africa as a high impact centre of excellence. In this model, we have included five dimensions of sustainability involving Organizational, Programmatic, Operational, Financial and Environmental Sustainability. CDT-Africa has been building sustainability capabilities from the outset and has secured Organizational sustainability arrangements within Addis Ababa University. We are working continuously on sustainable financing model that can support ongoing expansion of excellence and impact.

Epilogue

If the preceding account reflects a narrative of success, much of this achievement can be attributed to key funding frameworks.

First, the call to address 'development challenges' of Africa compelled the team to aspire for big goals but also to global ambitions. This shifted our perspective on university education – from mere talent development to an agent of meaningful transformation through innovation and value creation.

Secondly, the Centre of Excellence model played a vital role. The designation prompted institutions to pursue real world excellence, measurable impact and the commitment to advancing cutting-edge knowledge.

Thirdly, the requirement to engage partners encouraged us to establish principled partnerships. This was particularly crucial for a Centre of Excellence focused on building medical discovery capabilities, an area historically the purview of industrialised nations. Our partners proved indispensable to the accomplishments of CDT-Africa.

Finally, the results framework was an important driver and provided clear direction. Alongside the principle of 'semi-autonomy', it created an enabling foundation.

I began this epilogue tentatively. At present, most outcomes are process-oriented, and the fundamental challenge of limited access to medicines in Africa has yet to be fully addressed. Two critical inputs are proposed for future progress. First, additional funding is imperative. Although the investment by the World Bank and African governments has been considerable, they remain insufficient for empowering universities to meet Africa's development needs. Second, this impactful framework in relation to the functioning of universities has to be assimilated by universities and governments. The contribution of universities in Africa's development cannot be overstated. It is unrealistic to expect Africa to overcome its development challenges without establishing world-class universities. There is no shortcut. The time for action is now.

Prof Fekadu is the Director, CDT Africa

ACEITLMS' Decade of Strengthening STEM Education

ACEITLMS Resource Center

The African Centre of Excellence for Innovative Teaching and Learning Mathematics and Science (ACEITLMS), hosted by the College of Education at the University of Rwanda, has made significant contributions to strengthening STEM education in Africa over the past decade. Since its establishment in 2016, the Centre has played a pivotal role in building the capacity of STEM educators and researchers across the region.

By Prof Jean Uwamahoro

Over ten years of implementation, ACEITLMS has focused on postgraduate training, strengthening STEM education infrastructure, training in-service teachers, and producing impactful research. Today, the Centre stands firmly as a regional hub of excellence in STEM education and research.

Increased Capacity Building in Higher Education

Since inception, ACEITLMS has implemented a wide range of activities centered on three core pillars: teaching and learning, research and training, and community outreach.

The Centre currently hosts 62 PhD candidates and 307 Master's students enrolled across four PhD and four Master's programmes. These figures reflect both the rising demand for advanced STEM education and ACEITLMS' strong capacity to attract and nurture talent from across Africa.

As of October 2025, ACEITLMS had produced 37 PhD and 197 Master's graduates from Rwanda and 14 other African countries. Thirty percent of these graduates are women, demonstrating the Centre's deliberate efforts to promote gender inclusivity in STEM.

According to the June 2025 tracer survey, the majority of ACEITLMS graduates are employed in public and private institutions across Africa, particularly in higher education and education research sectors. Through its Continuous Professional Development (CPD) programme, the Centre has also trained more than 3,000 in-service teachers in innovative pedagogies and digital technologies for effective STEM teaching.

A STEM Research Hub of Excellence

ACEITLMS has established itself as a robust centre of research excellence in mathematics and science education. Faculty and students have produced 360 research publications, most of which appear in peer-reviewed and indexed journals, including Scopus-listed outlets. This strong output reflects the Centre's commitment to knowledge creation, dissemination, and practical problem-solving.

The research covers diverse areas such as innovative teaching approaches, project-based learning, applied research in emerging technologies, and policy-focused studies that inform decision-making within African education systems. These outputs strengthen evidence-based reforms in STEM education and contribute to regional development agendas.

Building Infrastructure for Quality Education and Research

To support its expanding academic and research mandate, ACEITLMS has invested heavily in infrastructure. The Centre established and equipped four modern science and mathematics laboratories and strengthened the university library with updated hard-copy and digital resources.

ACEITLMS also established a STEM Power Centre to support its community outreach efforts through STEM awareness campaigns and hands-on mathematics and science practicals for primary and secondary school students. This initiative nurtures early interest in STEM and strengthens the pipeline for future scientists and educators.

A major milestone is the construction of the ACEITLMS state-of-the-art Resource Centre. Designed to host regional students and international visitors, the facility provides modern spaces for learning, collaboration, and innovation. Beyond its physical function, the Resource Centre serves as a hub for knowledge exchange, regional networking, and collaborative research.

Strong Partnerships Enhancing Mobility and Collaboration

ACEITLMS has established active collaborations with 14 academic institutions in Rwanda, the region, and internationally, eight of which are governed

by signed Memoranda of Understanding. These partnerships have significantly strengthened staff and student exchange programmes. Within eight years of implementation, 82 staff and student exchanges were successfully supported.

Through these partnerships, ACEITLMS organized two major international conferences—the DETA Conference in 2017 and AFRICME6 in 2021—and also contributed to the organization of three University of Rwanda international conferences on reshaping education for sustainable development. These engagements increased the Centre's visibility, strengthened academic networks, and enhanced the quality of training and research.

Partnerships with teaching, learning, and research institutions have expanded exposure to regional and international standards, enhancing innovation and excellence in STEM education across programmes.

Lessons Learned and Recommendations

The implementation of ACEITLMS offers valuable lessons in establishing a strong postgraduate capacity-building model for STEM education in Eastern and Southern Africa. One key lesson is the central role of stable and sustained funding in maintaining high-impact programmes. Structured support from the World Bank enabled the development of diverse programmes and the training of a critical mass of mathematics and science educators and researchers, significantly strengthening regional human capital.

Sustained funding also facilitated the establishment of strategic academic partnerships that improved research quality, enabled staff and student mobility, and promoted regional integration. These collaborations enhanced the reputation of both ACEITLMS and the University of Rwanda beyond national borders.

However, heavy reliance on external funding exposed vulnerabilities following the conclusion of World Bank support. The discontinuation of tuition subsidies and research allowances affected the Centre's ability to attract international students and sustain programme accessibility. As a result, ACEITLMS was compelled to explore alternative financing and long-term sustainability strategies.

Looking ahead, the Centre is prioritizing diversified and sustainable funding sources. Developing self-sponsored programmes tailored to regional market needs, with attractive and relevant curricula, will help boost enrolment and financial self-reliance. ACEITLMS also plans to intensify efforts to secure competitive research grants and expand partnerships with governments, industry, and international development partners.

Further, the Centre intends to deepen collaboration beyond academia into policy and private sectors to open new funding avenues and create practical platforms for research and training. This approach will enhance graduate employability and ensure that research outputs address real-world challenges.

To strengthen its value proposition, ACEITLMS must continuously innovate its programmes to match evolving STEM education needs across Africa. Investing in digital learning platforms and blended delivery models will expand access and improve cost-efficiency, especially in the post-pandemic context. Enhancing research capacity through seed funding for high-impact projects and promoting interdisciplinary approaches will further position the Centre as a regional leader in STEM education research.

Overall, sustaining quality while strengthening financial and operational resilience will be decisive for ACEITLMS as it advances its mission of transforming STEM education in Africa with lasting impact.

Professor Uwamahoro is the Center Leader of the African Centre of Excellence for Innovative Teaching and Learning Mathematics and Science (ACEITLMS), University of Rwanda, College of Education

APA has strengthened agricultural policy analysis and informed decision-making

By Dr Beston Maonga

Introduction

Since its establishment in 2022, the African Centre of Excellence in Agricultural Policy Analysis (ACE II APA) at the Lilongwe University of Agriculture and Natural Resources (LUANAR) has made significant contributions to capacity building, research, and innovation. Through evidence-based research, the Centre has strengthened agricultural policy analysis and informed decision-making. Guided by the vision of the ACE initiative, our mission is to promote resilient and sustainable agri-food systems in Sub-Saharan Africa through data-driven policy and innovation.

Data-driven approach

For us, excellence means transforming agri-food systems by adopting collaboration between academic institutions, policymakers, and stakeholders using a data-driven approach. Our work has focused on five pillars: teaching and learning, capacity building, partnerships, policy engagement, and regional cooperation.

This pursuit is evident in several ways:

- **Accreditation**: All MSc and PhD programs are accredited by Malawi's National Council for Higher Education (NCHE), with regional accreditation underway through IUCEA, enhancing quality and recognition.
- **Applied Data Science:** New MSc and PhD programs in Applied Data Science address critical skills gaps in big data analytics, equipping the next generation of data scientists.
- **Infrastructure**: A landmark MoU with Malawi Research and Education Network (MAREN) enabled LUANAR to access high-performance computing, significantly boosting research and innovation capacity.
- **Partnerships**: Beyond academia, MoUs with public institutions, private sector players, and civil society have expanded joint research and outreach. Through Community Action Research Projects (CARP-E), we link research with practical solutions for farming communities.

Key Achievements

ACE II APA has recorded strong progress across its focus areas:

- **Teaching and Learning:** 7 MSc students graduated in 2025; over 200 MSc and 50+ PhD students are enrolled; five postgraduate programs accredited nationally.
- **Capacity Building**: 600 students trained through short courses; 15+ staff trained in leadership and management; 73 staff and PhD students participated in exchange visits; more than half of beneficiaries are women.
- **Collaboration**: 12 MoUs signed with local, regional, and international institutions; active CARP-E projects; and joint research through conferences, workshops, and symposia.
- **Policy Engagement:** Three policy briefs disseminated on food security, input subsidies, and agricultural innovation systems; 50+ research articles published; and over US$300,000 in research income generated.

Lessons Learned

- **Power of partnerships**: Sustained collaboration at national, regional, and international levels has helped us secure grants, train students, and expand innovation. These partnerships work best when guided by clear work plans and budgets.
- **Quality demands investment:** Accreditation processes, both national and regional require strong documentation, coordination, and patience. Similarly, the Big Data Hub and our partnership with MAREN highlighted the importance of infrastructure for advanced research and training.
- **Relevance and resilience matter:** Aligning research with national and regional priorities has strengthened our policy impact, while emerging technologies such as AI have opened new possibilities for addressing challenges in crop monitoring, climate adaptation, and food security. At the same time, resource mobilization remains a challenge, underscoring the need for diversified funding strategies.

APA postgraduate students embark on an exchange visit to the Regional Centre of Excellence in Agri-Food Systems and Nutrition at Eduardo Mondlane University, Mozambique.

Recommendations for policymakers and Development Partners

- Regional accreditation through IUCEA should be streamlined with stronger policy backing to reduce duplication and accelerate international recognition of programs
- Policymakers and partners should prioritize funding advanced ICT and high-performance computing infrastructure to unlock the potential of big data for agriculture and policy analysis.
- Policies should incentivize co-creation of research with private sector and civil society to ensure that innovations address real-world challenges along value chains.
- Governments should ensure sustainability of ACEs by embedding them into national higher education and research frameworks, with clear mandates, governance, and funding pathways.

General Thoughts on the ACE Initiative

The ACE program, launched by the World Bank in three phases since 2014, has invested over US$657 million to strengthen higher education across Africa.

To date, it has supported more than 80 centers in 20 countries, enrolling 90,000+ postgraduate students, producing 10,000+ research publications, and achieving significant milestones in accreditation, revenue generation, and industry partnerships.

For ACE II APA, these achievements resonate with our own journey. We view ACE not simply as a project but as a model for Africa's higher education transformation. It has expanded opportunities for quality postgraduate education, strengthened cross-border collaboration, and demonstrated that African universities, when well-resourced, can deliver globally competitive research and innovation.

Moving forward, ACE must continue to emphasize institutional sustainability, entrepreneurship, and technology transfer, ensuring that its gains translate into long-term impact for Africa's agri-food systems and beyond.

Dr Maonga is the Center Leader of ACE II APA

Transforming Africa's Food Systems Through Insects for Food Security

By Prof. Darius Andika, Prof. Monica Ayieko (Deputy Center Leader) and Mr. Joram Ooro, Project Manager.

Black soldier fly

The Africa Centre of Excellence in Sustainable Use of Insects as Food and Feed (INSEFOODS) at Jaramogi Oginga Odinga University of Science and Technology (JOOUST), Kenya, was established to tackle malnutrition and food insecurity in Sub-Saharan Africa through scientific innovation and sustainable practices. Operating under the ACE II initiative, INSEFOODS promotes the use of insects as nutritious, affordable, and eco-friendly protein sources for humans and livestock.

Our pursuit of excellence has been guided by three pillars: quality postgraduate training, cutting-edge research, and strategic partnerships linking academia, industry, and communities. These priorities align directly with Kenya's Vision 2030, Africa Agenda 2063, and key Sustainable Development Goals (SDGs) including; SDG 2: Zero Hunger, SDG 9: Industry, Innovation and Infrastructure, SDG 12: Responsible Consumption and Production and SDG 13: Climate Action as well as SDG 17: Partnerships.

Key Achievements

Since its inception in 2016, INSEFOODS has evolved into a regional model of excellence in science-led innovation. The Centre has enrolled over 180 postgraduate students, including 67 regional scholars, in MSc and PhD programs on food security and applied insect science.

Developed and accredited nine postgraduate programs, with the MSc and PhD in Food Security and Sustainable Agriculture achieving international accreditation through collaboration with Chalmers University of Technology (Sweden).

Established a Biodiversity Insect Repository, now recognized by the Inter-University Council for East Africa (IUCEA) as one of Africa's most advanced insect science facilities.

Published over 235 peer-reviewed publications and attracted KSh 129 million in competitive research grants.

Trained over 300 farmers, youth, and women's groups on insect rearing, value addition, and enterprise development, advancing rural livelihoods and SDG 2.

INSEFOODS has also diversified its research and innovation to include locust rearing and value addition, expanding its contribution to sustainable insect farming. The Centre is developing

technologies for locust food products production as a protein-rich feed ingredient and exploring food-grade applications that enhance nutrition and livelihoods across the region.

The Black Soldier Fly Revolution, empowers youth and women agripreneurs to convert organic waste into sustainable livestock feed, supporting SDG 12. Additionally, the Centre's cricket-enriched biscuits ("Juster Foods") marked a major step in commercialization, improving nutrition and generating income.

Infrastructure improvements have been at forefront including smart classrooms, refurbished laboratories, and upgraded ICT which has enhanced learning environments and research capacity.

Lessons Learned

The journey toward excellence has revealed vital lessons:

- Result-Based Financing (RBF) fostered a culture of accountability and data-driven management.
- Gender inclusion is crucial for sustainability. Through mentorship and flexible learning, INSEFOODS increased female postgraduate enrolment (from 7 to 27 at MSc and from 3 to 4 at PhD), advancing SDG 5 (Gender Equality).
- Industry partnerships require structured engagement. Collaboration with Sigma Feeds Ltd. emphasized the need for frameworks bridging research and market commercialization. Digital transformation ensured resilience during COVID-19, strengthening online supervision and virtual learning which is key to achieving SDG 4 (Quality Education).

Recommendations for Policymakers and Development Partners

1. Sustain and expand the ACE model to deepen regional capacity for research and innovation.
2. Establish a regional accreditation mechanism, as proposed by IUCEA, to harmonize academic standards and enhance scholar mobility.
3. Prioritize women and youth inclusion through scholarships, research grants, and innovation hubs focused on agrifood entrepreneurship.
4. Ensure timely and flexible funding within the RBF framework to maintain implementation efficiency.
5. Invest in sustainability and commercialization infrastructure for long-term impact.

Reflections on the ACE Experience

The ACE II program has been transformative providing experience that has broadened the academic excellence, research innovation, and regional collaboration. It redefined what African Universities can achieve when empowered to innovate. For JOOUST, INSEFOODS has transformed the university into a regional hub of sustainable food and feed innovation, strengthening governance, research quality, and visibility.

The program provided access to high-quality academic resources, mentorship, and exposure to multidisciplinary research with emphasis on practical, problem-oriented research to address real-world challenges particularly in food security, climate resilience, and sustainable development.

ACE II has fostered strong networks among scholars and institutions across East and Central Africa. Promoting interaction with peers and faculty from diverse backgrounds hence enhancing understanding of regional development dynamics and promote cross-border collaborations.

The ACE II model's focus on linking academia with industry and policy encouraged innovation and solution-oriented thinking.

Beyond academics, ACE II has nurtured leadership, teamwork, and entrepreneurial skills underscoring the importance of multidisciplinary projects and community outreach activities as well as emphasis on gender equity and inclusion.

The program also presented challenges which taught resilience, creativity, and resourcefulness.

By Prof. Darius Andika (Center Director

ACEPHEM: Bridging Modern Public Health and Traditional Herbal Medicine

By Prof Adamson Muula & Prof Fanuel Lampiao

The **Africa Centre of Excellence in Public Health and Herbal Medicine (ACEPHEM)** in Malawi is a pioneering center of excellence designed to address the critical public health challenges faced by African nations, particularly through a combination of modern medical practices and traditional herbal medicine.

Established under the World Bank's Africa Centers of Excellence (ACE) program, ACEPHEM's primary goal is to produce highly skilled professionals in public health and herbal medicine, while simultaneously conducting cutting-edge research in these fields to tackle the continent's pressing health issues. Situated at the Kamuzu University of Health Sciences (KUHES) in Blantyre, Malawi, ACEPHEM is unique in its holistic approach to health, recognizing the rich potential of indigenous knowledge in conjunction with scientific medical research. The center's achievements span across education, research, community outreach, and capacity building, and it has made substantial progress in addressing public health issues not only within Malawi but across the broader African context.

One of ACEPHEM's most notable achievements has been its success in training highly skilled professionals who can blend public health expertise with a deep understanding of herbal medicine. Over the years, the center has produced numerous graduates equipped to handle complex health challenges that require both conventional and traditional health solutions. It has offered 207 MSc and 23 PhD scholarships to Malawian and regional students. Regional students that were awarded ACEPHEM scholarships were from Namibia, Ethiopia, Democratic Republic of Congo, Kenya, Rwanda, Tanzania, Zambia, and Zimbabwe. Furthermore, ACEPHEM has trained 1,427 postgraduate students and researchers including 676 women in various short courses, including manuscript writing.

Short course trainings

In addition to the academic training, ACEPHEM has also contributed to advancing the research agenda in public health and herbal medicine, helping to establish a **robust evidence base** for the efficacy of herbal remedies and their potential integration into mainstream healthcare systems by contributing in the development of the National Traditional and Complementary Medicine Policy. Through collaborative partnerships with local and international institutions, ACEPHEM has been able to lead impactful research studies on **tropical diseases, nutrition, and the therapeutic properties of medicinal plants,** which are crucial in the African context.

ACEPHEM contributed to infrastructure development of the university. For instance, it procured a house located near the university which was converted into the first postgraduate students hostel for the university. It constructed a perimeter fence around university houses and offices at the Chipatala Avenue to enhance security. It also

is involved in the development of herbal based cosmetic products such as body lotions, soaps and hair oils.

ACEPHEM has worked closely with traditional healers, helping to professionalize and standardize herbal medicine practices, thus enhancing their credibility and efficacy. This has not only strengthened the relationship between traditional healers and formal healthcare systems but also ensured that the value of indigenous knowledge is recognized and preserved.

Lessons Learned

However, ACEPHEM's journey has not been without challenges, and several lessons have been learned along the way. One of the most significant lessons is the importance of **sustainability**. While ACEPHEM has achieved substantial progress in terms of education and research, the sustainability of its impact depends heavily on continued funding, institutional support, and the ability to maintain a steady flow of resources. As with many public health initiatives in low-income countries, the reliance on donor funding and external partnerships poses a risk to long-term stability. To address this, ACEPHEM must work towards **diversifying its funding sources,** engaging with both governmental and private-sector partners, and exploring opportunities for revenue generation through research commercialization, knowledge exchange, and health innovation initiatives.

Another critical lesson from ACEPHEM's experience is the need for **inter-sectoral collaboration**. While ACEPHEM has excelled in integrating traditional and modern healthcare, success in addressing public health issues requires a coordinated effort between different sectors such as agriculture, education, water and sanitation, and even infrastructure development. Public health challenges are multifaceted, and so too must be the solutions. As ACEPHEM continues to grow, it is important that the centre strengthens its ties with ministries of health, agriculture, and education to ensure that its impact is felt across all levels of society, from the grassroots to the national government.

Moving forward, ACEPHEM can build on its successes by focusing on **capacity building** at a more regional level. While Malawi has benefitted immensely from the center's activities, there is a significant opportunity to extend its influence across Southern Africa and even further afield. By fostering greater regional collaboration with universities, research institutions, and governmental agencies, ACEPHEM can become a key hub for public health and herbal medicine research, offering training, resources, and technical support to neighboring countries. Additionally, **policy advocacy** should become a focal point of ACEPHEM's strategy. The integration of herbal medicine into national healthcare systems, and the wider recognition of its potential in combating common diseases, will require robust policy frameworks that balance evidence-based medicine with indigenous practices

Herbal based products developed

By Prof Adamson Muula
Director, ACEPHEM

CREATES-FNS: From Performance to Permanence in Food & Nutrition Security (2017–2025)

By Prof. Hulda Swai (Center Leader) and Dr. Sr. John-Marry Vianey (Deputy Center Leader), NM- AIST

The Africa Centre for Research, Agricultural Advancement, Teaching Excellence and Sustainability (CREATES-FNS) was founded to harness science, engineering, technology and innovation to tackle East Africa's intertwined challenges of sustainable agriculture, food systems and human health. From day one, we embraced a performance-based model—delivering Disbursement-Linked Results (DLRs) and building capability that outlasts the project itself. By 2023, the Centre had triggered 100% of its DLRs, strengthening postgraduate education, applied research, partnerships, and outreach at NM-AIST.

Key achievements

Human capital & programmes
Expanded high-quality postgraduate training, 13 accredited specialized programmes, strengthened supervision (including an double-degree), and pedagogy and supervision

Human capital & programmes (short courses & certification)
Industry-linked short courses and certifications created pathways to employment and entrepreneurship for youth and practitioners.

Research quality & outputs
Investment in laboratories, screen houses, connectivity and learning resources increased the quantity and quality of outputs; publications and patents rose with regional co-authorship.

Outreach & inclusion
Gender- responsive programming, accessible infrastructure and STEM outreach broadened participation and community adoption.

Governance & systems. We improved institutional policies (e.g., IP policy), renovated teaching spaces and hostels, and established a **DDI** teaching factory, digital herbarium, botanical garden, and screen houses—tangible assets that anchor our sustainability.

Lessons Learnt

1. **Performance mind-set works.** Clear targets (DLIs/DLRs),

rigorous verification and timely course-correction drive results; future programmes should embed sustainability KPIs from inception.

2. **Systems matter.** Procurement and finance bottlenecks can delay excellence; streamlining processes with partners and aligning organograms ensures continuity when staff or systems change.
3. **Diversity of revenue is essential.** Matching indicators for externally generated funds created the right incentives; building consultancy, training and commercialization early stabilizes cash flow.
4. **Equity strengthens science.** Intentional gender and youth programming expands talent pipelines and community trust—critical for scale and adoption.

Sustainability: from project to platform

We are transitioning CREATES-FNS from a project to a platform for science-to-market delivery. The Data-Driven Innovation (DDI) platform—our teaching factory, incubation and technology-transfer arm—soon anchoring a dedicated DDI Spin-off Company under the NM-AIST Investment Company.

The spin-off will operate as an agile private entity with two units: *(i) a Research & Social Development unit for strategic R&D;* and *(ii) a Business Enterprise unit for commercialization*. Its revenue model blends grants and contracts with direct commercialization, incubation/acceleration services, technology transfer and licensing, contract manufacturing, IP out-licensing, joint ventures and consultancy.

Practically, this means faster routes from lab to market for products like Omega-3, SimBar, Nutrano and Spirulina; structured regulatory pathways; brand and market development; and risk-sharing with industry partners. By coupling the DDI teaching factory with the DDI Spin- off, CREATES-FNS can reinvest surpluses into talent and infrastructure while scaling innovations regionally.

Our sustainability strategy leverages on assets and strategic partnerships to deliver flagship R&D, consultancies & professional services, competence-based training & conferences, and product development, technology transfer & commercialization. With these, we project TZS 13.43 billion in revenue between 2025–2029 (57.3% from funded projects; 25.5% services/consultancy; 17.2% commercialization) against TZS 6.33 billion in costs—yielding a robust net cash position to reinvest in talent and infrastructure.

Operationally, we will integrate fully into the NM-AIST organogram, guided by a Technical Advisory Committee and strong MEL and risk systems, while deepening PPPs across the agri-food and health value chains.

Recommendations for policymakers & development partners

- **Institutionalize sustainability early.** Make centre sustainability plans and revenue KPIs part of DLRs from year one; reward diversified income streams and IP pipelines.
- **Back shared research infrastructure.** Facilities like DDI factories, digital herbaria, botanical gardens and HPCs are regional public goods; pooled financing and maintenance compacts improve uptime and access.
- **Finance scale-ready innovations.** Provide catalytic funds for regulatory approval, licensing, and first-loss mechanisms that de-risk tech transfers to industry.
- **Streamline procedures.** Harmonize procurement and reporting between national systems and financiers to reduce delays in disbursement and safeguard continuity.
- **Keep equity central.** Fund gender-responsive pipelines (scholarships, mentorship, safe campuses) to widen participation and accelerate impact

General reflections on ACE

ACE II proved that performance-based higher education investments can lift quality, relevance, and resilience—even through shocks like COVID-19—when centres are empowered to innovate, partner with industry, and serve communities. For CREATES-FNS, the ACE journey was not the finish line but the Launchpad.

Prof. Hulda Swai

CS-OGET: Advancing Excellence in Oil and Gas Engineering and Technology in Mozambique and Region

Prof. Luis Helder Lucas, Center Leader, CS-OGET, Eduardo Mondlane University
Prof. Antonio José Cumbane, Deputy Center Leader, CS-OGET, Eduardo Mondlane University

Since 2017, the Center of Studies in Oil and Gas Engineering and Technology (CS-OGET) at Eduardo Mondlane University (UEM) has played a transformative role in strengthening higher education, applied research, and professional capacity in Mozambique's energy and extractive sectors. Established under the Africa Centers of Excellence II (ACE II) Project, the Center emerged in response to the country's growing demand for highly trained engineers, environmental specialists, and researchers capable of supporting responsible and sustainable resource development in the oil and gas field. Today, CS-OGET stands as a leading institution and a regional reference in advanced training and industry-aligned research in oil and gas.

Journey of Growth

CS-OGET's pursuit of excellence is rooted in its commitment to international academic standards, national relevance, and industry alignment. Over the past eight years, the Center modernized curricula in collaboration with global experts, strengthened internal quality assurance systems, and invested in sound laboratories, digital tools, and advanced simulation technologies. Improvements in governance increased transparency and operational efficiency, enabling CS-OGET to consistently meet World Bank fiduciary requirements and institutional benchmarks.

A key part of this journey has been the development of a collaborative ecosystem that includes regional student mobility, industry engagement, and interdisciplinary research partnerships. These approaches have positioned CS-OGET as both an academic institution and a solutions hub for Mozambique's evolving energy and extractives landscape.

Key Achievements

1. Advanced Academic Programs and Human Resource Development

Between 2017 and 2025, CS-OGET developed or implemented six master's programs:

- Petroleum Engineering
- Hydrocarbon Processing Engineering
- Health, Safety and Environment (HSE)
- Building Fire Safety
- Petroleum and Gas Economics and Management
- Sustainable Mining

More than 800 students have been enrolled, including 44 regional students from Rwanda, Uganda, Ethiopia, Congo, Malawi, Niger, and Zimbabwe. Over 100 women have participated, contributing to increased gender inclusion in STEM.

At doctoral level, two programs—the PhD in Energy Science and Technology and the PhD in Hydrocarbon Geoscience and Technology—enrolled about 25 candidates, including eight regional students and four women.

Professional training was also strengthened, with more than 300

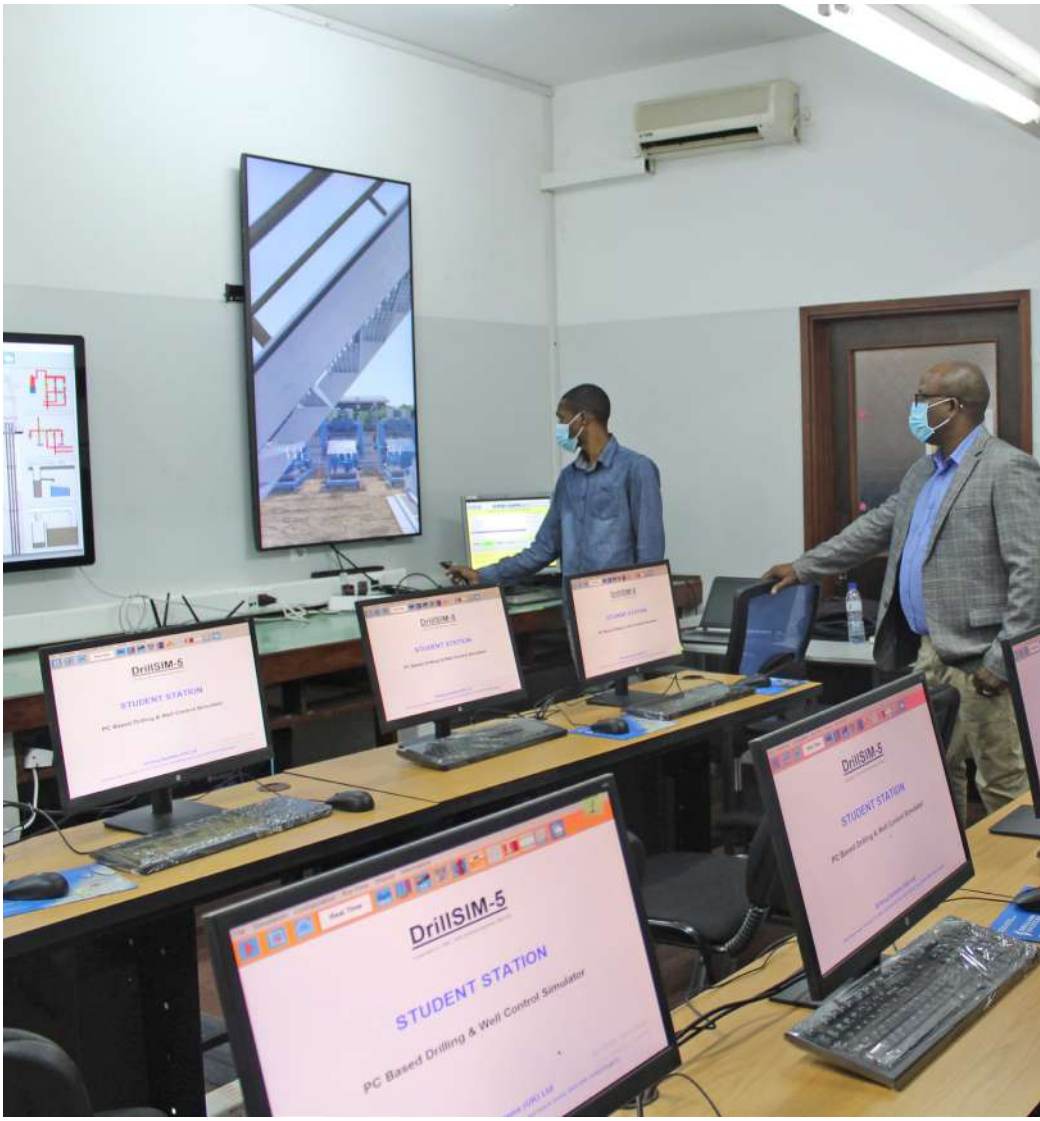
practitioners trained in specialized courses such as NEBOSH safety certifications, drilling simulation (DrillSim5), kerogen analysis, LNG trade, and local content development.

2. Scientific Research and Innovation-
CS-OGET coordinates 10 applied research projects with partners such as the University of Dar es Salaam, the University of Pretoria, and industry actors. Research areas include hydrocarbon residue monitoring, biogas production, environmental impacts of extractive industries, locomotive gas substitution, drilling fluid innovation, CO□ storage alternatives, biodegradable lubricants, and industrial furnace conversion to natural gas. These initiatives have produced over 30 peer-reviewed publications.

3. Quality Assurance and Institutional Strengthening-
Four master's programs received accreditation from the national accreditation body (CNAQ), while two reached regional accreditation. CS-OGET supported UEM's participation in the PASET benchmarking process, contributing to its position as 27th in Africa in the 2023 Times Higher Education ranking. Regional student scholarships further increased UEM's internationalization, with foreign students representing 15.6% of total enrollment between 2016 and 2023.

4. Strategic Partnerships and Regional/International Cooperation-
Strong industry partnerships with Anadarko, SASOL, Technip, and the Rovuma Basin consortium (ExxonMobil, TotalEnergies, CNPC) informed curricula, enabled internships, and supported applied research.

Regionally, CS-OGET collaborates with SONIDEP and EMIG in Niger, with 12 Nigerien students enrolled in UEM master's programs. It co-developed the Sustainable Mining master's program with ISPT and Zambia's Copperbelt University, and is training four ISPT staff members at PhD level. Other collaborations include universities in South Africa, Tanzania, and Kenya, as well as U.S. institutions such as the Universities of Houston, Arizona, and Wyoming.



5. Extension, Consulting, and Outreach-
The Center provided consulting services for the African Union's AFREC-ERGP energy capacity building initiative, Mozambique Railway Company (CFM) on LNG business development, the Infulene wastewater treatment plant, and WIOMSA coastal programs in Pemba—strengthening policy impact and technology transfer.

6. Infrastructure and Institutional Capacity- CS-

CSOGET.

OGET refurbished classrooms, laboratories, simulation rooms, and office facilities. Two high-capacity servers were installed, representing half of UEM's total data storage capacity. Staff development supported 27 individuals, resulting in 7 PhDs, 6 master's degrees, 2 bachelor's degrees, and 12 short-course completions.

7. Financial Sustainability- Through consulting, training, and externally funded projects, CS-OGET and UEM generated more than USD 1.8 million—strengthening financial autonomy and sustainability.

Lessons Learned

Important lessons learned from this ACE II implementation journey are:

- Alignment with national priorities increases impact and stakeholder engagement.
- Strong financial management and procurement systems are essential for effective implementation.
- Industry engagement ensures curriculum relevance and enhances employability.
- Flexibility and adaptive management mitigate implementation delays.
- Regional collaboration improves the quality of training, research, and innovation.

Recommendations for Policymakers and Development Partners

Following lessons learned through the implementation of the ACE II Project some recommendations for policymakers and development partners are drawn, namely:

- Establish long-term funding mechanisms to sustain research excellence and advanced training.
- Promote industry–academic partnerships through incentives for co-funded innovation.
- Support regional mobility and accreditation frameworks to strengthen the African higher education space.
- Invest in digital and research infrastructure to keep African institutions competitive.

Reflections on the ACE II Program

The ACE II Project has been a catalytic force in transforming higher education across Africa. For CS-OGET, it provided structure, resources, and partnerships that enabled remarkable progress in advanced training, research, and institutional development. As the program concludes in 2025, the Center is committed to expanding its contribution to responsible resource development, a sustainable energy transition, and regional capacity strengthening.

Prof. Luis Helder Lucas, Center Leader, CS-OGET, Eduardo Mondlane University

Prof. Antonio José Cumbane, Deputy Center Leader, CS-OGET, Eduardo Mondlane University

ACEII–PTRE: Advancing Excellence in Phytochemicals, Textile and Renewable Energy

By Prof Ambrose Kiprop

Moi University established the Africa Center of Excellence in Phytochemicals, Textile, and Renewable Energy (ACEII–PTRE) in 2016 to become a hub for cutting-edge postgraduate training, innovation, and research addressing Africa's pressing industrial and energy challenges. Nearly a decade later, the Center has not only proven its relevance but also emerged as an example of how targeted investment in higher education can transform knowledge into impact.

ACEII–PTRE was conceived as part of the World Bank–supported Africa Centers of Excellence initiative, which sought to build capacity in priority sectors across Africa. For Moi University, this meant harnessing its strengths in phytochemicals, textile, and renewable energy - sectors critical to Kenya's and the region's development.

For PTRE, excellence has meant more than just academic rigor. It has meant international accreditation of its PhD programmes, attracting competitive grants, regional partnerships, and deliberate steps to bridge the persistent gap between academia and industry. By setting high standards in teaching, research, and outreach, ACEII–PTRE has positioned itself as a regional training and innovation hub.

Key Achievements

1. Expanding Postgraduate Training

The Center has enrolled 196 postgraduate students from nine African countries, including Kenya, Uganda, Rwanda, Ethiopia, Tanzania, Zimbabwe, Malawi, South Sudan, and Zambia. Of these, 62 have graduated -14 with PhDs and 48 with master's degrees. The gender balance, though still tilted towards men (127 male vs. 67 female), shows progress in empowering women in STEM disciplines.

2. Accredited Programmes and Curricula Reform

Currently, ACEII–PTRE offers seven academic programmes, including three PhDs and four MScs. PhD programmes in Energy Studies and Textile & Material Engineering have received international accreditation,

Energy saving stove innovation by PTRE

underscoring the Center's quality. Curricula reviews, conducted with industry input, have ensured relevance to real-world demands.

3. Research and Innovation

With 110 peer-reviewed publications and one international conference proceeding, the Center has made significant contributions to regional and global knowledge. Its thematic research areas—climate change, industrial engineering, and renewable energy—directly address Africa's development challenges.

The Center has also mobilized over USD 3.9 million in external grants from partners such as AFDB, GIZ, DFID, EU, and KALRO, strengthening its sustainability and impact.

4. Partnerships and Industry Linkages

ACEII–PTRE has signed seven MoUs with private companies, public institutions, and professional bodies, including Flexi Biogas International, NOCART, KIRDI, and the Kenya Association of Manufacturers.

Beyond formal partnerships, the Center has engaged directly with communities, for example, through biogas installation and training for high schools, which not only showcased renewable energy solutions but also influenced adoption at household level.

5. Capacity Building for Staff

Over 60 staff members have benefitted from exchange programmes and training, while 21 staff have been supported for short courses. This has strengthened academic delivery and nurtured a new cadre of researchers and trainers.

6. Cost Cutting Measures

ACEII-PTRE in liaison with

the Directorate of Resource Mobilization, Enterprise Development and Institutional Advancement (RMEDIA) initiated a 30 MW Moi University Renewable Energy Innovation Park and Green Hydrogen, Ammonia, and Fertilizer Research Hub (MUREPHAR). This project aims on Decarbonization of the institution, eventual supply of renewable energy to the National Grid, and Green Hydrogen and Ammonia production. Moi University and RheinMain University of Applied Sciences, Germany, are working together on this project. A number of Moi University staff have been trained by GIZ on Green hydrogen. These include Prof. Milton Arimi, Sir Prof. Ambrose Kiprop, Dr. Faith Kandie and Dr. Stephen Kimutai.

Lessons Learned

From its journey, several lessons stand out:

- **Regionalization strengthens impact.** Recruiting students from across Africa has fostered cross-border networks, knowledge exchange and internationalization of our university.
- **Industry engagement.** The linkage committee and joint workshops have shown that co-creating solutions with industry ensures relevance and employability.
- **Sustainability requires diversification.** While donor funding has been critical, external grants, cost cutting through solar installations and community-based projects like biogas training point to alternative income streams.
- **Gender balance needs deliberate strategies.** Although progress has been made, women remain underrepresented in STEM, requiring targeted recruitment and support.
- **Strength in partnerships.** Collaborating with partners enhances achievements of individual institutions.

Recommendations for Policy Makers and Development Partners

1. **Scale up investments in postgraduate training.** Africa's development challenges demand highly trained scientists and engineers—Centers like ACEII–PTRE are key vehicles for producing them.
2. **Support industry–academia partnerships.** Governments and donors should incentivize collaboration between universities and private sector actors to accelerate commercialization of innovations.
3. **Promote regional collaboration.** Policy frameworks should encourage student and staff mobility across African universities to strengthen integration.
4. **Mainstream gender equity.** Dedicated scholarships, mentorship programmes, and enabling environments are essential to bring more women into STEM.
5. **Ensure sustainability beyond donor cycles.** Development partners should support endowment funds, commercialization ventures, and income-generating projects for ACEs.

General thoughts on ACE initiative

The Africa Centers of Excellence initiative has proven to be a game-changer for higher education in Africa. By focusing resources on niche areas, ACEs have catalysed innovation, built regional training capacity, and enhanced Africa's voice in global research. However, their sustainability depends on deeper national ownership, stronger industry linkages, and policy frameworks that encourage integration into mainstream university structures.

For ACEII–PTRE, the journey is still unfolding. But the story so far is clear: when excellence is pursued with vision and collaboration, universities can move beyond lecture rooms and laboratories to shape economies, empower communities, and light the path toward sustainable industrial growth.

Prof Kiprop is the Director, ACEII–PTRE

CRAFS: Pursuing Excellence in Building Resilient Agri-Food Systems

Prof Monjerezi

The Centre for Resilient Agri-Food Systems (CRAFS) at the University of Malawi (UNIMA) has emerged as a leading hub of innovation, research, and collaboration within the African Centres of Excellence (ACE) framework. With a strong focus on entrepreneurship, digital transformation, value addition, and community engagement, CRAFS bridges the gap between academic research and practical solutions to Malawi's food security and climate resilience challenges.

Pursuit of Excellence in Research, Teaching and Learning

CRAFS promotes research excellence through a multidisciplinary approach structured around three thematic areas: Agri-Food Systems and Nutrition; Agricultural Risk Management and Climate Change Adaptation; and Statistical Analysis, Foresight, and Data Management. These themes integrate natural sciences, climate modelling, informatics, and statistics to address challenges such as post-harvest value addition, climate variability, and digital transformation in agriculture.

Through innovations including weather-based index insurance, improved agricultural and market information systems, and the use of earth observation and artificial intelligence for drought prediction and crop yield forecasting, CRAFS delivers evidence-based solutions that strengthen food security and climate resilience. This holistic strategy positions the Centre as a catalyst for transformative change across Malawi's agri-food sector.

The Centre's agenda is delivered through strategic partnerships, postgraduate training, staff and student exchanges, and targeted short courses that build capacity in both academic and farming communities. Excellence is measured not only in publications but in tangible development outcomes.

A key milestone was the 2025 launch of the Food Innovation and Technology Hub (FiT-Hub), the University's first incubation centre. The Hub provides training, mentorship, and resources to help convert research outputs and business ideas into market-ready enterprises. At the launch, UNIMA Vice-Chancellor Professor Samson Sajidu captured the Centre's ethos: "The goal is not just knowledge acquisition, but action."

Key Achievements

CRAFS has significantly expanded postgraduate enrolment in science programmes and driven UNIMA's internationalisation agenda by admitting the highest number of regional master's and PhD students. This has strengthened regional integration and created a growing pool of skilled professionals for the agri-food sector. The Centre has also built institutional capacity by training management, finance, and administrative staff.

At community level, CRAFS has supported smallholder farmers through practical training in good agricultural practices and post-harvest handling. In collaboration with Tehilah Enterprises, farmers were trained in sweet potato value addition, producing bread, doughnuts, and biscuits. One participant noted, "We can now bake, package, and sell sweet potato

products that will bring more income to our families." Through Farmers Radio Trust, CRAFS also delivers agricultural and market advisories to farming communities.

FiT-Hub continues to nurture young entrepreneurs, supporting them to commercialise innovations and establish viable agribusinesses. Many start-ups emerging from the Hub are addressing food processing, agro-inputs, and climate-smart solutions.

At policy and systems level, CRAFS has strengthened national agricultural data management. Working with the Ministry of Agriculture, the Centre helped enhance the Digital Farmer Register through a mobile-compatible tool capable of scanning national IDs, working offline, and generating real-time dashboards. This innovation supports accurate targeting, planning, and policy formulation.

CRAFS has also improved research governance through its partnership with the National Commission for Science and Technology (NCST) to review and stabilise the Online Grants Management System, streamlining grant application processes nationwide.

On climate innovation, CRAFS collaborates with the Department of Climate Change and Meteorological Services and HISP UNIMA to develop climate products for agriculture and health. Rainfall and dry-spell analyses are now integrated into the national health management information system, enabling better anticipation of climate-sensitive diseases and strengthening public health preparedness.

The Centre has further embraced frontier technologies. Through participation in the international Tiny Machine Learning (TinyML) programme with the International Centre for Theoretical Physics

Dr. Margaret Maoni and Prof. Victoria Ndolo of CRAFS visited PHARMBIOTRAC in Uganda to learn about pharm-biotechnology and traditional medicine product formulation at its Incubation Center.

(ICTP), CRAFS staff and students explored low-power AI applications for monitoring soil health, crop conditions, and environmental changes. This work has produced models for pest surveillance and crop yield estimation, positioning CRAFS at the forefront of digital agriculture research in Malawi.

Lessons Learned

CRAFS's experience offers several key lessons. First, partnerships are essential. Collaboration with government, SMEs, and international institutions has amplified impact and sustainability. Second, solutions must be sensitive to the local context. The success of FiT-Hub enterprises and farmer value-addition initiatives depends on responding to local needs and market realities. Third, resilience-building is continuous. Farmers, entrepreneurs, and students require long-term mentorship and support beyond pilot phases.

FiT-Hub incubatee Mwambo Chuza, who is developing an inoculant to improve tomato yields, reflected: "I came here with just an idea, but now I can see how to make it work for farmers in my community."

Recommendations for the Future

Looking ahead, CRAFS should deepen foundational research and strengthen the translation of innovations beyond pilot stages. Start-ups emerging from FiT-Hub and technologies such as TinyML require sustained funding, mentorship, and enabling policies to scale to national and regional markets.

Investment in digital infrastructure and robust data governance is equally critical to ensure the long-term reliability of agricultural and research systems. Sustainability will also depend on integrating ACE initiatives into national development frameworks. While donor funding has played a catalytic role, long-term impact requires mainstreaming centres like CRAFS into Malawi's public financing and policy systems.

Stronger collaboration among ACEs across Africa would further enhance impact, especially in addressing transboundary challenges such as climate change, pest outbreaks, environmental degradation, and regional food insecurity.

Reflections on the African Centres of Excellence

The CRAFS experience demonstrates the transformative potential of the African Centres of Excellence model. By aligning university research with urgent development priorities, ACEs are redefining African universities as engines of innovation, entrepreneurship, and resilience.

CRAFS shows that African institutions can generate solutions that are both globally informed and locally relevant. Its progress in entrepreneurship, data systems, and climate–health integration illustrates how centres of excellence can drive systemic change.

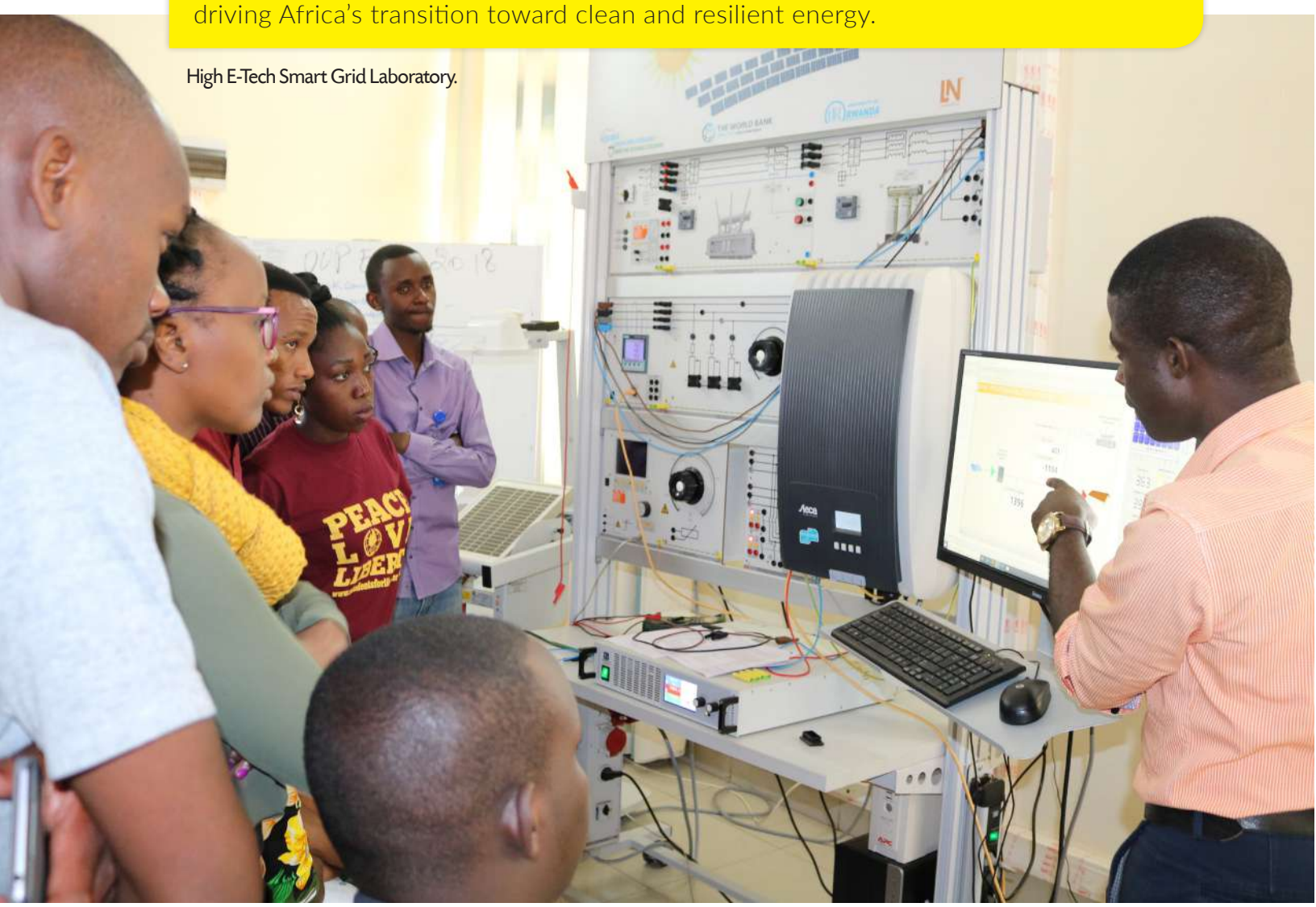
Ultimately, CRAFS embodies the ACE vision of excellence with impact. Through its research, innovations, and partnerships, the Centre is shaping the future of Malawi's agri-food systems while contributing to Africa's broader goal of building resilient and sustainable societies.

Prof Monjerezi is the Deputy Center Director at CRAFS

ACEESD: Powering Africa's energy future through Research, Training, and Innovation

By Dr. Emmanuel Ufiteyezu

The African Centre of Excellence in Energy for Sustainable Development (ACEESD), hosted at the University of Rwanda, is fast becoming a continental hub for advanced training, research, and innovation in renewable energy and sustainable power systems. Through its academic programs, world-class laboratories, and industry-focused innovation hub, the Center is shaping a new generation of experts who are driving Africa's transition toward clean and resilient energy.



High E-Tech Smart Grid Laboratory.

Building Africa's Human Capital in Energy sector

Since its establishment, in 2016, ACEESD has placed human capital development at the core of its mission. The Center has enrolled a total of 69 PhD students—comprising 57 males and 12 females—and 286 Master's students, of whom 247 are male and 39 female. This diverse student body reflects both the growing interest in renewable energy and the center's role as a pan-African magnet for talent.

To date, ACEESD has successfully graduated 21 PhD and 168 Master's students, many of whom are already contributing to energy policy, industry, and research institutions across Africa. These graduates represent a crucial workforce for a continent that is increasingly prioritizing sustainable energy solutions.

Currently, ACEESD hosts 38 ongoing PhD candidates (30 male, 8 female) and 123 Master's students (106 male, 17 female). These students are engaged in specialized areas such as smart grids, solar photovoltaics, hydropower, and energy efficiency—all critical to ensuring Africa's sustainable energy transition.

Our graduates are not only energy experts; they are innovators and problem-solvers. They are equipped to provide solutions to Africa's persistent energy challenges while also contributing to global debates on sustainability and climate change.

Strengthening Research Output

Alongside teaching, ACEESD has emerged as a knowledge hub through its research contributions. Faculty and students at the center have collectively produced 236 high-quality papers published in international peer-reviewed journals and conferences.

These publications explore diverse themes, including smart energy systems, renewable energy integration, energy storage technologies, and the socio-economic impacts of sustainable energy adoption in Africa. By producing rigorous, globally recognized research, ACEESD is helping to shape evidence-based policies and innovative practices in the energy sector.

The Centre has also secured research grants projects worth USD 3.5 million

Infrastructure Acquisition

To support advanced teaching and research, ACEESD has invested heavily in infrastructure. The center boasts High E-Tech Smart Grid Laboratory. This lab enables students and researchers to simulate, design, and test renewable energy technologies in real-world conditions including wind, hydropower, and solar photovoltaic (PV) systems

To further strengthen its physical capacity, ACEESD has also undertaken the rehabilitation of its working space, ensuring that its facilities meet the highest standards of functionality and comfort for both learning and innovation.

The Grid Innovation and Incubation Hub (GIIH)

One of the most notable achievements of ACEESD is the establishment of the Grid Innovation and Incubation Hub (GIIH). This hub is designed to bridge the gap between academic research and industry application by supporting the commercialization of research outputs.

At GIIH, students and researchers receive training in entrepreneurship, product development, and commercialization strategies, ensuring that their innovations do not remain confined to academic journals but make their way into the marketplace. The hub also serves as a collaborative space for startups, industry partners, and policymakers to explore solutions for Africa's evolving energy challenges.

Already, GIIH has supported promising innovations in solar-powered systems, energy-efficient appliances, and smart grid technologies. These initiatives are not only contributing to Africa's green energy agenda but are also creating new opportunities for business and job creation.

A young innovator supported by the hub remarked: *"Through GIIH, we learned how to transform our technical ideas into products that can compete in the market. The mentorship and facilities provided here are unmatched in the region."*

Gender and Inclusion

While male students still dominate enrollment, ACEESD is making deliberate efforts to close the gender gap in science and technology education. With 12 female PhD candidates and 39 female Master's students enrolled so far, the center is steadily building a pipeline of women leaders in renewable energy.

These efforts are aligned

with broader African and global initiatives that emphasize the importance of gender equity in STEM fields. ACEESD's programs include mentorship opportunities, targeted recruitment, and awareness campaigns to encourage more women to pursue careers in energy and technology.

Impact on Africa's Energy Future

Africa faces a dual challenge: expanding access to electricity while ensuring that its energy systems are sustainable and resilient to climate change. ACEESD's work directly responds to this challenge by equipping graduates with the skills to design, deploy, and manage renewable energy solutions. The Center's research and innovations are providing insights into how countries can transition to cleaner energy sources, integrate renewable energy into national grids, and develop policies that foster inclusive energy growth.

Policymakers in Rwanda and across Africa have already begun to benefit from the Center's expertise. Graduates are engaged in national energy utilities, ministries, and private firms, helping to craft and implement strategies that expand energy access while promoting sustainability.

Lessons learnt and recommendations

The implementation of the African Centre of Excellence in Energy for Sustainable Development (ACE-ESD) demonstrated that targeted postgraduate training and applied research can effectively build regional capacity in renewable energy and power systems. The centre's success in developing MSc, PhD, and short courses tailored to regional energy challenges showed the value of aligning academic programs with national and continental priorities. Strong governance systems, transparent financial management, and regular monitoring also proved essential for ensuring accountability, maintaining donor confidence, and driving continuous improvement.

Partnerships emerged as a cornerstone of ACE-ESD's success. Collaboration with regional universities, international partners, and industry stakeholders expanded learning opportunities, strengthened research relevance, and facilitated technology transfer through internships and practitioner engagement. However, sustaining such partnerships requires deliberate coordination, formal agreements, and dedicated management. Challenges such as retaining qualified faculty, securing research funding, and maintaining industry linkages after project closure highlighted the need for long-term institutional strategies and stronger ownership by the host university.

To ensure lasting impact, ACE-ESD and similar initiatives should develop sustainability plans from the onset, focusing on diversified revenue streams such as consultancy services, fee-based training, and industry-funded research. Expanding demand-driven short courses, enhancing faculty development, and integrating industry involvement into training and research will further strengthen outcomes. Additionally, centres should institutionalize regular performance reviews, share lessons learned across the ACE network, and communicate results widely to attract new partners and funding, ensuring that the gains made in capacity building and innovation are sustained beyond donor support.

Looking Ahead

The future of ACEESD is ambitious. The Center plans to expand its research collaborations with international universities, strengthen industry partnerships, and increase the scope of its incubation activities to support more innovators.

Our vision is to be Africa's leading hub for sustainable energy research and training. We are committed to producing the knowledge, skills, and innovations needed to power Africa's green energy transition.

Dr. Emmanuel Ufiteyezu, Centre Director, African Centre of Excellence in Energy for Sustainable Development (ACEESD)

A Pioneer in Agroecology and Livelihood Systems

By Dr. Joseph Ssemakula

As the only private university participating in the prestigious ACE II project, Uganda Martyrs University (UMU), proudly hosts the African Centre for Agroecology and Livelihood Systems (ACALISE), a center dedicated to reshaping the future of agroecology and livelihood systems. At the heart of ACALISE lies a powerful mission: to enhance agroecology and livelihood systems through quality training, impactful research, and meaningful community outreach. This mission is driven by a vision to transform agriculture into a sustainable, innovative, and inclusive sector that uplifts communities and secures livelihoods across the region.

ACALISE's objective is ambitious - to cultivate a new generation of highly skilled, motivated, and ethically conscious experts in agroecology and livelihood systems. To achieve this, ACALISE has laid out a comprehensive strategy:

1. **Training Future Leaders**: ACALISE is committed to producing a new breed of M.Sc. and Ph.D. graduates equipped to conduct ground-breaking research in agroecology and livelihood systems. These graduates will pioneer innovations that address regional challenges and extend their impact beyond borders.
2. **Integrating Ecological Approaches**: By embedding ecological principles into agriculture and related disciplines, ACALISE aims to stimulate sustainable development and improve livelihoods across the region.
3. **Fostering Regional Collaborations**: Recognizing the power of collective effort, ACALISE initiates critical regional partnerships to strengthen multidisciplinary and multi-sectoral research for development.
4. **Promoting Public-Private Partnerships (PPPs)**: To ensure that innovations reach the communities that need them most, ACALISE promotes PPPs. These collaborations enhance the dissemination of agroecological innovations and amplify their impact on livelihood strategies.
5. **Championing Ethical Leadership**: ACALISE places a strong emphasis on nurturing moral and ethical consciousness among its trainees. By instilling accountability and sustainability as core values, the center ensures that its graduates contribute to development that benefits local, national, and regional communities.

Contributions of ACALISE

ACALISE has demonstrated progress in advancing sustainable agriculture, agroecology, and rural livelihoods in the region. Its achievements surpass all set targets in the disbursement-linked results (DLRs) established by the World Bank, underscoring the center's capacity for high-impact research, innovative training, and community engagement. ACALISE has established itself as a regional leader by producing high-quality research, publishing in prestigious international journals, and securing accreditation for its academic programs - both nationally and internationally. This recognition has attracted regional and international students to its MSc and PhD programs, enriching academic diversity.

The center has actively facilitated academic exchanges for students and staff, fostering a vibrant scholarly environment that encourages knowledge sharing and collaboration. Its operational efficiency is reflected in exemplary financial management and procurement systems, which ensure sustainability and responsible resource use. ACALISE's partnerships span academia, the private sector, and

civil society, enhancing the reach and impact of its initiatives and creating avenues for practical applications of its research. The regional benchmarking exercise, conducted through the Partnership for Skills in Applied Sciences, Engineering, and Technology (PASET), has further validated its leadership, providing a platform to share best practices and strategies for continuous improvement.

A notable contribution is ACALISE's role in influencing national policy. The center spearheaded the drafting of Uganda's National Organic Farming Policy, demonstrating how research evidence can inform and shape government agendas directly.

Its innovation portfolio includes environmentally friendly solutions such as organic pesticides, biofertilizers, affordable black soldier fly larvae (BSFL) for use in animal feeds, and organic soil amendments, including vermicomposting, foliar fertilizers, and residual removers. These innovations have yielded tangible benefits for farmers, enhancing productivity, income, and environmental sustainability.

The center contributed significantly towards infrastructure development. ACALISE invested in state-of-the-art laboratories for soil and entomology, a modern postgraduate hostel for international students and staff, and a multi-purpose tractor and implements that support commercial farming and mechanization training. The establishment of affordable feed mills to produce animal feed from local resources reflects its commitment to supporting local livelihoods.

Lessons Learned

ACALISE's journey has provided several valuable lessons that can be applied to other institutions and development efforts. Foremost among these is the critical importance of multidisciplinary and multi-sectoral collaboration. Addressing complex agroecological challenges and rural development demands integrating expertise from researchers, extension workers, farmers, policymakers, the private sector, and civil society. Such partnerships foster innovation, facilitate technology transfer, and extend the impact of development programs.

Investments in infrastructure such as laboratories, training facilities, and community centers enhance the quality of research and education, which, in turn, lead to higher-quality output and greater community impact.

The center's experience also underscores the importance of locally driven solutions. Its innovations in organic inputs—such as bio-fertilizers, pesticides, and affordable animal feeds—are tailored to resource-limited farmers, demonstrating that sustainable solutions must be context-specific and accessible.

Integrating research, community outreach, and policy advocacy creates a holistic approach to rural transformation, fostering resilient agricultural systems that can withstand climate variability and economic pressures.

Recommendations for Policymakers and Development Partners

Based on its successes, ACALISE advocates for continued support and strategic investments by policymakers and development partners. There is need for integrated, multi-sectoral programs that prioritize sustainable agriculture and environmental innovation. Creating enabling policy environments that facilitate organic farming, private sector engagement, and the dissemination of innovation is essential for scaling impact.

Investments in infrastructure —such as laboratories, training centers, and community facilities —are crucial to maintaining high standards of research and education. Such investments should be complemented by fostering strong partnerships between academia, industry, government, and civil society, which can accelerate the commercialization and dissemination of innovations. Regional collaboration through benchmarking, knowledge exchange, and joint research efforts is crucial for promoting best practices and achieving success.

Dr Joseph Ssemakula of ACALISE

By ACEIDHA Team

Introduction

The Africa Center of Excellence for Infectious Diseases of Humans and Animals (ACEIDHA), hosted by the University of Zambia, is a flagship institution under the Africa Higher Education Centers of Excellence Phase II (ACE II) Project. Since its inception, ACEIDHA has championed efforts in building regional capacity to address emerging and re-emerging infectious diseases challenges especially at the human, animal, and the environment interface, a cornerstone of the One Health approach.

Our Pursuit of Excellence

ACEIDHA was established to respond to the urgent need for high-level expertise and research capacity in infectious diseases, particularly those of zoonotic origin. Guided by a vision of scientific excellence, innovation, and regional impact, the center has provided a platform for advanced academic training, high-quality research, and strategic partnerships that aim to improve public and animal health systems across the African continent.

Through interdisciplinary collaboration and evidence-based policymaking, ACEIDHA is building the next generation of African scientists equipped to tackle complex health challenges.

Key Achievements

- **Human Resource Development**: ACEIDHA has trained 226 postgraduate students (176 MSc and 50 PhD), with a strong emphasis on regional diversity and gender inclusion. These graduates are now contributing to research, teaching, and policy across Africa.
- **Research Excellence**: The center has produced impactful research in areas such as zoonotic diseases, antimicrobial resistance, and disease surveillance, contributing to 239 peer-reviewed publications.
- **Development of Programs and Accreditation:** The programmes developed (4) and accredited (6) by the Centre are:

Master of Science in Ecology & Ecosystems Health
Master of Science in Infectious Diseases and Zoonosis
Master of Science in One Health Analytical Epidemiology
Master of Science in One Health Food Safety
Master of Science in One Health Food Safety & Risk Analysis
Master of Science in One Health Laboratory diagnostics

The Centre also developed two (2)

taught PhD programmes.

- **Infrastructure and Laboratory Capacity**: Significant investments were made in rehabilitating the School of Veterinary Medicine with an extension of a two storey building which includes two lecturer rooms, computer laboratory, library and two research laboratories including molecular biology and diagnostics units, rehabilitation of two university houses which housed international students. These improvements to the infrastructure enhanced the centre's ability to conduct high-level research in accordance to its mandate.
- **Policy Engagement**: ACEIDHA supported evidence generation that informed national strategies on zoonotic disease control and the One Health Strategic Plan 2022 to 2026, working closely with the Zambia Public Health Institute, Veterinary Association of Zambia, Ministry of Livestock and Fisheries and Ministry of Green Economy and Environment.
- **Regional Collaboration**: With students and partners from 18 African countries, ACEIDHA has established itself as a regional hub for One Health training and research.
- **Development of a fish vaccine:** With the support from the Mississippi University, funding from USAID, ACEIDHA developed a fish vaccine.
- **Generation of Revenue:** ACEIDHA generated revenue from other funders including Skoll Foundation (funds used for COVID 19 Surveillance), Norwegian University of Life Sciences (FORTECASE Project), NORAD (EDUPROMO Project), USAID (Aquatic Health Fish Vaccine) and from the European Union (Food Systems Transformation in Southern Africa for One Health Project).
- Linkages with industries

Lessons Learned

- **One Health Integration is Key**: Solving Africa's infectious disease challenges requires integrated, cross-sectoral approaches. Our experience shows that collaboration across human and animal health sectors enhances both impact and sustainability.
- **Institutional Support Matters**: The success of ACEIDHA was made possible by strong institutional commitment from the University of Zambia and support from the government and other partners, for example, Hokkaido University.
- **Sustainable Impact Needs Long-Term Investment**: While the ACE II Project created a strong foundation, maintaining and expanding impact requires continuous investment in infrastructure, staff development, and research funding.

Recommendations for Policymakers and Development Partners

1. **Sustain Support for Centers of Excellence**: Continued investment in centers like ACEIDHA is essential to maintain regional capacity and leadership in public health and disease control.
2. **Institutionalize One Health Policies**: Governments should adopt and operationalize One Health Strategic Plan in national implementation plans to address the growing threat of zoonotic diseases and antimicrobial-resistant.
3. **Support Research to Policy Translation and Innovation**: Mechanisms should be established to ensure that academic research informs policy decisions and innovations at national and regional levels.
4. **Strengthen Regional Collaboration**: Infectious diseases are cross-border threats; policies and funding must encourage cross-country data sharing, joint research, and harmonized response strategies.

General Reflections on the ACE II Project

For ACEIDHA, the ACE II Project offered a platform to institutionalize excellence in postgraduate training in infectious diseases that affect both humans and animals, research, and regional collaboration. It has not only strengthened our internal capacity but also amplified our contribution to public health security and scientific leadership in the region.

As we look to the future, the legacy of ACEIDHA under the ACE II Project is clear: a more prepared, better trained, and better connected African scientific community, ready to tackle today's and tomorrow's infectious disease threats.

The Africa Center of Excellence for Water Management: A Journey of Transformation and Innovation in Water Sustainability

By Prof Feleke Zewge

The Africa Center of Excellence for Water Management (ACEWM) at Addis Ababa University stands as a testament to Africa's growing capacity to address its most pressing challenges through homegrown expertise and strategic international partnerships. Established in 2016 through the World Bank's Africa Centers of Excellence initiative, ACEWM has demonstrated an unwavering pursuit of excellence in creating sustainable solutions to water management challenges across the continent.

ACEWM graduates

ACEWM's journey toward excellence began with a clear vision: to become a world-class institution that addresses Africa's water challenges through innovative research, education, and partnerships. The Center adopted a systematic approach to quality enhancement, investing in state-of-the-art laboratory facilities, developing internationally-benchmarked curricula, and implementing rigorous quality assurance mechanisms. This commitment culminated in ACEWM becoming Ethiopia's first internationally accredited institution, certified by the German Agency for Quality Assurance (AQAS) for its eight graduate programs.

The Center's pursuit of excellence extended beyond academic credentials to encompass practical relevance and impact-driven research. By focusing on Africa-specific water challenges and engaging stakeholders from government, industry, and communities, ACEWM ensured its work remained responsive to real-world needs while maintaining the highest academic standards.

Key Achievements

Human Capital Development: The Center has enrolled 200 graduate students (129 MSc and

71 PhD) from across Africa, graduating 150 highly skilled water professionals equipped to address complex water challenges. Additionally, 300 professionals have enhanced their capabilities through specialized short courses.

Research Innovation: ACEWM has secured significant research grants, including the "Water Infrastructure for Chistosomiasis Endemic Regions" project funded by GCRF; "Doctoral Alliance for Climate Adaptation" project funded by Fonds Expertise France; the NORPART "All4WASH" project and the NORHEDII "One Health" project with Norwegian partners. These initiatives have generated context-specific solutions to water security, climate adaptation, and sanitation challenges.

Strategic Partnerships: The Center has established collaborations with leading international institutions including Imperial College London (UK), Waseda University (Japan), Norwegian University of Science and Technology, The University of Oklahoma (USA), The Arctic University of Norway (Norway) and multiple African universities. These partnerships have facilitated knowledge exchange, joint research, and capacity building.

Policy Influence: Through national and international conferences and engagement platforms, ACEWM has influenced water policy discussions across Africa, bringing scientific evidence to bear on critical water management decisions.

Lessons Learned: Insights from the Journey

ACEWM's experience offers valuable insights for similar initiatives:

Contextual Relevance: Programs that address specific African challenges while maintaining international standards have greater impact and sustainability. The Center's focus on local context combined with global expertise proved essential to its success.

Partnership Balance: Strategic international partnerships are crucial, but they must be balanced with strong local ownership and leadership to ensure relevance and sustainability.

Integrated Approach: Addressing water challenges requires interdisciplinary approaches that connect technical solutions with social, economic, and environmental dimensions.

Infrastructure Investment: Sustained investment in laboratory facilities and research infrastructure is essential for world-class research and training.

Governance Matters: Effective governance structures that engage diverse stakeholders—including government, industry, and communities—enhance relevance and impact.

Recommendations for Policymakers and Development Partners

Based on ACEWM's experience, we recommend:

1. **Sustained Investment:** Centers of Excellence require long-term, predictable funding to achieve meaningful impact. Policymakers should develop mechanisms for sustainable financing beyond initial project cycles.
2. **Policy Integration:** Formal mechanisms should be established to integrate research findings from Centers of Excellence into national and regional policy processes.
3. **South-South Collaboration:** Encourage greater collaboration among African institutions to share knowledge, resources, and best practices.
4. **Industry Engagement:** Develop structured frameworks for private sector engagement with Centers of Excellence to enhance practical relevance and job creation.
5. **Monitoring Systems:** Implement robust monitoring and evaluation systems that capture both quantitative and qualitative impacts of Centers of Excellence.

General Reflections on the ACE Model

The Africa Centers of Excellence model represents a paradigm shift in African higher education development. By focusing on specialized areas of critical importance, providing concentrated investment, and promoting international competition while maintaining local relevance, the ACE model has demonstrated remarkable success in advancing both academic excellence and development impact.

ACEWM exemplifies how this model can create institutions that simultaneously achieve international recognition and local relevance. The Center has not only produced high-quality research and graduates but has also established itself as a trusted advisor to governments and a collaborative partner to industry.

As Africa continues to face complex development challenges—from climate change to rapid urbanization—the ACE model offers a promising approach for developing the specialized expertise needed to address these challenges. The success of centers like ACEWM suggests that with strategic focus, adequate investment, and strong leadership, African institutions can achieve world-class status while driving development on the continent.

In conclusion, ACEWM's journey offers inspiration and practical guidance for how specialized centers of excellence can transform higher education and contribute to sustainable development in Africa. Its experience demonstrates that with the right combination of vision, investment, and partnerships, African institutions can indeed achieve excellence while addressing the continent's most pressing challenges.

Prof Zewge is the Director, ACEWM

PHARMBIOTRAC's pursuit of Excellence: Achievements and Lessons

By Dr. Casim Umba Tolo

Background

The Pharm-Biotechnology and Traditional Medicine Center (PHARMBIOTRAC) is one of the original 24 Eastern and Southern Africa Higher Education Centers of Excellence (ACE II). It was established at Mbarara University of Science and Technology (MUST) in 2017 by the Government of Uganda with financing from the World Bank.

The Africa Centers of Excellence (ACEs) is a regional initiative to address higher-level knowledge and skills development needs and applied research requirements for the continent's priority development sectors in the five main areas: Science, Technology, Engineering and Mathematics (STEM); Agriculture, Health, Environment, Applied Social Science and Education. PHARMBIOTRAC was founded to address critical gaps in pharmaceutical biotechnology, traditional medicine, and natural products research across Uganda and the Eastern and Southern Africa region. The center's main goal is to build a critical

PharmBiotrac Team

mass of specialized and skilled human resource that can advance traditional medicine and Pharm-Biotechnology for socio-economic development of Africa.

Key achievements

Over the years, the Centre has successfully trained and graduated over 200 postgraduate students (both MSc and PhD) from across Africa. The Center established state-of-the-art laboratories, supported applied research and innovations, and developed strong partnerships with academia, industry, regulatory agencies, and government. More significantly, PHARMBIOTRAC demonstrated vibrancy in research producing a total of over 200 research articles.

PHARMBIOTRAC's impact extends beyond its immediate academic community. Its graduates are making commendable contributions in the fields of traditional medicine, biotechnology, and pharmaceutical industries. For example, Dr. Mushagalusa Kasali Félicien, a center PhD graduate is

now the Dean of the Faculty of Pharmaceutical Sciences and Public Health at Université Officielle de Bukavu in DRC. Prof. Dr. Lina Sara Mathew Alonga is now the Director General for Science, Technology, and Innovation at the Ministry of Higher Education, Science, and Technology in South Sudan. Dr. Andrew Glory Mtewa is now Director of Postgraduate Studies, Malawi University of Science and Technology, Malawi. Dr. Emanuel Lyimo Peter has become the Director, National Institute for Medical Research (NIMR), Dar Es Salaam, Tanzania. For more information, please follow PHARMBIOTRAC Success Stories at: https://pharmbiotrac.must.ac.ug/our-success-stories/

PHARMBIOTRAC has also successfully incubated a range of innovations. Notably, the Covidex product, a herbal remedy for COVID-19. The product was a result of PHARMBIOTRAC students and staff working with a local company to test and obtain national regulatory emergency approval for use against Covid-19 pandemic. Till today, it remains a Ugandan treasure and pride. Beyond Covidex, the center has developed 50 other medical-related products (about 20% already in market) creating substantial jobs for youths. As a sustainability measure, the Center incorporated "Friends of PHARMBIOTRAC Foundation" in Uganda as an NGO and in the USA as a 501c3 tax-exempt non-profit organization.

Lessons learned

1. Infrastructure Capacity. Relying exclusively on host University's established infrastructure is limiting in terms of space and functionality. Therefore, investing in specialized center infrastructure is key in expanding its operations.
2. Innovation Incubation: The incubation center has made strides in nurturing local innovations that have reached market level. However, the center is constrained by key challenges such as limited resources, few industries to take up technologies for upscaling, marketing and distribution, etc.
3. Human Resources Retention: Successful operations of the center are run by highly skilled human resources that must be retained. Therefore, sustainability and motivation key staff is critical and those not on government payroll need be absorbed into the University structure.

Recommendations

Given our experience in ACE II Project, we strongly recommend the following:

1. establishing a specialized training and skilling facilities in the field of Traditional Medicine(TM) and Biopharmaceuticals is a priority for the center. Therefore, able funders/ investors are welcome for partnerships
2. review of curricula in TM and Biopharmaceuticals to deliver industry-led training/ skilling and recruit specialized human capital
3. fostering of specialized and industry-led R&D ecosystem for integration of TM into Uganda's mainstream healthcare system,
4. boosting of the PHARMBIOTRAC Innovation and incubation Hub to accelerate product development process and commercialization through Public-Private Partnership (PPP).

General thoughts about the PHARMBIOTRAC's journey:

Going forward, the ACE is now linking master's graduates to PhD funding in the field of traditional medicine and pharm-biotechnology. And while some graduates are lecturing in universities, working with herbal medicine factories, others have started their own companies through Centre's regional incubation hub. With this successful approach, PHARMBIOTRAC is poised to evolve into a leading Center of Excellence if it is supported with adequate resources and opportunities such as ACE Futures and any other related initiatives. With a strong focus on natural medicine, and biotechnology, PHARMBIOTRAC will address critical national and regional health challenges.

Dr. Tolo is the Director, PHARMBIOTRAC

Haramaya's Flagship Program

By Mulugeta Damie Watabaji

The Africa Center of Excellence for Climate Smart Agriculture and Biodiversity Conservation (ACE Climate SABC) at Haramaya University, Ethiopia, stands as a key institution within the World Bank's ACE II initiative for Eastern and Southern Africa. Established to develop skilled human resources for the region, the Center focuses on high-quality postgraduate programs, research, and institutional capacity building. Its core objectives include producing skilled graduates, generating new knowledge, promoting innovation, enhancing faculty skills, upgrading facilities, and strengthening partnerships to ensure long-term sustainability.

Key Achievements

1. Producing Skilled Graduates

The Center has successfully produced competent graduates in climate-smart agriculture and biodiversity conservation. It offers a Ph.D. program with five sub-specializations and two MSc programs in Climate Smart Agriculture and Biodiversity and Ecosystem Management. To date, ACE Climate SABC has enrolled 65 Ph.D. and 130 MSc students, with 25% from other African countries and 40% being female. Of these, 26 Ph.D. and 98 MSc students have graduated, contributing a diverse and skilled workforce to the region.

2. Generating New Knowledge

Graduates have made significant contributions to scientific knowledge through high-quality research. Their work has resulted in over 200 research projects, more than 240 articles published in reputable journals, and the addition of 26 Ph.D. dissertations and 98 MSc theses to the university's repository.

3. Enhancing Knowledge and Skills

ACE Climate SABC has organized numerous short-term training sessions to build the research capacity of faculty and technical staff. Over 350 trainees have benefited from these short courses, and approximately 150 faculty members have participated in staff exchange programs, fostering a culture of continuous learning and collaboration across the globe.

4. Upgrading University Facilities

The Center has significantly improved Haramaya University's teaching and research infrastructure. Key upgrades include over USD 500,000 in new laboratory equipment, a video conferencing facility, a Climate Smart and Agroecology Research Living Hub, an upgraded biogas facility, and furnished smart classrooms. The Center also established an automatic weather station, procured vehicles, and developed a dedicated website.

5. Forging Strong Partnerships

To enhance the exchange of skills and expertise, the Center has forged over 16 partnerships with public and private sector organizations. These collaborations have facilitated more than 100 student internships and provided a foundation for developing successful grant-winning project proposals, several of which are already funded.

6. Mobilizing Resources for Sustainability

Through collaborative projects with key partners, the Center has mobilized over USD 4 million in additional funding, ensuring its programs can continue beyond the initial project period. This success led to its selection as a host for PASET-RSIF Ph.D. scholars and IUCEA-sponsored female MSc students. The Center also secured funding for two Intra-Africa academic mobility projects, COCREATE-Africa and CSAS, and an ERASMUS+ project, Greening Ethiopia, set to begin in January 2026.

Climate SABC IUCEA scholarship students.

7. Increasing University Visibility

ACE Climate SABC has become a flagship program for Haramaya University, significantly enhancing its regional and international profile. By training students from across Africa, engaging in joint research and publications, and participating in international conferences, the Center has positioned the university as a leading institution in its field.

Lessons and Recommendations

The establishment of ACE Climate SABC has greatly expanded Haramaya University's capacity and visibility. A key lesson is the immense impact achievable with even modest financial investment, as demonstrated by the extensive research outputs addressing critical challenges in Eastern and Southern Africa. The Center has also proven to be a powerful tool for internationalization, attracting students from across the continent and building a robust institutional network.

Moving forward, it is recommended that all ACE II partners continue to strengthen the collaborative network. Co-creating joint projects is vital for sustaining the impact of the Centers. Furthermore, continued support from the World Bank, development partners, and governments for initiatives like the ACE II project is crucial. Such investments ensure that Centers of Excellence like ACE Climate SABC remain vibrant engines of research, innovation, and capacity development for Africa's future.

Dr Mulugeta is the Project Manager of Climate SABC

How CEESAM Enhanced Academic Research Excellence

By Prof George Owuor

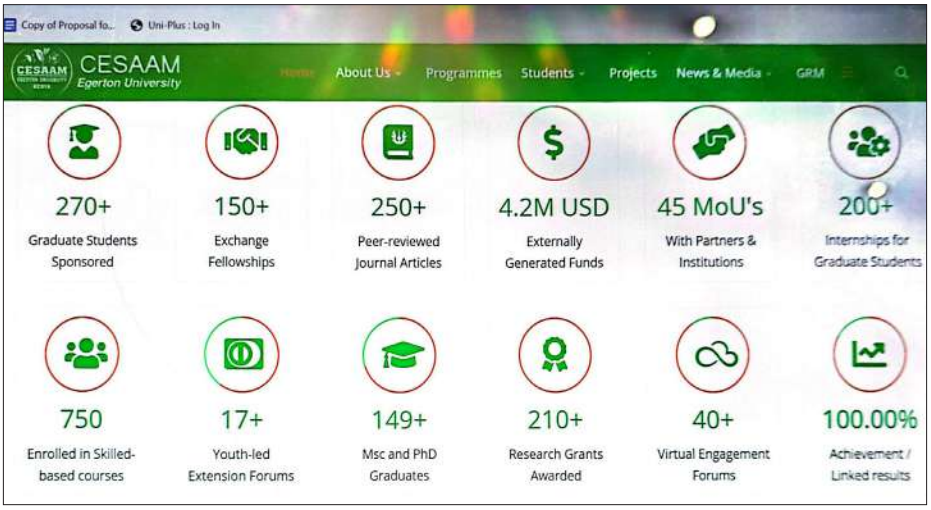
The Center of Excellence provided female mothers with excellent accommodation in the event they got selected for scholarship when they have toddlers or expectant, further the center used students and staff exchange opportunities to improve quality of student research through visits to China, USA and within Africa and further used summer schools to share lessons among students and faculty. Another strategy used to smoothen students transition into employment was through internship programmes with industry, conferences to enable students display research excellence and short courses to enhance students' professional development.

Key achievements:

Teaching, research, field visits, internships, summer school, short courses, exchange visits, publication of articles, then graduation

Lessons learned:

- Internships improved students' employability
- Exchange enhances completion
- Publication timelines
- Summer schools enhances students research excellence
- Good living conditions such as accommodation and networking enhances completion rates



Figute1: CESAAM Score Card

Recommendations for policy makers and development partners:

- include Credit based students exchange, internships and summer schools as part of students training programmes as these enhance quality in academics, research, innovation and professional development.
- procurement policy governing funded projects should be accorded affirmative action to use direct procurement across all key equipment to avoid lags and loss of value for money.

General thought about ACE II.

Results based financing model was key to deliverability of ACE projects both on time, quantity and quality.

Prof Owuor is the Center Leader at CEESAM

African Centre of Excellence in Data Science: Driving Africa's Data Revolution through research, training, and global partnerships

By Prof Charles Ruranga

The African Centre of Excellence in Data Science (ACE-DS), based at the University of Rwanda, has rapidly positioned itself as a leading centre for advanced training, research, and innovation in the rapidly growing field of data science. Through its internationally accredited programs, high-level partnerships, and state-of-the-art infrastructure, ACE-DS is playing a pivotal role in shaping Africa's digital and data-driven future.

Building Africa's next generation of data scientists

Since its inception in 2016 under the Eastern and Southern Africa Higehr Education Centers of Excellence (ACEII) project, ACE-DS has been committed to addressing the critical shortage of data science expertise on the continent. The Center has enrolled 71 PhD students—including 61 males and 10 females—and 346 Master's students, comprising 233 males and 113 females.

So far, ACE-DS has graduated 13 PhD holders from 5 African countries and 140 Master's students from 11 countries, who are now contributing to research, industry, and policy in Africa and beyond.

Currently, the center hosts 54 ongoing PhD students (47 males and 7 females) and 142 Master's students (90 males and 52 females). These scholars are engaging with advanced topics such as artificial intelligence, machine learning, health informatics, financial modeling, and climate data analytics.

"We are building a critical mass of data scientists who are equipped not only with technical expertise but also with the ability to apply data-driven solutions to Africa's most pressing challenges—from health and agriculture to finance and governance."

Research Excellence

Beyond teaching, ACE-DS is strengthening Africa's voice in the global research community. To date, faculty and students at the center have published 91 papers in international, peer-reviewed, and indexed journals and conferences.

These publications address a wide range of domains, including predictive analytics for disease outbreaks, data applications in smart agriculture, and big data modeling for sustainable urban planning. Such contributions not only highlight the rigor of the center's research but also provide actionable insights for policymakers and practitioners across the continent.

Enhanced Infrastructure

To support its mission, ACEDS has invested heavily in infrastructure that enables students and researchers to harness the power of big data. Key facilities include a High-Performing Computer system for big data storage and analysis, smart classrooms, modern computer labs, and a well-resourced library.

Our infrastructure is designed

to give our students a real-world experience in handling large and complex datasets, while also creating an environment that inspires innovation.

Global Partnerships and Accreditation

A major highlight of ACEDS' journey is its strategic partnership with the Data Science Council of America (DASCA), one of the world's leading certifying bodies in data science. This collaboration has enabled the center to align its curriculum with international industry standards, ensuring that its graduates are globally competitive.

Through this partnership, ACEDS students and faculty benefit from access to international certification opportunities, cutting-edge training resources, and participation in global networks of data science professionals. It also strengthens ACEDS' role in producing graduates who can work seamlessly across borders in today's interconnected digital economy.

Moreover, ACEDS has achieved international accreditation for its academic programs, underscoring the quality and global recognition of its teaching and research. This accreditation not only boosts the employability of graduates but also enhances the Center's credibility as a world-class institution.

Empowering Women in Data Science

While men still form the majority of ACE-DS' student population, the Center has made notable progress in promoting gender inclusion. With 10 women pursuing PhDs and 113 women enrolled at Master's level, ACE-DS is actively working to close the gender gap in science and technology fields.

Through mentorship, targeted recruitment, and awareness campaigns, the Center is encouraging more women to take up careers in data science. This aligns with continental and global initiatives aimed at empowering women in STEM and ensuring that Africa's digital transformation is inclusive.

Impact on Africa's Development

Africa is facing pressing challenges that require data-driven solutions, from managing

ACE DS graduates

population growth and health crises to addressing climate change and economic inequality. By producing highly skilled data scientists, ACEDS is directly contributing to the continent's ability to harness data for evidence-based policymaking and innovation.

Graduates of the Center are already making a tangible impact. Some are developing data-driven tools for agricultural forecasting, others are applying machine learning in healthcare to improve diagnostics, while others are working in financial institutions to strengthen risk analysis and digital banking solutions.

These contributions underscore ACE-DS' vision: to not only provide academic excellence but also to translate knowledge into practical, scalable solutions for Africa's sustainable development.

The future of ACEDS is marked by ambition and expansion. The Center plans to strengthen collaborations with international universities, expand industry partnerships, and scale up its research output. There are also plans to enhance its role as a regional hub for advanced training, attracting more students and researchers from across Africa.

Our goal is to remain at the forefront of Africa's data science revolution. We want to be the institution that sets the benchmark for training, research, and innovation in this critical field.

Lessons learnt, recommendations

The implementation of the African Centre of Excellence in Data Science (ACE-DS) highlighted the importance of strong institutional ownership, effective partnerships, and capacity building in achieving project goals. The University of Rwanda's leadership and integration of the centre's mission into its broader strategy ensured project relevance and continuity.

Regional partnerships within the ACE network enriched research diversity and visibility, while targeted efforts to promote gender inclusion and practical training proved essential for fostering inclusive excellence.

However, challenges such as limited qualified staff, procurement delays, and aligning research with industry needs underscored the need for long-term planning and structured collaboration.

Key lessons also pointed to the critical role of sustainability planning and robust monitoring mechanisms. While income-generating activities like short courses and consultancy services contributed to financial independence, sustaining operations beyond donor support requires solid business models and integration into national and institutional frameworks.

The World Bank's results-based funding approach enhanced accountability but revealed the need for streamlined reporting systems. Overall, ACE-DS demonstrated that successful implementation of such a centre depends on institutional commitment, effective stakeholder engagement, and a clear strategy for long-term impact and self-reliance

As the world becomes increasingly data-driven, ACE-DS is ensuring that Africa is not left behind, but rather takes its rightful place as a leader in data innovation and application.

Prof. Charles RURANGA, Centre Director, African Centre of Excellence in Data Science (ACE-DS), Email: aceds@ur.ac.rw

Harnessing the Power of Neglected Biodiversity: ACENUB's Journey to Excellence

By Cliff Kawanga

The African Centre of Excellence in Neglected and Underutilised Biodiversity (ACENUB) at Mzuzu University (MZUNI) stands today as a beacon of scientific innovation, inclusivity, and community impact in Malawi and the wider Eastern and Southern Africa region. Established in 2022 under the ACE II Additional Funding (ACE II-AF) programme, ACENUB exemplifies how a clear vision, strong partnerships, and evidence-based action can transform biodiversity research into tangible socio-economic outcomes.

A Vision Anchored in Impact

ACENUB's mission is rooted in unlocking the untapped potential of neglected and underutilised biodiversity (NUBs), plants, insects, and other biological resources that are crucial for food security, nutrition, and climate resilience but remain undervalued in conventional agricultural systems. Guided by MZUNI's Strategic Plan (2021–2030), the Centre has pursued a holistic agenda integrating research, innovation, and community enterprise.

Since its inception, ACENUB has functioned as a dynamic platform connecting universities, researchers, entrepreneurs, and farming communities across Africa. The Centre has aligned its agenda with MW 2063, AU-Agenda 2063 and UN-SDGS, positioning biodiversity as a key enabler of inclusive economic growth.

Key Achievements under ACE II

ACENUB has recorded outstanding milestones demonstrating institutional maturity and developmental relevance.

1. Institutional Strengthening and Infrastructure Development

ACENUB achieved 100 percent performance in the *Institutional Readiness and Strengthening (PBC 1)* indicator, successfully establishing an autonomous governance structure, research administration systems, and dedicated technical teams to manage large-scale

ACENUB Regional Students

projects. Construction of the ACENUB Complex, a state-of-the-art facility with specialised laboratories, innovation hubs, staff offices, a lecture theatre, and an incubation centre, is near completion. This infrastructure will anchor MZUNI's leadership in biodiversity science for decades.

2. Capacity Building and Human Capital Development

To date, ACENUB has enrolled 111 students (43 PhD, 68 MSc, and 160 short-course participants) drawn from eight African countries, including Tanzania, Kenya, Uganda, Mozambique, Rwanda, Benin, and the Democratic Republic of Congo. Over 32 percent of these are women, reflecting the Centre's commitment to gender inclusion in STEM. Beyond formal enrolments, ACENUB has trained 707 community members in enterprise development, climate-smart agriculture, and biodiversity utilisation, thus strengthening the "science-to-community" continuum.

3. Partnerships and Research Collaboration

Through over 26 Memoranda of Understanding (MOUs) with universities, government agencies, and private institutions, the Centre has built an expansive research network that promotes applied research, technology transfer, and student exchange. A total of 108 faculty and student exchanges have been completed, while 62 peer-reviewed publications have

contributed to global scholarship on biodiversity and sustainable food systems.

4. Programme Accreditation and Quality Assurance

In alignment with IUCEA standards, ACENUB facilitated the accreditation of 16 agriculture education programmes by the National Council for Higher Education (NCHE) and supported postgraduate programme accreditation. These efforts have strengthened MZUNI's academic credibility and advanced the ACE II-AF quality-assurance agenda.

5. Innovation, Incubation, and Enterprise Development

Through the Community Action Research for Enterprise Development (CARP-E) initiative, ACENUB has successfully incubated five community-based enterprises and established a SMART Farm to pilot green innovations. These enterprises are translating research outputs into marketable products, generating local employment, and demonstrating the economic value of NUBs. ACENUB's consistent performance across all Performance-Based Disbursement Conditions (PBCs) resulted in the Centre achieving an overall 78 percent disbursement rate, reflecting efficiency, accountability, and measurable impact.

Lessons Learned on the Road to Sustainability

ACENUB's experience offers valuable insights into building Centres of Excellence that are both scientifically robust and socially transformative.

First, the Centre learned that targeted research and capacity building can unlock immense potential in neglected biodiversity when coupled with community engagement. Second, behavioural and policy barriers often hinder the mainstreaming of NUBs into national food systems. Third, institutional ownership and integration into university structures are essential for sustainability beyond donor funding cycles.

Recommendations for Policymakers and Development Partners

To consolidate and scale these gains, ACENUB offers several evidence-based recommendations as follows:

1. Policy Integration - Governments should mainstream NUBs into national agricultural, biodiversity, and food policies to ensure resource allocation and institutional support.

2. Investment in Research Infrastructure - Sustained investment in Centres of Excellence and universities is critical to maintain cutting-edge research facilities and attract young scientists.

3. Value-Chain Development - Strengthening NUB value chains, from production to processing and marketing, will unlock job opportunities, particularly for women and youth, who are key actors in local food systems.

4. Regional Collaboration - Enhanced cooperation among ACEs through shared research platforms and joint training programmes will accelerate innovation and harmonise policies across Africa.

5. Climate-Smart Agriculture - Given NUBs' resilience to climate shocks, they should be prioritised within national climate-adaptation and food-security strategies.

Reflections on the ACE Model

The ACE II Programme has demonstrated that African universities, when empowered, can drive transformative change aligned with national development visions and the Sustainable Development Goals. For Mzuzu University, ACENUB has catalysed institutional renewal, strengthening research culture, enhancing postgraduate training, and positioning the University as a regional hub for biodiversity innovation.

Mr Kawanga is the Communication Officer at ACENUB

Innovative Rodent Pest Management: Leading Africa's Scientific Response to a Persistent Continental Challenge

By Prof Rhodes Makundi

Rodent pests have accompanied human societies since the earliest days of food storage and agriculture. Wherever grains or fruits were grown, rodents followed—destroying crops, invading homes, damaging infrastructure, and spreading serious diseases. Despite this long coexistence, rodent management remains among the least developed and least documented scientific fields, especially in Sub-Saharan Africa. Today, rodent outbreaks are increasing globally, from rural farming landscapes to major cities, underscoring the need for innovative and sustainable solutions.

Africa faces similar challenges. Rats pose recurrent threats in Tanzania, Ethiopia, Senegal, South Africa, Kenya, Uganda, Namibia, and beyond. They damage crops, contaminate stored food, and transmit zoonotic diseases, creating economic and psychological stress for households. Yet historically, the continent lacked trained specialists, coordinated research programs, or scalable management systems.

A major turning point came with the establishment of the Africa Centre of Excellence for Innovative Rodent Pest Management and Biosensor Technology Development (ACE IRPM & BTD) at Sokoine University of Agriculture (SUA) in Morogoro, Tanzania—the first institution on the continent dedicated solely to rodent science. As Emeritus Professor Charles Krebs notes, the Centre tackles a "problem that has remained largely invisible to agricultural scientists," making its creation a milestone for Africa and the global research community.

Understanding the Scale of the Rodent Challenge

Rodents cause losses across key sectors:

- **Agriculture:** Damage during germination, growth, and harvesting
- **Food Storage:** Contamination and spoilage
- **Infrastructure:** Damage to buildings, drainage, electrical systems
- **Public Health:** Transmission of over 64 diseases, including plague, Lassa fever, leptospirosis, and various hemorrhagic fevers

Many outbreaks go undetected or misdiagnosed, while most African countries historically lacked monitoring systems, research infrastructure, or coordinated knowledge-sharing platforms.

The Birth of ACE IRPM & BTD: Vision and Mandate

The Centre's mission is to strengthen Africa's scientific and technological capacity in rodent management and biosensor development while delivering sustainable solutions that protect food security, health, and livelihoods. Core functions include:

1. Applied research and innovation
2. Postgraduate training and curriculum development
3. Regional and international scientific collaboration
4. Community engagement and extension
5. Technology development and commercialization

It connects scientists, government agencies, public health systems, NGOs, and farming communities.

Core Research Themes

The Centre works across multiple high-priority research areas, including:

- Rodent ecology and population dynamics
- Ecologically-Based Rodent Management (EBRM)
- Zoonotic disease surveillance
- Fertility control technologies using hormonal compounds
- Predator-scent repellents derived from cat urine
- Barn owl biological control and community education
- Biosensor technology using trained rats for detecting landmines and tuberculosis
- Climate-driven distribution shifts
- Molecular genetics and taxonomy of African rodents

This integrated approach ensures rodent management is scientifically robust, culturally appropriate, and environmentally sustainable.

Training and Human Capacity Development

Before ACE IRPM & BTD, no African university offered a degree focused on rodent management. The Centre has since helped establish:

- **MSc in Rodent Pest Management** (Mekelle University, Ethiopia)
- **MSc in Pest Management –** Public Health (SUA)
- **MSc in Wildlife Management** (SUA)

In its first six years, it trained **100+ MSc** and **32 PhD** graduates from over nine African countries, supported by collaborations with partners in South Africa, Namibia, Ethiopia, Uganda, Zambia, the UK, China, Sweden, Belgium, and others.

Breakthrough Innovations

1. **Fertility Control Technology** Using Quinestrol and Levonorgestrel, the Centre developed hormonal bait suppressing rodent reproduction and slowing

population growth.

2. **Predator-Scent Repellent** Cat-urine compounds have shown promise in reducing household rat activity, with work underway on synthetic commercial formulations.

3. **Barn Owl Biological Control** By installing nest boxes and conducting community education to shift cultural perceptions, barn owls are promoted as natural rodent predators capable of eating up to 12 rodents nightly.

4. **Biosensor Technology** In partnership with APOPO, trained rats detect landmines and tuberculosis, with additional diagnostic applications under development.

5. **Trap-Barrier System (TBS)** A structural intervention allowing rodents to enter but not escape, reducing field infestations. More than 5,000 farmers now apply it.

Biodiversity, Disease, and Scientific Contributions

Research across Tanzania's Rift Valley, Eastern Arc Mountains, Kilimanjaro, and sites in Uganda, Ethiopia, and Kenya has expanded understanding of species diversity, genetics, climate impacts, and zoonotic reservoirs. The Centre has produced **300+ peer-reviewed publications**, making it one of the world's leading contributors to rodent science.

Infrastructure, Sustainability, and Future Directions

Two purpose-built research and teaching facilities house faculty, postgraduate students, and visiting researchers. Sustainability efforts focus on:

- Grant acquisition
- Postgraduate enrollment expansion
- Commercializing new technologies
- Strengthening extension and farmer knowledge programs
- Establishing a Pan-African rodent management data repository

Upcoming goals include scaling fertility control, growing owl-based biological control, and expanding biosensor diagnostics.

Three Lessons Learned

1. Community Engagement Determines Success

Technically strong interventions—such as fertility control, trap-barrier systems, or owl-based biological control—gain impact only when communities understand, accept, and participate in them. Cultural beliefs, risk perceptions, and local knowledge must shape implementation strategies.

2. Integrated Approaches Outperform Single Solutions

Rodent problems are ecological, agricultural, and public-health challenges simultaneously. Successful management requires combining ecological measures, technology, behavioral change, and continuous monitoring rather than relying on any one method.

3. Building Local Scientific Capacity Is Transformational

Training African researchers, technicians, and postgraduate students has proven essential for sustainability. Developing local expertise ensures long-term continuity, reduces reliance on external specialists, and accelerates innovation tailored to African ecosystems.

Conclusion

The Africa Centre of Excellence for Innovative Rodent Pest Management and Biosensor Technology Development marks a historic shift in Africa's ability to confront rodent-related threats to food security and public health. By building scientific capacity, pioneering new technologies, and strengthening regional cooperation, ACE IRPM & BTD is empowering African communities, institutions, and governments with the tools needed to protect livelihoods and shape a safer, healthier future.

Prof Makundi is the Deputy Center Leader at IRPM&BTD

Drones Hub

ACEIoT: Shaping Africa's Future in Internet of Things Research and Innovation

By Prof. Damien Hanyurwimfura

The African Centre of Excellence in Internet of Things (ACEIoT), hosted at the University of Rwanda, has emerged as a leading hub for advanced research, postgraduate training, and innovation in digital technologies. Established in 2016 under the Eastern and Southern Africa Higher Education Centres of Excellence Project, the Centre plays a pivotal role in building Africa's capacity in the Internet of Things (IoT), Artificial Intelligence (AI), and data-driven technologies—key pillars of the continent's digital transformation and knowledge economy.

Building Africa's Human Capital in IoT

A central mission of ACEIoT is to develop a highly skilled workforce capable of driving digital innovation across Africa. Since inception, the Centre has enrolled 96 PhD and 222 Master's students from across the continent. To date, 25 PhD candidates and 137 Master's students have graduated, joining Africa's growing pool of researchers, innovators, and technology leaders.

Currently, 53 PhD and 59 Master's students are actively pursuing their studies at the Centre. ACEIoT graduates are already contributing to academia, industry, and policy by applying IoT and AI to address real-world problems in agriculture, healthcare, transport, and urban development. Beyond producing academic knowledge, the Centre emphasizes practical application, ensuring that research responds directly to Africa's development priorities.

Research Excellence and Global Visibility

ACEIoT has established itself as a strong research institution with global visibility. Faculty and students have produced more than 186 peer-reviewed publications in reputable international journals and conferences. These outputs span smart agriculture, e-health, smart cities, cybersecurity, machine learning, and data analytics.

By tackling both local and global challenges, ACEIoT positions Africa as an active contributor to global scientific knowledge rather than merely a consumer of digital technologies. The growing volume and quality of publications reflect the Centre's academic rigor and its reputation as a trusted hub of innovation.

Modern Infrastructure Supporting Innovation

To support high-quality training and research, ACEIoT has invested in modern infrastructure, anchored by a fully equipped IoT Laboratory that enables advanced experimentation, prototyping, and applied research. The Centre has also refurbished its premises to enhance collaboration among students, researchers, and industry partners. Additionally, a dedicated breastfeeding room promotes inclusivity and supports female researchers and students.

With support from the International Development Research Centre (IDRC), ACEIoT established the Transformative Artificial Intelligence Research (TAIRI) Lab, which has sponsored 10 students (five MSc and five PhD) to address local challenges using AI. TAIRI's work focuses on inclusive healthcare, agriculture, environmental management, and policy integration.

Another major milestone is the Drone Knowledge Hub, which equips professionals with skills in drone operations and applications. To date, 65 professionals have been trained through the hub, expanding Africa's capacity in emerging technologies.

ACEIoT has signed 17 Memoranda of Understanding with local and international partners, facilitating student exchanges, internships, joint research, and co-supervision. The Centre has also secured 23 research grants worth more than USD 2.5 million. It was competitively selected to host the Regional Scholarship and Innovation Fund (RSIF), through which 23 PhD students have been supported and eight research grants awarded.

The Incubation Hub: From Research to Market

To ensure that innovation extends beyond academic publication, ACEIoT established an AI and IoT Incubation Hub with support from the Research and Innovation for Africa (RISA) Fund. The hub bridges the gap between academia and the market

by nurturing entrepreneurship and commercialization.

It provides training in prototyping, business development, and innovation management, alongside seed funding to promising projects. So far, 137 innovators have been trained, and 14 high-performing projects have each received USD 5,000 in seed funding. These projects span smart agriculture, health monitoring, intelligent transport systems, and environmental monitoring.

The incubation hub reflects ACEIoT's commitment to transforming research into economic value and employment. By equipping innovators with both skills and financing, the Centre accelerates the transition from laboratory research to market-ready solutions that address African challenges.

Impact Beyond Academia

The influence of ACEIoT extends well beyond the university. Alumni are contributing to digital transformation initiatives across Africa, deploying smart farming systems, developing AI-powered health solutions, and supporting data-driven governance.

In Rwanda, graduates collaborate with startups and government agencies on urban planning, disaster management, and energy efficiency. Across the continent, ACEIoT-trained experts are strengthening national digital ecosystems and contributing to technology policy and innovation frameworks. By integrating education, research, and entrepreneurship, the Centre is shaping a new generation of African digital leaders.

Lessons Learned

The implementation of ACEIoT demonstrates the value of aligning postgraduate training and advanced research with national and regional digital priorities. Through its MSc and PhD programs in Wireless Intelligent Sensor Networking and Embedded Computing Systems, the Centre has built a strong pool of specialized professionals.

International partnerships enhanced research quality, mentorship, and innovation, while practical projects and incubation initiatives nurtured entrepreneurship. Students benefited greatly from multidisciplinary collaboration and exposure to external institutions, gaining access to broader expertise, data, and research opportunities. Externally funded students consistently showed stronger performance.

Key lessons include the importance of robust institutional systems, effective stakeholder engagement, and proactive communication of results. Regional and international visibility proved critical in attracting students and strengthening the Centre's credibility.

However, challenges such as dependence on external funding, limited research resources, and staff retention underscore the need for long-term sustainability strategies. Strengthening industry–academia linkages remains essential to ensure research translates into market-ready technologies and policy impact.

Recommendations and Sustainability

To sustain and expand its impact, ACEIoT is prioritizing diversified funding through consultancy services, commercialization of research, and industry-sponsored projects. Continued support from IUCEA and development partners—particularly in faculty development, academic linkages, and industry partnerships—is strongly recommended.

Regular monitoring, sharing of best practices within the ACE network, and strong institutional ownership by the University of Rwanda will further consolidate ACEIoT's leadership in IoT research and innovation. Results-based management has proven effective, while partnerships with industry—such as NARADA and FabLab—have strengthened applied research and technological relevance.

Research outputs from the IoT and TAIRI labs with high commercialization potential should be further supported for scaling to address pressing societal challenges. With sustained investment, ACEIoT is well positioned to remain a regional engine for digital innovation and capacity building in Africa.

Prof. Damien Hanyurwimfura is the Director, African Center of Excellence in Internet of Things (ACEIoT)

Driving Regional Integration through Railway Excellence: The Journey of the African Railway Center of Excellence

By Dr. Zewdie Moges

Background and Vision

Across Africa, major railway construction and rehabilitation projects are underway to address long-standing transport challenges such as poor infrastructure, inefficient logistics, and inadequate connectivity. One of the flagship initiatives under the African Union's Agenda 2063 is the Integrated African High-Speed Train Network, envisioned to connect all African capitals and major commercial centers. The first three goals—interconnecting landlocked countries, linking regional corridors, and establishing Trans-Africa beltways. This initiative aims to lower transport costs, relieve congestion, and stimulate continental integration, economic growth, and cultural unity.

Ethiopia, as part of this continental vision, has included railway expansion as a top national priority in its Ten-Year Perspective Plan (2020–2030), targeting the construction of more than 4,000 km of new railway lines. However, the continent continues to face a critical shortage of skilled professionals, technologies, and institutional capacity in the railway sector, leading to dependence on foreign expertise.

To address these gaps, the Addis Ababa University (AAU), in collaboration with the Ethiopian Railway Corporation, launched MSc programs in Railway Engineering in 2012. Building on this foundation, and with the support of the World Bank Group, the African Railway Center of Excellence (ARCE) — also referred to as ARERI–ARCE — was established in 2016 under the ACE II Project.

Vision: To expand regional integration through railway transportation by creating an academic and research excellence center in railway engineering for Africans.
Mission: To strengthen knowledge in the railway sector through short-term training, higher education, innovation, research, and consultancy services.

Pursuit of Excellence

ARCE's pursuit of excellence rests on three core pillars: education, research, and industry collaboration. It offers four PhD programs in Railway Engineering and Management (Civil Infrastructure, Rolling Stock, Traction & Train Control, and System Management) and three MSc programs in related fields. These programs are tailored to address Africa's railway development priorities, combining academic rigor with hands-on training.

Since its inception, ARCE has enrolled more than 400 MSc students (including 95 regional students from 17 African countries) and 26 PhD candidates, while its predecessor programs trained over 460 national and 10 regional MSc graduates in Railway engineering. The Center has invested over three million USD in Advanced-Railway laboratory equipment, Innovation Center, design software, smart classrooms, and high-performance computers to strengthen teaching and research capacity.

Key Achievements

ARCE has made significant strides toward transforming railway education and research in Africa:

- **Human Capacity Development:** More than 425 students in postgraduate level have been trained,
- **Short-Term Professional Training:** Over 260 railway professionals from public and private sectors have received specialized technical training.
- **Research and Innovation:** ARCE has produced more than 260 research outputs, including 50 peer-reviewed journal articles and one patented work, which received an award from the Prime Minister of Ethiopia in 2019.
- **Consultancy Services:** The Center successfully conducted the Post-Project Evaluation of the Sebeta–Meiso–Dewale Railway Line and the Ethio–Djibouti Railway Infrastructure Assessment, both with budgets exceeding one million USD.
- **Partnerships:** ARCE has developed collaborations with top global and regional institutions, including Southwest Jiaotong University (China), Korean Railroad Research Institute, Norwegian University of Science and Technology (NTNU), University of Birmingham, Sophia University, Yokohama University, Makerere University, Indian Institute of Technology, and multiple Ethiopian universities. Partnerships also extend to industry leaders such as Bombardier and Ing. Zewdie Eskindir Consultancy S.C.
- **Infrastructure and Facilities:** ARCE has established innovation centers, smart classrooms, and specialized laboratories to support railway engineering education, research, and prototyping.

Lessons Learned

ARCE's experience offers critical lessons for sustaining excellence in specialized higher education:

1. Strategic Leadership and institutional commitment are essential to long-term impact.
2. University–Industry Linkages ensure that education and research respond to real operational challenges.
3. Regional Cooperation enhances the sharing of expertise, infrastructure, and best practices.
4. Financial Sustainability depends on diversification through

Ethiopia-Djibouti Railway

consultancy, training, and innovation-driven projects.

Recommendations for Policymakers and Development Partners

To sustain the ACE model and advance railway development in Africa, ARCE recommends that governments and development partners:

- Continue investing in advanced laboratories and research infrastructure.
- Strengthen industry–academia collaboration to promote innovation.
- Support joint degree programs and academic mobility within Africa.
- Establish dedicated research and innovation funds for technology transfer and commercialization.

Reflections on ACE II and the Way Forward

The ACE II Project has transformed higher education across Africa, enabling institutions to evolve from teaching-focused entities into centers of applied research and problem-solving. For ARCE, ACE II created a platform for capacity development, regional integration, and innovation in a critical sector.

Looking ahead, ARCE aims to expand its reach by integrating artificial intelligence, nanotechnology, and digital systems into railway engineering and management curricula. It also envisions establishing a Railway Innovation, Incubation, and Commercialization Center to translate research into industry solutions. With continued support from governments, the World Bank, and IUCEA, ARCE will remain a driving force in connecting people, economies, and opportunities through sustainable railway networks.

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Shaping the Future of Aquaculture and Fisheries Through Innovation and Excellence

By Prof Daud Kassam

At the Africa Center of Excellence in Aquaculture and Fisheries (AquaFish), our drive for excellence continues to shape the next generation of leaders in research, innovation, and entrepreneurship. Established in 2016 and hosted at the Lilongwe University of Agriculture and Natural Resources (LUANAR), AquaFish is committed to building skilled professionals, advancing research, and developing innovations that are transforming aquaculture and fisheries across the region. Since our establishment, we have made great strides in training, research, and innovation, always focused on finding solutions that address real challenges in food security and livelihoods.

One of the areas where AquaFish has broken new ground is in industrial hemp research. Working with partners, we are exploring hemp as a sustainable source of food and animal feed. Hemp seed meal, rich in protein and essential fatty acids, is being tested as an affordable alternative to conventional feed ingredients, while hemp seed cake is being used in foods like maize-hemp meal to improve nutrition.

We have also advanced research on insect-based proteins using black soldier fly larvae and mealworms. These insects provide high-quality protein and fat while promoting circular agriculture by recycling crop residues and food waste into valuable feed ingredients.

Tijoy Lowore

Another important research area is fish preservation and value addition. Using lactic acid bacteria as a natural preservative, our student has developed a safe, low-cost method to extend the shelf life of fresh fish, reducing losses and improving food safety and trader incomes.

In addition, AquaFish promotes climate-smart technologies such as aquaponics, an integrated system that combines fish farming with hydroponic vegetable production. This system recycles water and nutrients, lowering input costs and producing both fish and vegetables. It offers an ideal model for urban and peri-urban communities with limited land and water resources.

Innovation at AquaFish has been further strengthened through our incubation programs and Carp-E initiatives. These programs provide a platform for turning research into real products and enterprises. To date, seventeen Carp-E products have been developed, with several now moving toward incubation.

Over the past nine years, AquaFish has recorded notable achievements. We have enrolled 467 Master's students and 84 PhD students from 20 African countries. In addition, 1,156 individuals have been trained through tailored short courses designed to promote entrepreneurship and technical skills at the TVET level. The Centre has built strong partnerships with 23 partners, including five from the private sector that have co-financed research programs. Our research output continues to grow, with 159 publications produced so far, and 174 students and staff have participated in exchange programs across Africa and beyond.

Lessons Learned

The lessons we have learned from implementing the ACE II project are equally important. We have seen how postgraduate training can accelerate national and regional research contributions and support Malawi's future industrialization. However, the bureaucratic nature of administrative systems in time-limited projects has sometimes made it difficult to move innovations beyond the prototype stage. For sustainable impact, such programs need more time and flexibility to allow innovations to mature into market-ready products.

We have also learned that breaking new ground in technology development helps reveal hidden talent. Through our work in hemp agronomy, insect protein, and aquaculture feeds, we have seen young researchers bring fresh ideas to long-standing challenges. Yet, access to innovation financing remains a challenge. Regional financial institutions are still hesitant to support incubation and commercialization efforts, limiting the growth of promising ideas.

Another lesson is the growing need for private sector engagement in research. Universities are beginning to see that working with industry is essential not only to address practical challenges but also to generate revenue from intellectual property and technology transfer. However, the number of private sector players involved in research remains low, showing that more effort is needed to build a stronger culture of collaboration.

The ACE II initiative has transformed how postgraduate training is viewed in Africa. It has shown that with the right support, universities can move from being consumers of knowledge to becoming creators of solutions that address real challenges. Through this model, opportunities such as the IUCEA's regional accreditation body have emerged, strengthening collaboration and quality assurance across the continent.

Our journey under the ACE II Project has been one of growth, learning, and transformation. At AquaFish, we remain committed to advancing research and innovation that contribute to food security, economic development, and sustainable livelihoods. The lessons we have learned and the successes we have achieved will continue to guide us as we build on the foundation that ACE II has laid. We believe this model will continue to shape the future of higher education and research in Africa for many years to come.

Prof Kassam is the Director at AquaFish

Makerere University Regional Centre for Crop Improvement: A hub for Research, Innovation and Community Impact

By Dr Richard Edema

The main goal of the Makerere University Regional Centre for Crop Improvement (MaRCCI) was to train high-quality graduate students and establish active research programs in improvement of cowpea, sorghum, horticultural (tomato, pumpkin, pepper, amaranth) and seed Science and Technology. The ACE II project has greatly strengthened the ability of MaRCCI to deliver high quality post-graduate education that contributes to the economic development needs of Uganda and the region. MaRCCI has become a recognized regional leader, and even global leader, in delivering training that produces "market-ready" "fit-for-service" graduates in plant breeding, biotechnology and seed systems who can operate effective variety development and delivery programs.

Key achievements

Crop Breeding Programs: Launching programs for producing resilient crop varieties that are (i) High yielding (ii) Nutritious (iii) Meet market needs (food and income security). A number of MaRCCI cowpeas varieties are nearing official registration. A commercial licensing agreement is ongoing with SEEDCO Zimbabwe for two cowpea varieties, while four varieties have been submitted to the National Seed Certification Service of Uganda for testing.

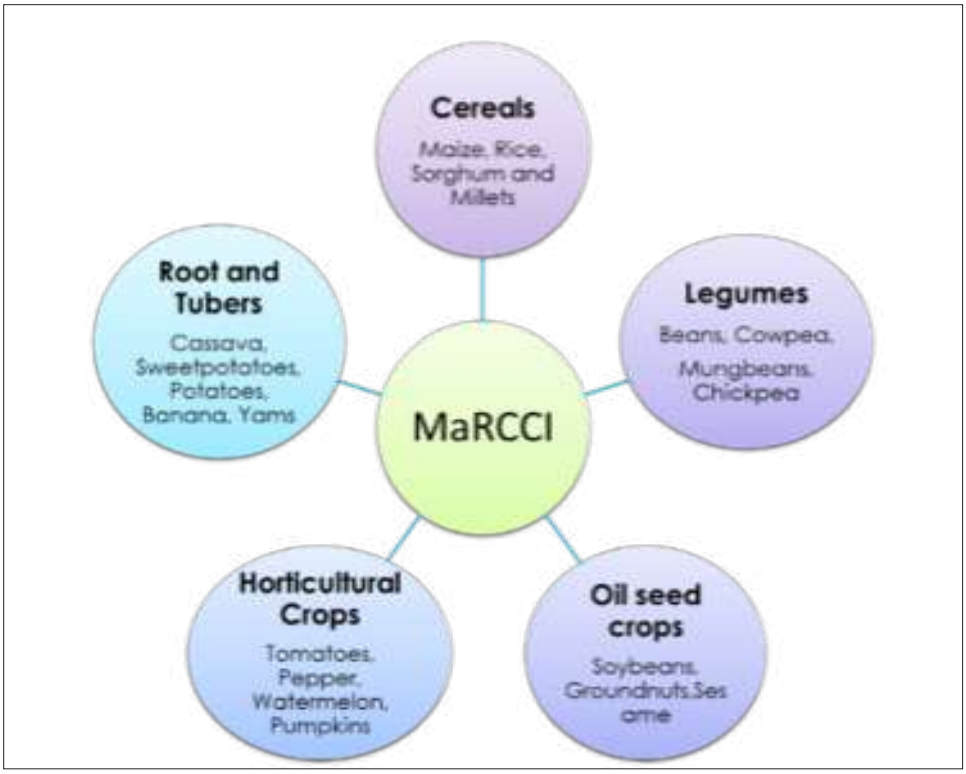

Figure 1. Key Crops where MaRCCI Training and Research is focused

The Biotechnology Laboratory (Training and Research) Services: Genetic finger printing, Microbiology and disease diagnostics, and Bioinformatics

Research Publications: Over 200 peer-reviewed scientific articles published by students and staff, some in top-tier journals.

Student Training: In the seven years of the project (2016 to 2023) MaRCCI trained 121 MSc and 57 PhD students from 20 African countries, with many graduates taking leadership roles in their home countries.

Research Infrastructure: Construction of a Graduate Training and Research Laboratory building and establishment of a Biotechnology lab.

Partnerships: MaRCCI has established productive, long lasting collaborations with local and international universities, research institutions, and private sector organizations.

Short Courses: Offering specialized training in plant breeding, seed systems, and biotechnology.

Research Grants: Additional funding has been secured from organizations like the AGRA, Seed Systems groups, the Government of Uganda and other agencies to support research and training programs.

Lessons learned-

Partnerships are key: Collaborations with local and international universities, research institutions, and private sector organizations are crucial for success.

Perseverance pays off: Overcoming challenges and securing funding leads to significant achievements.

Recommendations for policymakers and development partners

a. Invest in agricultural research: Prioritize funding for crop improvement and biotechnology research to address food security challenges.
b. Support capacity building: Provide scholarships and training opportunities for students and staff in cutting-edge technologies.

Gene Bank: Services: Germplasm conversation - Over 7000 local, regional, and international accession of cowpea & Sorghum

The Brand-New Office and classroom block built using ACE II funds

c. Foster partnerships: Encourage collaborations between universities, research institutions, and private sector organizations.
d. Promote innovation: Create an enabling environment for startups and entrepreneurs in agriculture and biotechnology.

This will help drive excellence in research, innovation, and community engagement in Uganda and beyond.

The key challenges in operating the ACE II model have been:

a. Demand for places in the degree training programs has been high, overwhelming supervision capabilities, resulting in less-than-ideal research guidance and delays in completion. This is being addressed by drawing upon outside volunteer help from local, regional, and internationally based scientists.

b. The delay in getting the verification agency contracted, and further delays in the initiation of verification led to great financial difficulties.

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