MOUNTAINS OF THE MOON UNIVERSITY

Heights for Progress

MMU RESEARCH
Dissemination Conference

3RD MMU RESEARCH DISSEMINATION CONFERENCE 2026

THEME: Harnessing Research and Innovation to Strengthen Inclusive Growth and Sustainable Development

BOOK OF ABSTRACTS

25TH – 26TH JUNE 2026

MOUNTAINS OF THE MOON UNIVERSITY, UGANDA; LAKE SAAKA CAMPUS

Heights for Progress

THEME

Harnessing Research and Innovation to Strengthen Inclusive Growth and Sustainable Development

SUBTHEMES

1. **Research and Innovation for Sustainable Agri-food Systems**
   Advancing sustainable agriculture, food security, agribusiness, livestock production, and climate-smart farming innovations.

2. **Environmental Sustainability, Climate Action and Green Innovation**
   Promoting environmental stewardship, natural resource management, climate resilience, biodiversity conservation, and green technologies.

3. **Digital Transformation, Emerging Technologies and the Innovation Ecosystem**
   Exploring digital solutions, artificial intelligence, data science, ICT innovations, and technology-driven development.

4. **Entrepreneurship, Industrialization and Commercialization**
   Fostering enterprise development, industrial growth, commercialization of innovations, and sustainable economic transformation.

5. **Human Capital, Governance and Social Inclusion**
   Strengthening governance systems, social inclusion, leadership, labour markets, public policy, and community development.

6. **Innovations for Health, Well-being and Social Protection**
   Advancing healthcare technologies, public health, mental health, disease prevention, well-being, and inclusive social protection systems for all.

7. **Education Innovations and Inclusiveness through Research-Driven Policy and Practice**
   Transforming education through innovative pedagogies, competency-based approaches, inclusive education, and evidence-based policy.

Foreword from the Vice Chancellor

Prof. Pius C. Achanga, Ph.D. (Cranfield)

It gives me great pleasure to welcome our dear delegates, to the 3rd Research Dissemination Conference of Mountains of the Moon University (MMU), held under the theme: ***"Harnessing Research and Innovation to Strengthen Inclusive Growth and Sustainable Development"***.

The Research Dissemination Conference, is a key milestone in MMU's undertaking, as it demonstrates the University's commitment to advancing knowledge, fostering innovation, and promoting evidence-based solutions to the challenges facing our communities and the global society.

As a university rooted in the philosophy of community transformation through education, research, and innovation, MMU recognizes that sustainable development can only be achieved, when research findings are translated into practical actions, policies, technologies, and innovations, that improve lives and livelihoods.

This Conference therefore, provides an important platform for researchers, policymakers, the industry, development partners, and students to share ideas, disseminate findings, showcase innovations, and establish collaborative partnerships. Through such engagements, linkages are strengthened, which is a precursor for academia, industry, government, and communities, ensuring that research remains relevant, impactful, and responsive to societal needs.

The abstracts presented in this booklet, demonstrate the diversity and richness of research and innovation activities taking place within Uganda and beyond. As you will recognize, the contributions span a wide range of thematic areas, including sustainable agri-food systems, environmental sustainability and climate action, tourism and cultural development, digital transformation and emerging technologies, entrepreneurship and commercialization, governance and social inclusion, healthcare innovation, and education transformation. Collectively, these contributions offer valuable insights and practical solutions for promoting inclusive growth and sustainable development.

I commend all the authors whose work appears in this Book of Abstracts, for their dedication to generating knowledge that contributes to societal transformation. I also extend my appreciation to the Conference Organizing Committee, the Editorial Board, reviewers, session chairs, partners, and sponsors, whose commitment made this Conference possible.

As we engage in the presentations, discussions, and networking opportunities offered by this Conference, I encourage all participants to embrace interdisciplinary collaboration, knowledge exchange, and innovation. Let us continue to build partnerships that advance research excellence, and create lasting impact within our communities and beyond.

On my own behalf, and that of Mountains of the Moon University, I take the honour to wish you productive deliberations during the Conference.

Prof. Pius Coxwell Achanga, PhD (Cranfield)

VICE CHANCELLOR

Welcome Message from the Conference Chairperson

Prof. Dr. John M. Kasenene

It is my pleasure to welcome you to the 3rd Research Dissemination Conference of Mountains of the Moon University (MMU). This conference brings together researchers, innovators, practitioners, students, policymakers, development partners, and members of the wider community to share knowledge, exchange ideas, and explore innovative solutions to contemporary societal challenges.

Held under the theme, "Harnessing Research and Innovation to Strengthen Inclusive Growth and Sustainable Development," the conference provides an important platform for showcasing research and innovations that contribute to national development and the achievement of sustainable development goals.

The abstracts presented in this volume reflect the diversity, relevance, and growing impact of research being undertaken across different disciplines and sectors.

On behalf of the Conference Organizing Committee, I warmly welcome all participants and express my sincere appreciation to the authors who submitted abstracts and shared their research findings and innovations. The quality and breadth of contributions presented in this Book of Abstracts demonstrate the growing commitment of our academic and research communities to generating knowledge that informs policy, improves practice, and addresses societal needs.

I extend our profound gratitude to the Government of Uganda for its continued support towards research, innovation, and higher education. We are equally grateful to the Common Knowledge Project for partnering with Mountains of the Moon University and supporting the successful organization of this conference. Their financial and technical contributions have strengthened opportunities for research dissemination, collaboration, and knowledge exchange.

I also wish to thank the reviewers and members of the Scientific Committee for their dedication in ensuring the quality and integrity of the conference programme. Special appreciation goes to the University Council, Senate, and Management of Mountains of the Moon University for their unwavering support of research, innovation, and community engagement.

Finally, I warmly welcome our keynote speakers, session chairs, collaborators, sponsors, partners, and all conference participants. Your presence and active engagement are central to the success of this conference and to advancing the role of research and innovation in promoting inclusive growth and sustainable development.

I wish you productive discussions, meaningful networking opportunities, and a rewarding conference experience.

Prof. Dr. John M. Kasenene
Chairperson, Central Organizing Committee and DVC Academic Affairs
3rd MMU Research Dissemination Conference 2026
Mountains of the Moon University

Remarks from the Chief, Directorate of Graduate Studies, Research and Innovation

Prof. Dr. Bagamba Fredrick

This publication represents the intellectual contributions of researchers, innovators, practitioners, and graduate scholars who are actively engaged in generating knowledge and developing solutions to contemporary societal challenges.

Dissemination of research and innovation outputs is a critical component of the research and innovation cycle.

The outputs are fully realized when they are shared, subjected to scholarly scrutiny, translated into policy and practice, and utilized to improve the well-being of communities.

Research and innovation dissemination conferences therefore provide an important platform for knowledge exchange, collaboration, networking, and the generation of new ideas that stimulate further inquiry and innovation.

The 2026 conference attracts a diverse range of submissions from universities, research institutions, government agencies, development organizations, and independent researchers. Following a rigorous peer-review process, a total of 90 abstracts were accepted for presentation. These contributions span seven thematic areas, namely: sustainable agri-food systems; environmental sustainability and climate action; digital transformation and emerging technologies; entrepreneurship and commercialization; human capital, governance and social inclusion; healthcare innovations; and education innovations and inclusiveness through research-driven policy and practice. Collectively, they reflect the growing role of research and innovation in addressing development priorities at local, national, and global levels.

I am particularly encouraged by the increasing participation of early-career researchers and graduate students, whose contributions demonstrate the emergence of a vibrant research culture within our institutions. This conference provides them with an invaluable opportunity to engage with experienced scholars, receive constructive feedback, and build collaborative networks that can enhance the quality and impact of their future research.

I extend my sincere appreciation to the Government of Uganda for its continued support towards research and innovation in public universities, and to the Common Knowledge Project for partnering with Mountains of the Moon University in promoting research dissemination and knowledge exchange. I also thank the Scientific Committee, reviewers, session chairs, keynote speakers, authors, and organizing team whose dedication has contributed to the success of this conference.

It is my hope that the discussions and collaborations emerging from this conference will stimulate new research partnerships, inspire innovation, and strengthen the contribution of research and innovation to inclusive growth and sustainable development.

I wish all participants fruitful engagements and a rewarding conference experience.

Prof. Dr. Bagamba Fredrick
Chief, Directorate of Graduate Studies, Research and Innovation

Message from the Chairperson Scientific Committee

Dr. John Sekajugo (Ph.D)

It is with great pleasure and a profound sense of responsibility that I present this Book of Abstracts for the 3rd Mountains of the Moon University (MMU) Research Dissemination Conference 2026. This volume represents the culmination of rigorous scientific inquiry, collaborative effort, and intellectual dedication from scholars and practitioners across the different disciplines that constituted this conference.

The 90 abstracts compiled herein reflect the diversity and depth of research being presented at this year's conference. Each submission has undergone a thorough peer-review process by our esteemed Scientific Committee, supported by 45 invited reviewers from within and outside MMU.

The review process ensured that only contributions of the highest academic quality and originality were accepted. Our committee worked diligently to evaluate, select, and shape a programme that we believe advances the frontiers of knowledge in our University.

The themes explored in this edition include Research and Innovation for Sustainable Agri-food Systems, Environmental Sustainability, Climate Action and Green Innovation, Digital Transformation, Emerging Technologies, and the Innovation Ecosystem, Entrepreneurship, Industrialization and Commercialization, Human Capital, Governance and Social Inclusion, Healthcare Innovations to Strengthen Well-being and Social Protection, and Education Innovations and Inclusive Development, among others. These contributions not only highlight current trends and emerging challenges but also offer innovative solutions and critical insights that will undoubtedly inspire further research and meaningful dialogue.

I extend sincere gratitude to my colleagues on the Scientific Committee, Dr. Edith Namutebi, Dr. Issa Ndungo, Dr. Abudul Mahajubu, Dr. Kyalisiima Prisca, Dr. Wacal Cosmas, and Mr. Enos Mirembe Masereka, whose dedication and expertise were instrumental in maintaining the academic rigour of this event. I appreciate all the authors and presenters for sharing their valuable work and enriching our scientific community, as well as the entire organising committee and support staff, for their seamless coordination and tireless effort. Specifically, I thank the management of MMU and the Common Knowledge Project for financing the conference.

To the readers, whether you are attending in person or following from afar, I invite you to engage actively, question thoughtfully, and connect liberally. It is through such exchanges that science progresses, and societies get transformed.

I look forward to the stimulating discussions, fruitful collaborations, and lasting friendships that this conference will undoubtedly foster.

Dr. John Sekajugo (PhD)
Chairperson of the Scientific Committee
3rd MMU Research Dissemination Conference 2026

Editorial Notes

Dr. Issa Ndungo (Ph.D)

Dear Readers, Authors, and Conference Participants,

This Book of Abstracts presents a diverse collection of scholarly and innovative contributions showcased at the 3rd MMU Research Dissemination Conference 2026, held under the theme "Harnessing Research and Innovation to Strengthen Inclusive Growth and Sustainable Development." The volume reflects the growing commitment of researchers, innovators, practitioners, students, policymakers, and development partners to generating knowledge and solutions that address contemporary societal challenges and contribute to sustainable development.

The abstracts published in this volume cover a broad range of disciplines and thematic areas, illustrating the multidisciplinary nature of research and innovation at Mountains of the Moon University and beyond. They demonstrate the important role that evidence-based inquiry plays in informing policy, improving practice, advancing technology, strengthening communities, and promoting socio-economic transformation. To facilitate scholarly engagement and ease of reference, the abstracts have been organized according to the conference subthemes.

Maintaining the quality and integrity of the conference proceedings was a key priority throughout the editorial process. All submitted abstracts underwent a single-blind peer-review process coordinated by the Scientific Committee. Each submission was evaluated against established criteria, including relevance to the conference theme, originality, methodological soundness, clarity of presentation, significance of findings, and potential contribution to knowledge, policy, and practice. Authors were provided with constructive feedback and, where necessary, given an opportunity to revise their submissions prior to final acceptance.

On behalf of the Editorial Team, I extend sincere appreciation to all authors for entrusting us with their work and for contributing to the success of this conference. I am equally grateful to the reviewers and members of the Scientific Committee for their professionalism, diligence, and commitment to upholding academic standards. Special appreciation goes to the Conference Organizing Committee, the Directorate of Graduate Studies, Research and Innovation, and the University Management for their invaluable support throughout the conference preparation process.

It is our hope that this publication will serve as a valuable resource for learning, collaboration, policy engagement, and future research. We encourage readers to engage critically with the ideas presented, explore opportunities for interdisciplinary collaboration, and support the translation of research findings into meaningful societal impact.

I wish you a productive and rewarding conference.

Dr. Issa Ndungo
Editor, Conference Abstract Book
3rd Research Dissemination Conference, 2026

CONFERENCE PROGRAM

DAY ONE: Thursday, 25th June 2026

Plenary Session-Opening Ceremony		
Time	Activity	Responsibility/Chair
8:00 – 9:00	Registration of Participants	Nyakahuma Charles
9:00 – 9:15	National, East African, Kingdom and University Anthem	Gilbert Matsiko Akky/Cissy Nazziwa
9:15 – 9:20	Opening Prayer	Rev. Fr. Edward Muhumuza, Chaplain - Catholic Community
9:20 – 9:30	Welcome Remarks	Chairperson, Organizing Committee,
9:30 – 9:45	Remarks by the Vice Chancellor	Prof. Pius Coxwell Achanga, PhD (Cranfield)
9:45 – 10:10	Official Opening by the Chief Guest	Mr. Francis Ogwang, Uganda Country Manager, East African Development Bank
10:10 – 10:50	Main Keynote Address	Prof. Fred Kabi, College of Agricultural Sciences, Makerere University
10:50 – 11:00	Discussion and Questions	Dr. David Katende
11:00 – 11:30	Tea Break and Networking	Nyakahuma Charles
Parallel Keynote Sessions (11:30 – 13:00)		
Track	**Theme**	**Keynote Speaker/Chair**
Parallel Session 1	Research and Innovation for Sustainable Agri-food Systems	**Dr. Stanley Nkalubo**, Director, Rwebitaba ZARDI
Parallel Session 2	Environmental Sustainability, Climate Action and Green Innovation	**Prof. Dominic Byarugaba**, Director, Higher Degrees and Research (Western Campus), Kampala International University
Parallel Session 3	Digital Transformation, Emerging Technologies and the Innovation Ecosystem	**Dr. Simon Kawuma**, Deputy Director, Graduate School, Mbarara University of Science and Technology
Parallel Session 4	Entrepreneurship, Industrialization and Commercialization	**Prof. Tumwine Sulait**, Dean Graduate Studies and Research, Makerere University Business School
Parallel Session 5	Human Capital, Governance and Social Inclusion	**Assoc. Prof. Barigye Godfrey**, Kabale University
Parallel Session 6	Healthcare Innovations to Strengthen Well-being and Social Protection	**Prof. James K. Tumwine**, Dean, School of Medicine, Kabale University
Parallel Session 7	Education Innovations and Inclusiveness through Research-Driven Policy and Practice	**Prof. Ronald Bisaso**, College of Education and External Studies, Makerere University
Time	**Activity**	**Responsibility/Chair**
13:00 – 14:00	Lunch Break	Nyakahuma Charles
Parallel Sessions (Paper Presentations)		
Time	**Activity**	**Responsibility/Chair**
14:00-17:00		
	Parallel Sessions 1	Prof. Wesana Joshua
	Parallel Sessions 2	Prof. Moses Muhumuza
	Parallel Sessions 3	Dr. Edwin Akugizibwe
	Parallel Sessions 4	Dr. John Rwakihembo
	Parallel Sessions 5	Dr. Fred Mutabaruka
	Parallel Sessions 6	Dr. Emmanuel Kimera
	Parallel Sessions 7	Dr. Paul Muleke
17:00-17:30	**Evening Tea**	Nyakahuma Charles

DAY TWO: Friday, 26th June 2026

Parallel Sessions (Paper Presentations-Continue)

Time	Activity	Responsibility/Chair
8:00 – 9:00	Registration	Nyakahuma Charles
9:00 – 11:00	**Paper Presentations**	
	Parallel Sessions 1	Prof. Wesana Joshua
	Parallel Sessions 2	Prof. Moses Muhumuza
	Parallel Sessions 3	Dr. Edwin Akugizibwe
	Parallel Sessions 4	Dr. John Rwakihembo
	Parallel Sessions 5	Dr. Fred Mutabaruka
	Parallel Sessions 6	Dr. Emmanuel Kimera
	Parallel Sessions 7	Dr. Paul Muleke
11:00-11:30	**Break Tea**	Nyakahuma Charles
11:30-13:00	**Paper Presentations**	
	Parallel Sessions 1	Prof. Wesana Joshua
	Parallel Sessions 2	Prof. Moses Muhumuza
	Parallel Sessions 3	Dr. Edwin Akugizibwe
	Parallel Sessions 4	Dr. John Rwakihembo
	Parallel Sessions 5	Dr. Fred Mutabaruka
	Parallel Sessions 6	Dr. Emmanuel Kimera
	Parallel Sessions 7	Dr. Paul Muleke
13:00-14:00	**Lunch**	Nyakahuma Charles
Plenary Session(Panel Discussion)		
14:00-15:00	**Panelists** 1.Prof. Tumwine Sulait 2.Dr. Simon Kawuma 3.Dr. Stanley Nkalubo 4.Prof. Dominic Byarugaba 5.Assoc. Prof. Barigye Godfrey 6.Prof. Ronald Bisaso 7.Prof. James K. Tumwine	Dr. Katende David
15:00- 15:30	Awards	Prof. Pius Coxwell Achanga, PhD (Cranfield)
15:30-16:00	Closing	Eng. Dr. Ben M. Manyindo, Chairperson University Governing Council, MMU
16:00-16:30	Exhibition /Evening Tea	Gilbert Matsika/Charles

N.B. Refer to Order of presentation for detailed arrangement

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RESEARCH AND INNOVATION FOR SUSTAINABLE AGRI-FOOD SYSTEMS

External Factors Affecting Agro-Processing Firms in Africa: A Systematic Review and the Future Research Agenda

Paddyblick Ariiyo, Judith Bijurenda Asiimwe, Ssenyonjo Moses
Department of Management Sciences, Faculty of Economics and Business Studies,
Kabale University, Kabale, Uganda.

ABSTRACT

Background: African countries have set up deliberate policy frameworks to leverage their agricultural comparative advantage and transform the continent through agro-industrialization. Agro-processing firms are integral to Africa's industrialization and transformation agenda.
Problem: While existing literature contains numerous studies on the effects of external factors on agro-processing firms, evidence from the African context remains fragmented. As many African economies strive to attain middle-income status, considerable attention has been paid to private-sector development. Nonetheless, the continent continues to experience high rates of business failure, often attributed to external pressures.
Methodology: This study is a Systematic Literature Review (SLR) guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Literature was sourced from Google Scholar. The review included peer-reviewed articles published in English between 2020 and 2026 that examined external factors affecting agro-processing firms in Africa. Studies conducted outside Africa and non-peer-reviewed publications were excluded. The search yielded 63,400 records, which were progressively screened using language, period, relevance, and title criteria. Following eligibility assessment and removal of irrelevant studies, 20 articles were retained for thematic analysis.
Results: The review found that environmental, political, infrastructural, socio-cultural, and economic factors significantly influence the performance of agro-processing firms in Africa. Environmental factors, particularly climate variability and environmental uncertainties, emerged as the most consistently reported factors across the reviewed studies. The review further identified research gaps relating to resilience, sustainability, and technological adaptation, which informed the proposed future research agenda.
Conclusions: The influence of external factors on the agro-processing industry has important implications for policymakers, practitioners, and investors. The study concludes that external factors are crucial in influencing the growth and proliferation of the agro-processing industry in Africa.
***Keywords**: External factors, agro-processing, agro-industrialization, manufacturing, Africa*

Unlocking Anthracnose Resistance in Farmer-Preferred Common Bean Market Classes to Advance Bean Breeding in Uganda

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ABSTRACT

Background: Common bean (*Phaseolus vulgaris* L.) is Uganda's most important grain legume and a major source of dietary protein, income, and food security for millions of households. However, bean productivity remains constrained by several biotic and abiotic stresses, among which anthracnose, caused by *Colletotrichum lindemuthianum*, is one of the most devastating diseases, causing yield losses of up to 80% under favourable conditions. The deployment of resistant varieties remains the most effective, economical, and environmentally sustainable strategy for managing the disease.

Problem Statement: Despite the importance of the common bean in Uganda, information on anthracnose resistance among farmer-preferred market class genotypes is limited, hindering the identification and utilization of resistant germplasm for breeding durable varieties.
Methodology: A total of forty-four farmer-preferred common bean genotypes comprising differential cultivars, released varieties, and breeding lines were evaluated against three virulent races of *C. lindemuthianum* under screen-house conditions. The experiment was arranged in a split-plot design with four replications. Disease severity was assessed seven days after inoculation using a standardised 1-9 rating scale, and data were analysed using analysis of variance.
Results: Genotypes, races, and genotype x race interaction effects were significant ($p<0.001$). Differential cultivars: Kaboon (Co-1^2), Michelite (Co-11), TO (Co-5), and Widusa (Co-1^5, Co-3^3) exhibited broad-spectrum resistance to all three races. Among released varieties, NABE 9C and NAROBEAN 6 were consistently resistant, while breeding lines: ACC 31, KARP 63, G5686, ARD00068CIC, ARD00001CIC, ARD00070CIC, NUV 234-3-2, NUV 15-2, KARP 22, NUV 54, NUV 30, and ARD00036CIC also showed stable resistance across races.
Conclusion: The identified genotypes represent valuable sources of broad-spectrum resistance and can be used as parents in breeding programs aimed at developing high-yielding, farmer-preferred, and anthracnose-resistant bean varieties, thereby enhancing bean productivity, resilience, and food security in Uganda.
Keywords: *Anthracnose, Colletotrichum lindemuthianum, Common bean, Disease resistance, Bean breeding*

Effect of Maize and Oyster Mushroom Blending Ratio on Nutritional and Sensory Quality of Maize-Mushroom Composite

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ABSTRACT

Background: Oyster mushroom (*Pleurotus ostreatus*), though underutilized in complementary feeding, and is rich in micronutrients. Blending it with maize flour can improve the nutritional quality of cereal-based foods widely used in resource-constrained settings, though its composite effects remain largely unexplored.
Problem Statement: Despite ongoing efforts, iron and zinc deficiencies remain prevalent among infants in Northern Uganda due to reliance on maize-based complementary foods. Promoting home-based traditional diets using local sources like oyster mushrooms offers a nutrient-rich alternative. This study examined maize and mushroom composites.
Methodology: Quality maize and fresh oyster mushrooms were purchased from the local market in Gulu District, dried, sorted, cleaned, milled into flour, and blended at ratios of 1:0; 9:1; 8:2; 7:3; 6:4 w/w, respectively, to obtain maize-oyster mushroom composite flour. The composite flour was analyzed for proximate and mineral composition using AOAC 2005 methods, and 65 caregivers were employed for sensory evaluation.
Results: The result showed that protein (8.74-17.87%), fiber (0.76-3.58%), ash (1.14-3.13%), zinc (1.1-3.4%), iron (2.3-8.2%), calcium (28-55%), and magnesium (19-53%) increased significantly ($p<0.05$) with higher oyster mushroom ratios, while moisture (4.67-3.13%), fat (1.45-1.29%), carbohydrate (83.25-70.77%), and sensory scores declined. Acceptability at 10% inclusion matched maize-only flour ($p>0.05$).
Conclusion: Blending maize flour with oyster mushroom significantly improves protein, fiber, and key micronutrients while maintaining sensory acceptability at 10% inclusion. This innovation supports complementary feeding, informs nutrition policy, and strengthens household food security, offering a sustainable solution to micronutrient deficiencies in infants 6-24 months.
Keywords: *children, maize-mushroom composite, micronutrient deficiency, nutritional quality, and sensory quality.*

Consumer Acceptability of Onion Powder: Reducing Postharvest Losses of Horticultural Crops for Increased Farm Income

Geoffrey Candia Levuason[1], Lonah Nampwera[1], Patience Ntegeka[1], Francis Magu[1], David Agole[1], Gerald Tuwmine[1], Ronald Kabbiri[2]

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ABSTRACT

Background: Onion (*Allium cepa* L.) is one of the most widely consumed vegetable crops globally due to its culinary and nutritional value. However, its highly perishable nature contributes to substantial postharvest losses, particularly in developing countries. Value addition through processing into shelf-stable products, such as onion powder, presents an opportunity to reduce losses, improve marketability, and enhance farm income.
Objective: This study assessed the nutritional characteristics and consumer acceptability of onion powder as a potential value-added product for reducing postharvest losses and promoting sustainable utilization of onions.
Methods: A mixed-methods approach was employed at the Faculty of Agriculture and Environmental Sciences, Mountains of the Moon University. Fresh bulbs of the Red Creole onion variety were processed into powder through oven drying and milling. Nutritional analyses of fresh and powdered onion samples were conducted using standard Association of Official Analytical Chemists (AOAC) procedures. Consumer acceptability was assessed using a sensory evaluation involving 100 randomly selected university students who rated aroma, color, taste, and overall acceptability using a nine-point hedonic scale.
Results: Fresh onions contained significantly higher vitamin C levels (9.50 ± 0.35 mg/100 g) than powdered onions (4.30 ± 0.75 mg/100 g; $p = 0.028$). Although crude protein content was higher in fresh onions (5.18 ± 0.03%) than in onion powder (2.16 ± 0.70%), the difference was not statistically significant ($p = 0.840$). Onion powder received higher ratings for aroma (6.7 ± 2.0) and demonstrated significant color differences ($p = 0.001$), aroma ($p = 0.039$), taste ($p = 0.002$), and overall acceptability ($p < 0.001$). Despite limited prior exposure to onion powder, participants expressed willingness to purchase and recommend the product, primarily due to its convenience and strong flavor.
Conclusion: Onion powder shows considerable potential as a value-added product for reducing postharvest losses and improving market opportunities for onion producers. Increased consumer awareness, product familiarization, and improvements in processing technologies could further enhance consumer acceptance and commercial viability.
Keywords: *Onion powder, value addition, postharvest losses, consumer acceptability, farm income.*

Production of Green Biorefinery Protein Concentrate Derived from Perennial Napier Grass as an Alternative Feed for Pigs

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ABSTRACT

Background: Livestock production systems worldwide remain heavily dependent on soybean meal and maize-based protein sources, raising concerns regarding environmental sustainability, deforestation, greenhouse gas emissions, and competition with human food systems. Green biorefinery technologies offer an innovative approach to valorizing perennial forage crops into protein-rich feed ingredients for monogastric animals.
Objective: This study evaluated the potential of protein concentrate derived from Napier grass (*Pennisetum purpureum*) as a sustainable alternative protein source in pig diets.
Methods: Fresh Napier grass was processed using a green biorefinery technique to extract soluble protein fractions and produce leaf protein concentrate. The concentrate was incorporated into pig diets at inclusion levels of 0%, 20%, 35%, and 50%. Thirty-six weaner piglets were assigned to the dietary treatments and monitored for growth performance, feed intake, feed conversion ratio, and health indicators throughout the feeding trial. Nutritional composition of the protein concentrate was determined through laboratory analysis.
Results: The leaf protein concentrate contained 34.4% crude protein, indicating substantial nutritional value. Pigs receiving Napier grass protein concentrate exhibited improved growth performance compared to

the control group. Average daily weight gain increased from 0.682 kg/day in the control treatment to 0.742 kg/day in supplemented diets. No adverse effects were observed on dung consistency, feed intake, or animal health, indicating good dietary acceptability and safety. The results demonstrate that Napier grass-derived protein can partially substitute conventional protein sources without compromising animal performance.
Conclusion: Napier grass protein concentrate represents a promising alternative feed ingredient for pig production. Adoption of green biorefinery technologies could reduce dependence on imported protein feeds, promote circular bioeconomy approaches, and enhance the sustainability of livestock production systems in sub-Saharan Africa.
Keywords: *Green biorefinery, Napier grass, leaf protein concentrate, pig nutrition, sustainable livestock production, circular bioeconomy.*

Determinants of smallholder farmers' intention to adopt edible insect farming in northern Uganda

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7. More University of Applied Sciences, Belgium.

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ABSTRACT

Background: Edible insect farming is increasingly recognized as a sustainable strategy for improving food security, dietary diversity, and household nutrition while providing an alternative source of animal protein. In addition, insect farming offers opportunities for income generation and climate-resilient food production.
Problem Statement: Despite the nutritional, environmental, and economic benefits associated with edible insects, the adoption of insect farming remains limited among smallholder farmers in Uganda. Existing studies have largely focused on the nutritional value and production potential of edible insects, with limited empirical evidence on the socio-psychological factors influencing farmers' intentions to adopt edible insect farming technologies. This knowledge gap constrains the design of effective interventions aimed at promoting edible insect production and consumption.
Methods: A cross-sectional household survey was conducted among 600 randomly selected respondents from four districts in Northern Uganda. Data were analyzed using descriptive statistics and Structural Equation Modelling (SEM) based on the Theory of Planned Behaviour framework. Multi-group analysis was performed to examine the moderating effects of selected socio-demographic characteristics.
Results: Adoption intentions were significantly influenced by subjective norms, suggesting that social influence plays a critical role in shaping farmers' decisions to engage in edible insect farming ($\beta = -0.216$, $p < 0.001$). In contrast, attitudes toward edible insect farming ($\beta = 0.001$, $p = 0.996$) and perceived behavioural control ($\beta = 0.007$, $p = 0.880$) did not significantly influence adoption intentions. Gender-based analysis showed a stronger influence of subjective norms among female respondents ($\beta = -0.311$, $p < 0.001$), while no significant moderating effects were observed across age groups or among respondents with non-formal and post-primary education.
Conclusion: Social influence is a key determinant of farmers' intentions to adopt edible insect farming in Northern Uganda. Promotion strategies should therefore leverage community networks, farmer groups, and awareness campaigns to enhance acceptance and uptake of edible insects as a sustainable alternative protein source.
Keywords: *Edible insects, adoption intentions, Ruspolia differens, Acheta domesticus, food security, Structural Equation Modelling, Uganda.*

Towards breed-responsive and season-specific precision feeding for dairy cattle in Uganda: A state-of-the-art review and research agenda

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ABSTRACT

Background: Dairy cattle production in Uganda is constrained by seasonal feed scarcity, variable pasture quality, poorly balanced supplementation, uncertain breed composition, and limited precision feeding technology. Although precision feeding technologies with sensor-supported decision-making and machine-learning prediction are advancing globally, locally generated evidence is needed for low-input Ugandan systems to adapt them.
Problem Statement: Ugandan and East African studies demonstrate the importance of ration guidance, balanced supplementation, seasonal feed gaps, forage quality, and crossbred-cattle genetics, but evidence remains fragmented because feed-resource assessment, supplementation, genetics, economics, and predictive modelling are rarely integrated within one dairy feeding framework, limiting practical technologies for the South-Western Cattle Corridor.

Methodology: A structured narrative state-of-the-art review was conducted in June 2026 using major scientific databases, CGSpace/ILRI, FAO/AGRIS, and Ugandan policy repositories. Literature mainly from 2015-2026 was prioritised, with selected foundational and Uganda-specific older sources retained. Search terms covered precision livestock farming, dairy nutrition, forage quality, supplementation, smallholder economics, SNP-based breed verification, machine learning, and decision-support systems. Evidence was screened and grouped thematically.
Results: The search generated 126 candidate records; 72 were screened closely, 56 detailed-source records were assessed, and 48 core records were retained, including 41 from 2015-2026. Seven domains emerged: precision feeding, machine-learning prediction, East African feed-resource constraints, balanced feeding and supplementation, genomics and breed verification, supplementation economics, and Uganda-specific decision support. Evidence from Tanzania, Rwanda, Ethiopia, Kenya, and Uganda showed seasonal fodder scarcity, variable forage quality, balanced feeding needs, crossbred genetics, and benefits of ration guidance and nutrient-balanced supplementation.
Conclusion: The review identifies a research opportunity that integrates seasonal pasture nutrients, DNA-verified breed composition, supplementation response, milk yield and quality, feed efficiency, profitability, and predictive decision support; offering fundamental data for locally developed precision feeding technologies. This would potentially boost stable productivity, sustainable dairy growth, profitability, genetic resource management, livelihoods, and food security
Keywords: *Precision feeding; Dairy cattle nutrition; Pasture nutrient characterization; Breed verification; South-Western Cattle Corridor.*

Supplementation of maize bran with either sunflower or oil palm seed cakes improves growth and nutritional value of the edible house cricket (Acheta domesticus)

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ABSTRACT

Background: The house cricket (*Acheta domesticus*) is among the most widely domesticated edible insects and has gained global attention as a sustainable source of protein for human consumption and animal feed. However, the high cost of conventional feeds remains a major constraint to the profitability and scalability of commercial cricket production, particularly in developing countries.

Problem Statement: Despite growing interest in insect farming as an alternative protein production system, limited information exists on the use of locally available agro-industrial by-products as cost-effective feed resources for mass rearing of *A. domesticus*. Identifying alternative diets that support optimal growth while enhancing nutritional quality is critical for sustainable cricket production.

Methods: This study evaluated the effects of five dietary treatments on the growth performance and nutritional composition of *A. domesticus*. The treatments included commercial chicken mash (CCM) as the control, maize bran supplemented with 50% sunflower seed cake (SFC50), 50% shea seed cake (SBC50), 50% oil palm seed cake (POC50), and a mixed formulation comprising 25% maize bran and 25% each of the three oilseed cakes (MSSP25). The experiment was conducted using a randomized block design comprising 50 blocks. Survival rate, development time, adult body weight, and nutritional composition were assessed across treatments.

Results: Crickets reared on maize bran supplemented with sunflower seed cake (SFC50) and oil palm seed cake (POC50) exhibited survival rates comparable to those fed on commercial chicken mash. However, individuals reared on SFC50 and POC50 attained significantly higher adult body weights and demonstrated improved growth performance. The shortest development period was recorded among crickets fed SFC50. Nutritional analysis revealed that crickets reared on the control diet contained higher crude protein levels, whereas those fed SFC50 and POC50 had elevated concentrations of lipids, essential minerals (sodium, calcium, and iron), and polyunsaturated fatty acids (PUFAs).

Conclusion: Supplementation of maize bran with either sunflower seed cake or oil palm seed cake significantly improves growth performance and enhances the nutritional quality of *A. domesticus*. These agro-industrial by-products offer viable and potentially cost-effective alternatives to commercial feeds for sustainable mass production of edible crickets.

Keywords: *Acheta domesticus, edible insects, sunflower seed cake, oil palm seed cake, alternative feeds, nutritional quality, sustainable protein production.*

Growth performance of African catfish fingerlings after feeding them with Fermented ripe banana, jackfruit seeds, and sweet potato tuber diets

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ABSTRACT

Background: African catfish (Clarias gariepinus), belonging to the family Clariidae and order Siluriformes, is one of the most widely cultured fish species in Uganda due to its rapid growth, adaptability, and high market demand.

Problem Statement:

The high cost of commercial fish feeds remains one of the major challenges affecting catfish farming in Uganda. This increases production costs and reduces profitability for farmers. Consequently, there is a need to explore locally available and affordable feed resources such as ripe bananas, jackfruit seeds, and sweet potato tubers as alternative feed ingredients.

Materials and Methods: Ripe bananas, jackfruit seeds, and sweet potato tubers were fermented for 10 days and dried to below 15% moisture content to facilitate processing into flour. The resulting flours were fed to one-month-old African catfish fingerlings for a period of one month in tanks arranged in a Completely Randomized Design (CRD). The experiment was conducted at the Aquaculture Laboratory of Mountains of the Moon University. A sample of 20 fish was randomly selected using a scoop net and measured weekly for body weight and length to determine specific growth rate (SGR), feed conversion ratio (FCR), weight gain, and mortality rate. Data were analyzed using STATA version 12. One-way ANOVA and the Kruskal–Wallis test were used to determine significant differences among treatments at a 5% level of significance.

Results: The highest specific growth rate (SGR) was recorded in fish fed the control diet (4.01%), followed by fish fed fermented ripe banana (1.68%), fermented jackfruit seed (0.17%), and fermented sweet potato tuber diets, which exhibited a negative SGR (-0.8%). Significant differences in SGR were observed among the treatments (Kruskal–Wallis test, $p < 0.05$). Fish fed the fermented ripe banana diet exhibited the highest survival rate (16%), followed by fish fed fermented jackfruit seeds (5.2%), the control diet (4.8%), and fermented sweet potato tubers (0%). Significant differences in survival rates were observed among treatments ($p < 0.05$). The highest total ammonia nitrogen concentration was recorded in tanks receiving the control diet (2.69 mg/L), followed by fermented jackfruit seed (1.25 mg/L), fermented ripe banana (0.23 mg/L), and fermented sweet potato tuber diets (0.13 mg/L). Significant differences in total ammonia nitrogen were observed among treatments ($p < 0.05$).

Conclusion: The findings suggest that fermented ripe banana has potential as an alternative feed ingredient for African catfish culture. Fish fed the fermented ripe banana diet exhibited relatively favorable growth performance, the highest survival rate, and lower total ammonia nitrogen concentrations compared to most other treatments. These results indicate that fermented ripe bananas may contribute to more sustainable and cost-effective aquaculture production.

***Keywords**: African catfish, fish feeds, fermented plant-based diets, fish nutrition, sustainable aquaculture, water quality.*

Supplementation of maize bran with either sunflower or oil palm seed cakes improves growth and nutritional value of the edible house cricket (Acheta domesticus)

Francis Sengendo[1,2], James Peter Egonyu[3], Anu Valtonen[4], Isabelle Noyens[2], Harriet Angwech[1], Martha Franny Alaroker[1,2], Philip Nyeko[5], Geoffrey Maxwell Malinga[1], Sabine Van Miert[2]

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ABSTRACT

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Problem Statement: Despite growing interest in insect farming as an alternative protein production system, limited information exists on the use of locally available agro-industrial by-products as cost-effective feed resources for mass rearing of *A. domesticus*. Identifying alternative diets that support optimal growth while enhancing nutritional quality is critical for sustainable cricket production.

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Conclusion: Supplementation of maize bran with either sunflower seed cake or oil palm seed cake significantly improves growth performance and enhances the nutritional quality of *A. domesticus*. These agro-industrial by-products offer viable and potentially cost-effective alternatives to commercial feeds for sustainable mass production of edible crickets.
Keywords: *Acheta domesticus, edible insects, sunflower seed cake, oil palm seed cake, alternative feeds, nutritional quality, sustainable protein production.*

The diversity and distribution of cuscuta l (convolvulaceae) in Mubuku Irrigation Scheme, Kasese Municipality, Western Uganda

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ABSTRACT

Background: *Cuscuta* species are obligate stem holoparasitic plants that cause significant economic losses in agricultural systems worldwide by reducing crop productivity and affecting plant health. Early detection and characterization of infestations are essential for developing effective management strategies.
Problem Statement: Farmers within the Mubuku Irrigation Scheme in western Uganda reported the rapid emergence and spread of a yellow, thread-like parasitic plant suspected to be *Cuscuta*. However, information regarding the species involved, its distribution, and host range within the irrigation scheme was lacking, limiting efforts to manage its spread and potential impacts on agricultural production.
Methods: A cross-sectional descriptive survey was conducted using systematic transect sampling across Mubuku Irrigation Scheme I and II. Geographic coordinates of all *Cuscuta* infestations were recorded using a handheld GPS receiver. Plant specimens of both the parasite and host species were collected, pressed, and identified morphologically using standard taxonomic keys. Spatial distribution was mapped using QGIS, while descriptive analyses were performed using Microsoft Excel. Six voucher specimens were accessioned at the Makerere University Herbarium (MHU51614–MHU51619).
Results: The survey identified a single parasitic species, *Cuscuta cassytoides*. All infestations were restricted to Mubuku Irrigation Scheme I, with no occurrence recorded in Scheme II. The parasite exhibited a clustered distribution pattern, with the highest infestation intensity occurring along primary water channels and *Euphorbia tirucalli* hedges. A total of 58 host species belonging to 20 plant families were documented. *Euphorbia tirucalli* was the most frequently parasitized host species. Only four food crops, *Amaranthus caudatus*, *Amaranthus hybridus*, *Musa × paradisiaca*, and *Psidium guajava*, were identified among the host plants, while most hosts were non-crop weeds and hedge species.
Conclusion: *Cuscuta cassytoides* is established within Mubuku Irrigation Scheme I and demonstrates a broad host range. Its distribution appears to be associated with settlement patterns, hedge vegetation, and irrigation water channels. Targeted monitoring and management of infestation hotspots are necessary to prevent further spread and safeguard agricultural productivity.
Keywords**:** *Cuscuta cassytoides*, *parasitic plants, host diversity, irrigation schemes, infestation mapping, Uganda.*

Development and Pilot Evaluation of the Farm Care Group Agritech Model for Improving Smallholder Farmer Productivity and Market Access in Kyenjojo District, Uganda

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ABSTRACT

Background: Agriculture remains the backbone of Uganda's economy, employing more than 70% of the population. However, smallholder farmers continue to face multiple constraints, including limited access to quality agricultural inputs, unreliable rainfall, inadequate extension services, and weak market linkages. These challenges reduce productivity, increase production costs, and constrain household incomes, particularly among women and youth farmers.

Problem Statement: Despite the availability of various agricultural support initiatives, most interventions address production, advisory services, irrigation, or market access separately. The absence of integrated service delivery models limits the effectiveness of efforts aimed at improving smallholder agricultural productivity and commercialization. This study developed and pilot-tested the Farm Care Group Agritech Model to address these interconnected challenges through a bundled service approach.
Methods: The Farm Care Group model was implemented across three sub-counties in Kyenjojo District and comprised five integrated components: community-based input supply, irrigation infrastructure, digital advisory services, institutional market linkages, and demonstration farming. A mixed-methods design involving household surveys, platform analytics, and focus group discussions was employed among 120 participating households to assess implementation outcomes and user experiences.
Results: The pilot demonstrated operational feasibility and strong farmer uptake. Average input procurement distance declined from 51 km to less than 3 km, while seed acquisition costs decreased by 18%. Eighty-five households gained access to irrigation facilities, and 94 of the 120 participating households activated the digital advisory platform, with 78% utilizing market price alerts. Twelve institutional buyers established supply agreements, enabling 67 households to access formal markets. Agronomic knowledge scores improved among 110 participating farmers, while women-headed households accounted for 38% of programme beneficiaries.
Conclusion: The Farm Care Group model demonstrates the potential of integrated Agritech approaches to improve farmers' access to inputs, irrigation, extension information, and markets. Scaling such models could contribute to enhanced agricultural productivity, commercialization, and inclusive rural development among smallholder farming communities.
Keywords: *Agritech, smallholder farmers, digital agriculture, market access, irrigation.*

Location-Specific Performance of Tropical Maize Hybrids for Grain Yield and Resistance to Striga hermonthica

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ABSTRACT

Background: Maize (*Zea mays* L.) is a major staple crop in sub-Saharan Africa, but its productivity in Uganda remains low due to several constraints, including infestation by *Striga hermonthica*, a parasitic weed causing severe yield losses.
Problem statement: Despite advances in breeding for Striga resistance, limited information exists on the stability and location-specific performance of resistant maize hybrids across diverse Striga endemic environments in Uganda.
Methodology: Forty-five single-cross maize hybrids developed from a 10 x 10 half-diallel mating design were evaluated in naturally Striga-infested fields in Namutumba, Tororo, and Kasese for over three seasons. Trials were established using a 9 x 5 alpha lattice design with three replications. Grain yield and Striga-related traits were assessed, and the Area under the Striga Number Progress Curve (AUSNPC) was computed. Data were analyzed using combined ANOVA, Additive Main Effects and Multiplicative Interaction (AMMI), and Genotype plus Genotype × Environment (GGE) biplot analyses.
Results: Significant ($P<0.05$) genotype, environment, and genotype x environment interaction effects were observed for grain yield and AUSNPC. Hybrids TZISTR1199 x TZISTR1181, TZISTR1192 x TZISTR1174, and TZISTR1162 x TZISTR1198 exhibited stable resistance, while TZISTR1199 x TZISTR1174, TZISTR1199 x CML442, and TZISTR1198 x CML312 showed superior grain yield performance. Kasese was the most discriminative testing environment, whereas Tororo and Namutumba were more representative of target production environments.
Conclusion: Several hybrids combined stable *Striga* resistance and high grain yield across environments, demonstrating strong potential for maize improvement. These findings support the development of resilient varieties that enhance food security, farmer livelihoods, and sustainable agricultural production in Uganda and sub-Saharan Africa.
Keywords: *Striga hermonthica, maize hybrids, genotype x environment interaction, grain yield, yield stability.*

Effects of Coffee-Husk-based Soil Amendments on the Growth and Yield of Collards (Brassica oleracea var. acephala) on Andosols in Rwenzori Region, Uganda

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ABSTRACT

Background: Vegetable production is an important nutrition-sensitive agricultural intervention that contributes to food and nutrition security in Uganda. However, declining soil fertility remains a major constraint to sustainable vegetable production. Coffee husks, a by-product of coffee processing, have potential as an organic soil amendment capable of improving soil fertility and crop productivity in nutrient-deficient soils.
Problem Statement: Despite the abundance of coffee husk residues in Uganda, limited information exists on their effectiveness, either alone or in combination with poultry manure and biochar, in improving the growth and yield of collards on Andosols in the Rwenzori region.
Methods: A field experiment was conducted using a Randomized Complete Block Design (RCBD) with five treatments: raw coffee husks (CH), coffee husk biochar (CHB), coffee husk–poultry manure mixture (CHPM), coffee husk–poultry manure biochar (CHPMB), and a control (CTR) without coffee-husk-based amendments. Growth parameters, including plant height, number of leaves, leaf length, and leaf width, were measured weekly. Yield parameters assessed at harvest included above-ground biomass, below-ground biomass, stem girth, number of nodes, leaf weight, and stem weight. Growth data were analyzed using two-way repeated-measures ANOVA, while yield data were analyzed using one-way ANOVA in R software.
Results: Significant treatment effects ($p < 0.05$) were observed for leaf length, number of leaves, below-ground biomass, stem girth, and number of nodes. Leaf length ranged from 23.7 to 29.1 cm, the number of leaves from 12 to 20, below-ground biomass from 0.170 to 0.455 t ha^{-1}, stem girth from 3.8 to 8.4 cm, and number of nodes from 16 to 34. The CHPM and CHPMB treatments produced the best overall performance, with CHPM consistently recording the highest growth and yield indicators.
Conclusion: Coffee husk–poultry manure amendments significantly improved the growth and yield of collards on Andosols. Direct application of coffee husks combined with poultry manure appears to be a more effective and practical soil fertility management strategy than conversion into biochar, offering a sustainable approach for enhancing vegetable production in the Rwenzori region.
Keywords: *Coffee husks, poultry manure, biochar, collards, soil fertility, Andosols, Uganda.*

Biomass Yield and Nutritive Value of Mulberry (Morus alba) and Guatemala Grass (Tripsacum andersonii) at Different Maturity Stages: Implications for Formulation of a Low-Cost Rabbit Feed

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ABSTRACT

Background: The rising economic and ecological costs associated with cereal – and legume-based livestock feeds continue to constrain intensive rabbit production in East Africa. Consequently, there is growing interest

in the use of locally available, high-biomass forage resources such as Mulberry (*Morus alba*) leaves and Guatemala grass (*Tripsacum andersonii*) as sustainable alternatives for livestock feeding.
Problem statement: Despite the potential of Mulberry and Guatemala grass as alternative feed resources, limited information is available on the optimum stage of maturity that balances biomass yield and nutritional quality for rabbit feed formulation.
Materials and Methods: This study evaluated the biomass yield, nutritive value of Mulberry leaves, and Guatemala grass harvested at three maturity stages (8, 12, and 16 weeks). Fresh biomass yield and proximate composition analyses were determined after harvest.
Results: Forage maturity significantly affected both biomass production and nutrient composition ($p < 0.05$). Biomass yield increased with advancing maturity in both species. Mulberry dry matter yield ranged from 2.3 t $ha^{-1}$and 3.6 t ha^{-1}, while Guatemala grass (15.5 - 25.9 t ha^{-1}) compared to mulberry. However, mulberry consistently exhibited superior nutritional quality, with crude protein levels ranging from 16.49% to 19.3% dry matter, alongside higher mineral and carbohydrate contents. Importantly, the 12-week maturity stage provided the best compromise between forage quantity and nutritional quality for both species.
Conclusion: The study demonstrated that the complementary nutritional characteristics of Mulberry and Guatemala grass make them suitable low-cost ingredients for forage-based feed formulations. The 12-week maturity stage provided the best compromise between forage quantity and nutritional quality for both species.
Keywords: *Mulberry, Guatemala grass, Rabbit feed formulation, Biomass yield, Nutritive value.*

Co-application of biochar and cow manure enhances growth, yield, and soil chemical properties under spinach production

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ABSTRACT

Background: Soil fertility decline, characterized by reduced nutrient availability and poor soil health, remains a major constraint to vegetable production in many tropical regions, including Uganda. Sustainable soil amendment strategies are therefore required to improve soil fertility, enhance crop productivity, and reduce dependence on synthetic fertilizers. Biochar has emerged as a promising soil amendment due to its stable carbon content, high porosity, and nutrient retention capacity.
Problem Statement: Although biochar and organic manures have been promoted as sustainable soil fertility management options, limited information exists on the effects of their combined application on crop performance and soil chemical properties under spinach production systems in Uganda.
Methods: A field experiment was conducted at the Faculty of Agriculture and Environmental Sciences, Mountains of the Moon University, during the March–May 2025 growing season. Four treatments were evaluated: control, biochar alone (50 t ha^{-1}), cow manure alone (20 t ha^{-1}), and a combined application of biochar (25 t ha^{-1}) and cow manure (10 t ha^{-1}). Treatments were arranged in a Randomized Complete Block Design (RCBD) with three replications. Data were analyzed using one-way Analysis of Variance (ANOVA) and Principal Component Analysis (PCA).
Results: The combined application of biochar and cow manure produced the tallest plants (45.6 cm), representing a 120% increase over the control (20.7 cm) and a 35.7% increase over sole biochar application. The highest spinach yield (22.5 t ha^{-1}) was also obtained under the combined treatment, representing a 78% increase compared to biochar alone and a 31.1% increase compared to cow manure alone. Principal Component Analysis revealed strong positive associations between growth and yield parameters and key soil properties, including total nitrogen, potassium, electrical conductivity, and pH.

Conclusion: Co-application of biochar and cow manure significantly improves spinach growth, yield, and soil chemical properties. Integrating biochar with cow manure enhances its agronomic effectiveness and offers a sustainable soil fertility management strategy for vegetable production in Uganda.
Keywords: *Biochar, cow manure, spinach, soil fertility, soil chemical properties, organic amendments, Uganda.*

Oil Palm Empty Fruit Bunch Amendments on Okra Yield on Coastal Savannah Acrisols in Central Region, Ghana

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ABSTRACT

Background: Coastal savannah acrisols are inherently constrained with low soil fertility, low organic matter, low cation exchange capacity, and limited water retention capabilities. As a result of that, okra yield can be severely limited by poor soil quality in nutrient-deficient coastal savannah acrisol.
Problem Statement: Edaphic (soil) constraints such as intensive cultivation, rapid mineralization of organic matter under high tropical temperatures, lead to coastal savannah acrisols being attributed with inherent soil bio-physico-chemical properties. The Oil palm industries in Ghana produce several wastes in form of empty oil palm fruit bunches with negative consequences for the environment. This study addresses the constraints of managing oil palm processing waste whereas simultaneously improving soil fertility and crop productivity in nutrient-deficient coastal savannah acrisols.
Methodology: A field experiment was established in a Randomized Complete Block Design (RCBD) with four replicates to assess the effects of oil palm empty fruit bunch (EFB) soil amendments on the yield of okra. The treatments included EFB Biochar at two levels (10tha (EFBB10) and 20tha (EFBB20)), EFB Compost 20tha (EFBC20), EFBB10+EFBC20, EFBB20+EFBC20, NPK, and Control (CTRL). Okra pods were harvested across ten time points over a period of 44 days with the number of pods and weight of pods measured. Analysis of variance was applied to assess the okra yield data using R software.
Results: Mean values of the number of pods were of the order EFBB20+EFBC20 > NPK > CTRL >EFBB10+EFBC20 > EFBC20> EFBB10>EFBB20, ranging from 142.25 to 91.75. The highest pod weight was from EFBB20+EFBC20 and the lowest pod weight was from EFBB10 with mean pod weights of 2071g and 1376g, respectively. There was no significant difference ($p>0.05$) observed for the pod weight across treatments. No significant interaction ($p>0.05$) existed between harvest time and treatments. However, statistically significant differences ($p<0.05$) were observed for the number of pods between treatment groups. Post hoc analysis using least significant difference test (alpha=0.05) showed that EFBB20+EFBC20 and NPK were significantly different from EFBB10 and EFBB20 but not the rest of the treatments.
Conclusion: Combining EFB biochar with compost as a soil amendment possibly offers better benefits for ameliorating soil fertility than applying EFB biochar alone. This synergistic interaction could possibly be associated with the microbial activity of the compost. These findings offer practical insights for sustainable waste valorization, soil fertility and crop production improvement. However, the mechanisms for these interactions will need to be further explored with subsequent research.
Keywords: *Oil Palm Empty Fruit Bunch, Biochar, Compost, Soil Amendments, Ghana.*

ENVIRONMENTAL SUSTAINABILITY, CLIMATE ACTION AND GREEN INNOVATION

Systematic Review of Determinants of Adoption of Soil and Water Conservation Practices among Smallholder Farmers in Highland areas

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ABSTRACT

Background: Soil erosion from highland croplands' steep slopes removes large amounts of macro nutrients and organic C, often comparable to fertilizer inputs, and drives both on-farm soil fertility declines and off-farm water pollution. Soil and water conservation practices (SWCPs) are effective in reducing soil erosion and runoff.
Problem Statement: Despite the effectiveness of SWCPs, adoption remains low, and erosion rates are high. This is due to the lack of voluntary participation of smallholder farmers and the failure to understand site-specific situations before the implementation of interventions. This review aimed at synthesizing factors that affect the adoption of SWCPs.
Methodology: The PRISMA framework was used for a comprehensive literature search in Google Scholar, ScienceDirect, and SpringerLink, with keywords including adoption, SWC, smallholder farmers, and highland areas. The literature review included studies from 2011 to 2025. The criteria for inclusion focused on SWC adoption, smallholder farmers in highland areas, and peer-reviewed publications published in English. Screening was done for 79 papers, and as a result, 66 were selected for synthesis.
Results: Findings indicate that sex, farm size, training, extension services, credit services, slope, land tenure security, income, family labour, social networks, and education were positively significant in influencing the adoption of SWC practices. Negatively significant factors include: age, farm distance, distance to market, and off-farm activities. SWCPs contributed to sustainable agriculture and environmental conservation.
Conclusion: Adoption of SWCPs is determined by different factors. Extension services should strengthen knowledge transfer for site-specific practices. Policy makers should strengthen land tenure security, financial incentives, and infrastructure. Funders should consider sustainable long-term investments, local institutions, and integrated watershed approaches.
Keywords*: soil and water conservation practices, soil erosion, runoff, soil fertility*

Optimizing Genomic Selection for Drought Tolerance in Common Bean: Multi-Trait Models and Environment-Specific Strategies

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ABSTRACT

Background and Problem Statement: Common bean (*Phaseolus vulgaris* L.) is critical for global food security, but its productivity is severely limited by drought. Traditional breeding for drought tolerance has been challenging due to the polygenic nature of stress-responsive traits and their strong genotype-by-environment interactions. Genomic selection presents a viable approach by permitting the early identification of superior genotypes without requiring extensive phenotyping. Nevertheless, the effectiveness of GS for drought resistance hinges on the selection of models, the structure of the trait, and the consistency of environmental conditions.
Methodology: A panel of 350 genotypes was phenotyped under well-watered and drought stress conditions, measuring grain yield, chlorophyll content, and leaf relative water content, traits that are sensitive to moisture stress, and subsequently genotyped with SNP markers to build a genomic relationship matrix. A comparison of multiple genomic selection models, including GBLUP, Bayesian models, and Random Forest,

was conducted via five-fold cross-validation, where prediction accuracy was quantified by the correlation of genomic estimated breeding values with observed phenotypes.
Results: The findings indicated GBLUP delivered the most stable performance across traits ($r = 0.42$), whereas Bayesian models performed better for traits with potential large-effect QTLs ($r = 0.51$). Drought stress lowered prediction accuracy relative to well-watered conditions, indicating greater environmental noise. Training population size and marker density positively influenced accuracy, albeit with diminishing returns beyond a threshold. Cross-environment predictions exhibited lower reliability, which underscores the necessity for training tailored to specific environments.
Conclusion. Model accuracy differs markedly based on genetic architecture, as GBLUP delivers consistent predictions for polygenic traits such as yield, whereas Bayesian approaches perform better for traits affected by large-effect QTLs. Multi-trait models, especially those merging physiological indicators with yield, highlight the importance of a systems-level perspective for predicting drought tolerance. This research yields practical recommendations for refining genomic selection approaches to bolster crop adaptability in areas prone to drought.
Keywords: C*ommon bean, drought tolerance, genomic prediction, GBLUP, multi-trait models.*

Adoption, Financial Viability, and Efficiency of climate-smart Agriculture practices among smallholder farmers for improved food security in Alego Usonga Sub-County, Kenya

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ABSTRACT

Background: Climate change poses a significant threat to agricultural productivity, food security, and rural livelihoods, particularly among smallholder farmers who depend on rain-fed agriculture. Climate-Smart Agriculture (CSA) has emerged as a sustainable approach for increasing productivity, enhancing resilience to climate change, and promoting food security. Despite efforts by government agencies and development partners to promote CSA technologies and practices, adoption levels among smallholder farmers in Alego Usonga Sub-County remain relatively low.
Problem Statement: Low adoption of CSA practices limits farmers' ability to improve productivity, profitability, and resilience to climate-related shocks. Understanding the factors influencing adoption and the economic and technical performance of CSA practices is essential for designing effective interventions that support sustainable agricultural development and food security.
Methodology: A cross-sectional survey of 384 smallholder farmers was conducted. Data were analyzed using descriptive statistics, multivariate probit regression, cost–benefit analysis, and stochastic frontier analysis to assess adoption determinants, financial viability, and technical efficiency.
Results: CSA adoption was significantly influenced by education, land size, credit access, and group membership ($p < 0.001$). Adopters achieved higher net benefits (Ksh 124,088) than non-adopters (Ksh 44,195) and recorded a higher Benefit–Cost Ratio (6.5 versus 2.8). Technical efficiency was also significantly higher among adopters (0.662) than non-adopters (0.386). Credit access, group membership, and climate change awareness reduced technical inefficiency.
Conclusion: CSA adoption improves both profitability and technical efficiency among smallholder farmers. Strengthening access to credit, farmer organizations, and climate-smart extension services can enhance adoption and contribute to sustainable food security.
Keywords: *Climate-Smart Agriculture, Adoption, Food Security, Technical Efficiency, Cost–Benefit Analysis, Smallholder Farmers.*

A Comparative Analysis of the Effectiveness of Flood Risk Management Strategies in a Mountainous Environment: The Case of the Nyamwamba and Nyamughasana Riverine Systems, Kasese District, Uganda

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ABSTRACT

Background: Global disaster risk is increasing, with more frequent and severe hazard events. Floods are the most significant disaster type globally, accounting for 35–40% of annual disaster impacts between 2015 and 2023. Between 1990 and 2022, 4,713 floods affected 3.2 billion people worldwide, with 19.7% of these events occurring in Africa. In Uganda, floods annually affect 50,000 people and cause USD 62 million in losses.
Problem statement: Despite the implementation of Nature-Based and Engineering-Based solutions, the Nyamwamba and Nyamughasana catchments continue to experience recurrent flooding, while limited empirical evidence on the effectiveness of these interventions constrains sustainable flood management. This study assessed the effectiveness of these approaches in reducing flood risks in the Rwenzori Mountains.
Methodology: A sequential research design with stratified random sampling was applied across slope zones. Sixty sites implementing Nature-based and engineering –based solutions were assessed. GPS coordinates and soil samples were collected from each site. Infiltration rates were measured in situ using the SATURO method, while soil moisture content and aggregate stability were evaluated through field and laboratory analyses. Data was coded in Excel and analyzed in R to compare soil aggregate stability, infiltration, and moisture retention under different interventions and identify the most effective flood risk reduction measures.
Results: Results show that aggregate stability significantly differs among the interventions ($F = 2.574$, $p = 0.048$), with higher soil stability and organic matter levels observed under nature-based interventions compared to engineering solutions. Nature-based Solutions, particularly bamboo planting, agroforestry, and tree planting, generally exhibited higher infiltration rates and greater soil moisture retention than gabions. The highest soil moisture contents were observed under bamboo planting (55%) and tree planting (49%) in the Nyamwamba catchment.
Conclusion: Nature-based solutions provide more sustainable and effective approaches for flood risk reduction compared to engineering-based interventions. Policy makers and local governments should prioritize nature-based solutions and integrate them into regional flood management plans and strategies to enhance soil stability, infiltration, reduce flood risks, and strengthen catchment resilience for effective flood risk management.
Keywords*: Floods, Nature-Based Solutions, Engineering-Based Solutions, infiltration, aggregate stability.*

Development of Biodegradable Materials from Milk Casein and Beeswax as A Sustainable Alternative to Plastic

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ABSTRACT

Background: Plastic pollution remains a major environmental challenge worldwide, largely due to the persistence of conventional petroleum-based plastics in the environment. The development of biodegradable materials from renewable biological resources offers a sustainable approach to reducing plastic waste and promoting circular bioeconomy principles.
Problem Statement: In Uganda, plastic waste constitutes a significant proportion of municipal solid waste and contributes to environmental degradation, blocked drainage systems, and ecosystem pollution. Fort Portal City alone generates approximately 70 tonnes of solid waste daily, with plastics accounting for a substantial and persistent fraction. There is a growing need for environmentally friendly alternatives to conventional plastics, such as High-Density Polyethylene (HDPE).
Methods: This study developed and evaluated biodegradable composites derived from milk casein and beeswax as potential alternatives to HDPE. Three formulations were prepared comprising 5% beeswax (CB5), 10% beeswax (CB10), and 15% beeswax (CB15), each replicated five times. The composites were

assessed for tensile strength, water absorption, and biodegradability, and their performance was compared with that of HDPE.
Results: Tensile strength increased significantly with increasing beeswax concentration, with CB15 exhibiting the highest mean tensile strength (12.1 MPa) compared to CB5 (7.2 MPa). Water absorption decreased as beeswax content increased, declining from 38.8% in CB5 to 22.74% in CB15, while HDPE exhibited negligible water absorption (0.014%). Biodegradability was highest in CB5 (63.9%) and declined to 48.72% in CB15, whereas HDPE showed minimal degradation (0.046%). One-way ANOVA indicated significant differences among the composite formulations for all measured properties ($p < 0.001$).
Conclusion: Milk casein–beeswax composites demonstrate considerable potential as biodegradable alternatives to conventional plastics for low-load applications such as nursery seedling pots and other agricultural products. Although their mechanical properties remain lower than those of HDPE, their high biodegradability and improved water resistance make them suitable for sustainable agricultural and environmental applications. Further research should explore reinforcement with natural fibres and cross-linking technologies to enhance material performance.
Keywords: *Biodegradable composites, milk casein, beeswax, sustainable materials, plastic alternatives, High-Density Polyethylene*

Integrating the adoption of Ecological approaches and Economic instruments to strengthen Climate resilience in the Lake Victoria Basin, Uganda.

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ABSTRACT

Background: Climate change continues to threaten rural livelihoods and ecosystem sustainability in Uganda's Lake Victoria Basin (LVB). Ecological approaches such as agroforestry and soil and water conservation, alongside economic instruments including microfinance and input support mechanisms, are increasingly recognized as important adaptation strategies for addressing climate-related risks.
Problem Statement: Despite the growing importance of these adaptation strategies, empirical evidence on the factors influencing their integrated adoption remains limited, particularly in rural and resource-constrained settings.
Methodology: This study examined the determinants of household adoption of ecological approaches and economic instruments for climate resilience in Uganda's LVB. Using multi-stage sampling design, primary cross-sectional data was collected from 600 households in Mukono and Mayuge districts. The multivariate probit (MVP) model was applied to analyze the joint adoption of ecological approaches (agroforestry, soil and water conservation), and economic instruments (microfinance and input support mechanisms). This model was appropriate because households often adopt multiple, complementary climate resilience strategies simultaneously.
Results: The results indicated that 62.5% of households adopted at least one ecological approach, while only 34.8% utilized economic instruments for climate resilience. Education ($\beta = 0.042$, $p < 0.01$), climate adaptation training ($\beta = 0.317$, $p < 0.001$), access to extension services ($\beta = 0.286$, $p < 0.05$), and institutional support ($\beta = 0.401$, $p < 0.01$) significantly increased the likelihood of integrated adoption. In contrast, female-headed households ($\beta = -0.214$, $p < 0.05$) and greater distance from public infrastructure ($\beta = -0.029$, $p < 0.05$) reduced adoption. Significant complementarities existed among strategies, with positive correlations between agroforestry and soil conservation ($\rho = 0.43$), microfinance and input support ($\rho = 0.36$), and agroforestry and microfinance ($\rho = 0.21$), indicating integrated climate resilience decisions.
Conclusion: Strengthening local knowledge systems, expanding financial inclusion, improving extension and advisory services, and enhancing rural infrastructure are essential for promoting integrated climate resilience strategies. These findings provide important policy insights for designing inclusive and sustainable climate adaptation interventions in high-risk rural landscapes of Uganda.
Keywords: *Climate resilience, ecological approaches, economic instruments, multivariate probit model, Lake Victoria Basin.*

Controls of the spatial distribution of land degradation in Mountainous agro ecosystems: the case of Bududa District in Mount Elgon, Uganda.

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ABSTRACT

Background: Land degradation is a widespread environmental challenge that threatens agricultural productivity, ecosystem services, and livelihood resilience worldwide. In Uganda's mountain agroecosystems, particularly in the Mount Elgon region, soil erosion and landslides are among the most severe forms of land degradation, undermining sustainable land management and efforts toward achieving land degradation neutrality.

Problem Statement: Despite substantial investments in soil and water conservation, many interventions are implemented without adequate consideration of terrain characteristics, hydrological conditions, and agroecological context. Consequently, the effectiveness of conservation practices in controlling specific land degradation processes remains poorly understood. This study assessed the spatial distribution of land degradation and identified the factors controlling soil erosion and landslide occurrence in Bududa District, Mount Elgon.

Methods: A geospatial assessment integrating remote sensing, Geographic Information Systems (GIS), field observations, and statistical modelling was conducted. Spatial patterns of soil erosion and landslides were analyzed across different conservation practices. Logistic regression models were used to determine the influence of vegetation cover, topographic variables, and conservation approaches on the occurrence of land degradation processes.

Results: Soil erosion in the study area was estimated at 46.3 tonnes ha^{-1} $year^{-1}$, approximately nine times the sustainable threshold. The occurrence of land degradation processes varied significantly across conservation practices ($p < 0.001$), with the lowest frequency recorded under agroforestry systems (18.27%) and the highest under conventional farming systems without conservation interventions (84.38%). Vegetation cover (NDVI) exhibited a significant inverse relationship with soil erosion ($\beta = -13.36$, $p = 0.002$) and reduced landslide susceptibility. Terrain-related factors, including slope angle, LS factor, and topographic ruggedness index, were significant predictors of landslide occurrence. The predictive models demonstrated strong performance, achieving accuracies of 78.19% (AUC = 0.854) for soil erosion and 85.06% (AUC = 0.845) for landslide occurrence.

Conclusion: Land degradation in mountain agroecosystems is strongly influenced by conservation practices, vegetation cover, and terrain characteristics. Agroforestry systems significantly reduce degradation risks, highlighting the need for landscape-specific conservation strategies tailored to topographic and hydrological conditions. Such targeted interventions can contribute substantially to sustainable land management and land degradation neutrality in mountainous environments.

Keywords: *Land degradation, soil erosion, landslides, agroforestry, sustainable land management, and mountain agroecosystems.*

Impacts of Farm-Made Biofertilizers on Sorghum Growth, Yield, and Soil Health of Semi-Arid Soils

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ABSTRACT

Background: Smallholder farmers in semi-arid areas of sub-Saharan Africa depend on farm-generated organic inputs such as cattle manure and crop residues to meet their soil fertilization needs. Although these inputs can improve soil nutrient availability and soil health in smallholder fields, high land use intensity often limits their availability and utilization.
Problem statement: Fermented cow dung and forest litter are reported to increase plant growth, yield, and soil health improvement; however, it is unclear whether these benefits arise from microbial characteristics or nutrients in the ferments. Additionally, few studies have simultaneously examined the effects of ferments on soil microbial communities, plant-microbe interactions, and enzyme activities under farm conditions
Methodology: Using a fermentation strategy, we tested two farm-made biofertilizer options: cow dung and forest litter under greenhouse conditions using intact and sterilized recipes applied as seed coating and liquid topdressing to understand nutrient and biological contributions. And field trials of biofertilizers alongside inorganic fertilizer (DAP-Urea) to evaluate plant growth and yield effects under semi-arid conditions.
Results: Greenhouse results showed biofertilizers increased plant stem girth, decreased time to flowering by 4 days (p<0.01), increased panicle weight by 18g (p<0.001), increased root colonization by arbuscular mycorrhizae fungi, increased microbial functional diversity, and 124% N uptake. Field results showed that biofertilizer application increased plant girth, panicle weight, and yield (+639 kg ha^{-1}).
Conclusion: The positive impact on crop growth, yields, and AMF root colonization shows evidence of plant nutrient supply and microbial effects of biofertilizers. Hence can be optimised for sustainable productivity of cropping systems in semi-arid conditions.
Keywords*: Farm-made, biofertilizers, microbial*

The Nexus between Safe Water Access and Environmental Degradation - A Case of Mpanga Catchment, Western Uganda

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ABSTRACT

Background: Access to safe water is fundamental to public health, livelihoods, and socio-economic development. Although substantial progress has been made globally in expanding access to improved water sources, disparities persist, particularly in rural areas that rely on decentralized water supply systems. Increasing environmental degradation poses a significant threat to the sustainability of these water resources, potentially undermining gains made in water access and security.
Problem Statement: The Mpanga Catchment in western Uganda records relatively high safe water access rates, ranging between 70% and 90%. Despite these achievements, the catchment is experiencing rapid environmental degradation characterized by deforestation, agricultural encroachment into fragile ecosystems, population growth, environmental pollution, and climate change. The implications of these environmental pressures for the long-term sustainability of safe water access remain inadequately documented.
Methodology: This study employed a narrative review approach to examine the relationship between environmental degradation and safe water access. Scholarly literature, policy documents, government reports, and catchment management records were reviewed to synthesize global evidence and contextualize findings within Uganda and the Mpanga Catchment. Data were analyzed thematically to identify patterns, trends, and emerging linkages between environmental change and water resource sustainability.
Results: Findings reveal substantial spatial variations in safe water access across districts within the Mpanga Catchment. In Kabarole District, access rates ranged from 7% in Kijura Town Council to 95% in Bukuuku Sub-county. In Kamwenge District, access ranged from 65% in Bwizi Sub-county to 95% in Kahunge Sub-county, while in Kyenjojo District, access varied from 2% in Kyakatwire Town Council to 95% in Batalika Sub-county. Concurrently, forest cover loss between 2020 and 2025 was estimated at 4.0%, 5.0%, and 7.0% in Kabarole, Kyenjojo, and Kamwenge districts, respectively, with most losses occurring within humid primary forests. The review demonstrates that forest ecosystems and other natural habitats play a critical role in groundwater recharge, watershed protection, flow regulation, and natural filtration of pollutants. Consequently, continued environmental degradation threatens the long-term reliability and quality of water resources despite current improvements in access coverage.
Conclusion: While considerable progress has been achieved in expanding safe water access within the Mpanga Catchment, these gains remain vulnerable to ongoing environmental degradation. Sustainable water security, therefore, requires an integrated approach that combines investments in water supply infrastructure with the protection of water recharge zones, watershed ecosystems, and broader

environmental conservation initiatives. Strengthening ecosystem-based water resource management is essential for safeguarding long-term access to safe water in the catchment.

Keywords*: Safe water access; Environmental degradation; Watershed conservation; Climate change; Mpanga Catchment; Uganda.*

Assessment of Current and Projected Surface Water Quantity and Quality in The Mpanga Catchment, Western Uganda

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ABSTRACT

Background: Surface water resources are essential for domestic water supply, agriculture, hydropower generation, and ecosystem functioning. The Mpanga Catchment in western Uganda plays a critical role in supporting livelihoods and economic activities. However, increasing population pressure, land-use changes, and climate variability pose significant threats to both water quantity and quality within the catchment.

Problem Statement: Despite the socioeconomic importance of the Mpanga Catchment, there is limited information on the combined effects of anthropogenic activities and future climate change on surface water availability and quality. This knowledge gap constrains evidence-based planning and sustainable water resource management.

Methodology: This study employed a mixed-methods approach involving hydrological modelling, climate projections, and water quality assessment. Daily rainfall, streamflow, and evapotranspiration data were analyzed using the Hydrologic Engineering Center–Hydrologic Modeling System (HEC-HMS). Flow Duration Curve (FDC) analysis was used to assess water availability and flow reliability. Future streamflow conditions were projected under Representative Concentration Pathways (RCP 4.5 and RCP 8.5) using downscaled climate model outputs. Water quality was evaluated through laboratory analysis of physicochemical and microbiological parameters collected from upstream, midstream, and downstream sections of the catchment.

Results: The findings revealed pronounced seasonal variability in water availability, with streamflow patterns closely corresponding to rainfall distribution. Peak flows reached 81.54 m^3/s during wet seasons, while dry-season flows declined to approximately 6.0 m^3/s, indicating vulnerability to water scarcity. Climate projections suggest an overall increase in future streamflow, with median flows projected to reach 98.84 m^3/s and low flows increasing to approximately 40.42 m^3/s by 2100. However, greater hydrological variability is expected to increase the likelihood of extreme events such as floods and droughts. Water quality analysis showed moderate pollution levels in upstream sections and substantial deterioration downstream due to agricultural runoff, livestock activities, and untreated wastewater discharge. Elevated turbidity, nutrient concentrations, and microbial contamination were observed in highly disturbed areas.

Conclusion: The Mpanga Catchment possesses considerable water resources but remains vulnerable to climate change and anthropogenic pressures. Strengthening catchment conservation measures, pollution control strategies, water storage infrastructure, and continuous monitoring systems is necessary to enhance water security and ecosystem resilience. The study provides valuable evidence to support integrated water resources management and climate adaptation planning in Uganda and similar catchments across East Africa.

Keywords: *Surface Water Quantity, Water Quality, Climate Change, Hydrological Modelling, Mpanga Catchment, Water Resources Management, Uganda.*

Relationship between Social-Structures and Participation of Social-Groups in River Mpanga Catchment Resource Management in Rwenzori Region.

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ABSTRACT

Background: Community participation is a critical factor in promoting sustainable development and service delivery. In the Rwenzori region, the River Mpanga catchment serves as a vital economic lifeline, yet evidence regarding how local social structures influence community-based resource management remains limited.

Problem Statement: Despite interventions, rural communities continue to face systemic exclusion from river catchment management. Top-down regulations frequently ignore localized livelihood dependencies, resulting in low participation, resource friction, and economic displacement among marginalized social groups. This study examined the influence of social structures on group participation in River Mpanga's resource management.

Methodology: A convergent mixed-methods design was employed. Quantitative data were collected from 335 household heads using structured questionnaires and analyzed using Principal Component Analysis (PCA) and Pearson correlation. Qualitative data from focus groups and key informant interviews were analyzed thematically.

Results: Quantitative findings indicated that socio-structures significantly correlate with catchment participation ($r = 0.123$, $p = 0.025$), aligning with broader development trends where active engagement drives service utilization ($\beta = 0.48$, $p < 0.001$). PCA extracted individual social capital, identity barriers, and institutional regulations as key structural dimensions. While political discrimination was minimal (0.6%), community laws (51.0%) and distance (44.5%) constrained access. Qualitative data revealed strict gendered labor roles in riverbank farming and a collapse in capture fisheries (11.6%) driven by militarized state enforcement, which triggered severe household economic distress.

Conclusion: Socio-structural dynamics heavily dictate resource management participation. Strengthening community engagement, building transparent feedback mechanisms, and integrating sustainable livelihoods into water governance can improve resource conservation and, consequently, rural development outcomes.

Keywords*: Riparian livelihoods, Catchment management, Socio-economic vulnerability, Rural Development, Economic displacement, Co-management frameworks*

An Investigation of the Roles of Education and Awareness Programs in Promoting Sustainable Water Resource Management in the Mpanga Catchment

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ABSTRACT

Background: The Mpanga Catchment in western Uganda supports agriculture, domestic water supply, hydropower generation, and vital ecosystem services. However, environmental degradation, climate variability, population growth, and unsustainable land-use practices increasingly threaten the sustainability of its water resources.

Problem Statement: Although Integrated Water Resources Management (IWRM) frameworks and catchment management plans have been implemented, limited public awareness and inadequate environmental education continue to hinder effective community participation in water resource conservation. This study examined the role of education and awareness programs in promoting sustainable water resource management by influencing community knowledge, attitudes, and conservation practices.

Methodology: A qualitative case study approach was employed, drawing on experiences from the implementation of the Mpanga Catchment Management Plan and related stakeholder engagement initiatives. Data were obtained through document review and thematic analysis of interventions implemented by government agencies, community-based organizations, non-governmental organizations, and other stakeholders.

Results: Education and awareness programs improved community understanding of watershed conservation and sustainable resource management. Effective approaches included community sensitization campaigns, local-language communication, radio programs, demonstration sites, and participatory learning platforms. These initiatives encouraged the adoption of agroforestry, riparian buffer protection, soil and

water conservation, and sustainable land-use practices while strengthening collaboration among stakeholders.

Conclusion: Education and awareness programs are critical for sustainable water resource management. Strengthening continuous environmental education, integrating indigenous and scientific knowledge, and institutionalizing community engagement can enhance catchment conservation, climate resilience, and long-term water security.

Keywords: *Integrated Water Resources Management, environmental education, community awareness, watershed conservation, Mpanga Catchment.*

Assessing the Nexus between Wetland Conservation and Tourism Development in Rwanda: A Case Study of Rugezi Wetland

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ABSTRACT

Background: Wetlands provide critical ecological, economic, and social benefits, including biodiversity conservation, climate regulation, tourism development, and livelihood support. Rugezi Wetland is one of Rwanda's most important high-altitude wetlands and an internationally recognized Important Bird Area supporting approximately 194 bird species, including several Albertine Rift endemics.

Problem Statement: Despite its ecological significance and tourism potential, Rugezi Wetland faces increasing pressure from agricultural encroachment, uncontrolled grazing, and unsustainable resource extraction. Limited empirical evidence exists on the relationship between wetland conservation, avi-tourism development, and community wellbeing, thereby constraining the design of integrated conservation and development strategies.

Methods: A convergent mixed-methods design was employed to examine the nexus between wetland conservation, tourism development, and community livelihoods. Data were collected from 992 respondents through household surveys, 10 key informant interviews, two focus group discussions, ecological assessments, and field observations. Quantitative data were analyzed using descriptive statistics and correlation analysis, while qualitative data were analyzed thematically. Triangulation was used to enhance the validity and reliability of the findings.

Results: The findings revealed a strong negative relationship between anthropogenic activities and wetland conservation outcomes ($r = -0.72$, $p < 0.05$), indicating that increasing human pressure significantly reduced habitat quality and avian diversity. Conversely, wetland conservation exhibited a strong positive relationship with avi-tourism development and community wellbeing ($r = 0.68$, $p < 0.05$). Qualitative findings further highlighted the importance of community participation, environmental awareness, and alternative livelihood opportunities in promoting sustainable wetland management and tourism development.

Conclusion: Effective wetland conservation is essential for sustaining biodiversity, supporting avi-tourism development, and enhancing community wellbeing. Strengthening participatory conservation approaches, environmental education, and livelihood diversification can promote both ecological integrity and socio-economic sustainability in Rugezi Wetland and similar ecosystems.

Keywords: *Wetland conservation, biodiversity, avi-tourism, community livelihoods, sustainable tourism, Rugezi Wetland, Rwanda.*

Evaluating the Effectiveness of Fisheries Policy in Controlling Immature Fish Trading along Western Uganda's Fish Trading Corridor (2015-2023)

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ABSTRACT

Background: Fisheries management in Uganda is vested in the central government Ministry of Agriculture Animal Industry and Fisheries, as the competent authority, mandated to promote, support, guide, regulate and control the fisheries resources and is responsible for the formulation of policies in the sub-sector. Recognizing the benefits of the

sub-sector and the existing potentials, the government has shown its interest by formulating the fisheries policy and regulations governing fisheries resources and their conservation, Despite the existence of the policy, the sector's performance has not been impressive, with significant decline in fish stock, illegal fishing practices leading to persistence of immature fish trading especially along Western Uganda's fish trading corridor Thus, the study examined the effectiveness of the fisheries policy on controlling immature fish trading and specifically, we investigated fishers' knowledge of the fisheries policy objectives and regulations on immature fish trading; established underlying reasons for the persistence of immature fish trading and determined possible strategies to eliminate immature fish trading.

Methodology: The study adopted the cross-section research design combining both qualitative and quantitative approaches. A sample population of 96 respondents was selected using both simple random sampling and purposive sampling techniques. Respondents were categorized as general respondents who are involved in the fish value chain and key informants who are involved in policy implementation. Primary data collection methods included questionnaires, open ended interviews and observation methods directed to fishers and KI's within the fish trading corridor. Quantitative data was analyzed using descriptive statistics in SPSS, while content analysis was used for qualitative data. To assess policy effectiveness, we used indicators like; market supply interventions and enforcement outcomes with secondary indicators as; prevalence of immature of fish in the local markets, regulatory compliance levels to licensing and volumes of seized immature fish and illegal gears.

Results: The study revealed 75.42% of the fishers have full knowledge of the fisheries policy and laws that regulate immature fish trading, however, it is not translated into compliance, 94% of the fishers had no licenses nor fish movement permits revealing noncompliance to policy regulations rendering policy regulations ineffective, 90.6% of the respondent's attributed persistence of immature fish trading to the continued manufacture and importation of illegal fishing gears, while 87.5% of the fisher's suggested elimination of illegal fishing and illegal gears as the best strategy to abate immature fish trading. Findings of the study characterize the fisheries policy as ineffective.

Conclusion: Policy effectiveness could be enhanced by shifting towards changing behavioral incentives other that awareness raising addressing economic drivers on non-compliance such as poverty, cost of legal gears and alternative livelihoods, enforcement should address the upstream supply of illegal gears with strict import bans, custom point checks and audits, and harmonizing enforcement which must be uniform in all fish trading corridors and water bodies by standardizing operations between agencies will ensure that enforcement is legally predictable, persistent, and respectful of human rights to preserve system legitimacy.

Key words: Fisheries Policy, Illegal Fishing, Immature Fish Trading, Fisheries Governance, Fish Value Chain, Uganda.

DIGITAL TRANSFORMATION, EMERGING TECHNOLOGIES AND THE INNOVATION ECOSYSTEM

Design and Fabrication of a Biogas Upgrading Unit and Storage System for Powering Agricultural Machinery

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ABSTRACT

Background: Growing demand for energy for household cooking and agricultural mechanization has increased pressure on conventional fossil fuel resources, necessitating the adoption of sustainable and renewable energy alternatives. In Uganda, many households and smallholder farms have adopted biogas technology to meet domestic energy needs and support backyard farming activities. However, the direct utilization of raw biogas is constrained by its low energy content and the presence of undesirable gaseous impurities.
Problem Statement: Despite the increasing adoption of biogas systems, the use of raw biogas for cooking and operating farm machinery remains limited due to the presence of carbon dioxide (CO_2) and hydrogen sulfide (H_2S). Carbon dioxide reduces the calorific value of biogas, while hydrogen sulfide is corrosive, environmentally harmful, and poses health risks to users. These impurities reduce the efficiency of biogas-powered equipment and accelerate the deterioration of engines, pumps, compressors, storage tanks, and other metallic components. Existing biogas upgrading technologies are often expensive, technically complex, and inaccessible to most smallholder farmers.
Methodology: This study designed, developed, and evaluated a low-cost biogas upgrading system aimed at improving the quality and usability of biogas for household energy and agricultural applications. The system was developed using locally available materials and tested for its ability to remove carbon dioxide and hydrogen sulfide from raw biogas. Performance was assessed by examining improvements in gas quality, combustion efficiency, and suitability for powering biogas-fueled machinery.
Results: The developed biogas upgrading system effectively reduced concentrations of hydrogen sulfide and carbon dioxide, resulting in improved biogas quality and enhanced calorific value. The upgraded biogas demonstrated improved combustion characteristics and successfully powered biogas engines used in farm operations. The system provided a cost-effective and locally adaptable alternative to conventional upgrading technologies while improving safety and reducing corrosion-related damage to equipment.
Conclusion: The study demonstrates that locally developed biogas upgrading technologies can significantly enhance the quality and utilization of biogas for clean cooking and agricultural mechanization. The upgraded biogas successfully supported the operation of farm machinery at the Mountains of the Moon University demonstration farm, highlighting its potential for wider adoption among smallholder farmers and rural communities. Scaling up such technologies could contribute to renewable energy utilization, environmental sustainability, and improved agricultural productivity.
Keywords: *Biogas upgrading, Renewable energy, Hydrogen sulfide removal, Agricultural mechanization, Biogas engines, Sustainable farming.*

A Real-Time Air Quality Monitoring and Prediction System for Urban Environmental Sustainability in Uganda

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ABSTRACT

Background: Urban air pollution is an escalating public health threat in Uganda. In Kampala, particulate matter (PM2.5) consistently exceeds World Health Organization safety limits. While networks like AirQo

provide baseline monitoring, an operational gap remains: a lack of localized, real-time predictive configurations offering short-term forecasting for swift municipal action.
Problem Statement: Existing monitoring infrastructures remain retrospective, decentralized, and difficult to scale. This study aimed to design and implement an integrated IoT framework fusing edge-computed sensor telemetry with machine learning to provide real-time, actionable environmental intelligence for proactive urban exposure mitigation.
Methodology: An IoT network prototype was designed and validated across five high-density Kampala nodes: Kawempe-Bwaise, Nakawa Industrial Area, Kisenyi Central, and the Kireka-Mukono corridor. Calibrated Plantower PMS7003 sensors and DHT22 modules logged PM2.5, PM10, temperature, and humidity at 1-minute intervals over a six-month trial window, transmitting data via GSM/GPRS. An optimized Long Short-Term Memory (LSTM) network model processed historical data, traffic profiles, and micro-climate indicators to generate 24-hour-ahead forecasts.
Results: The developed system achieved 97.4% transmission reliability, pushing automated dashboard and SMS alerts within 120 seconds of threshold breaches during testing. The LSTM model yielded a Root Mean Squared Error of 4.8 $\mu g/m^3$ and a Mean Absolute Percentage Error of 11.2% in forecasting spikes, mapping localized hotspots driven by vehicular idling and biomass combustion.
Conclusion: Locally engineered, low-cost IoT networks paired with deep learning offer a scalable path forward for smart city environmental governance. Upon full deployment, this predictive forecasting framework will equip municipal planners with the empirical intelligence required to implement targeted traffic management, execute clean-air zoning policies, and measurably reduce public exposure to airborne hazards.
Keywords: *Air Quality Monitoring, Predictive Analytics, Internet of Things (IoT), Long Short-Term Memory (LSTM), Urban Sustainability.*

DeltaSense: Africa's remote sensing guardian of landscape degradation

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Visit the website of the platform: https://deltasense.csic.es/

ABSTRACT

Background: Land degradation is a major environmental challenge in East Africa, threatening ecosystem stability, biodiversity, agricultural productivity, and human well-being. Conventional monitoring approaches often detect degradation only after substantial environmental damage has occurred, making restoration interventions costly and less effective.
Problem Statement: Existing land degradation monitoring systems primarily focus on direct land-use changes and often fail to provide timely information for early intervention. Consequently, there is a need for innovative monitoring approaches capable of detecting degradation processes in near real-time and evaluating the effectiveness of remediation measures across diverse landscapes.
Methods: This study presents **DeltaSense**, an innovative remote sensing platform that utilizes inland lake deltas as sensitive indicators of landscape degradation. The approach integrates satellite time-series analysis

of delta dynamics and water turbidity with field-based measurements, including unmanned aerial vehicle (UAV) imagery, bathymetric surveys, and turbidity monitoring. Historical datasets spanning over 40 years were analyzed to identify spatiotemporal patterns of degradation and assess remediation outcomes across the African Great Lakes region.
Results: DeltaSense successfully identified degradation hotspots and their upstream drivers across Uganda, Tanzania, and the Democratic Republic of Congo. The platform detected degradation associated with deforestation, agricultural expansion, mining activities, and conflict-related land disturbances. The integration of satellite and field data enabled near real-time monitoring of environmental change while supporting the evaluation of restoration interventions. Stakeholder consultations highlighted the platform's potential to strengthen evidence-based environmental management and decision-making.
Conclusion: DeltaSense represents a novel and scalable approach for monitoring land degradation and evaluating restoration efforts in near real-time. Its application can support sustainable natural resource management, targeted remediation, and environmental policy implementation across the African Great Lakes region and beyond.
Keywords: *DeltaSense, land degradation, remote sensing, Great Lakes region, environmental monitoring, restoration, near real-time assessment.*

Mobile Communication for Livestock Disease Management: Challenges, Opportunities, and Farmer Readiness in Kyenjojo District, Western Uganda

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ABSTRACT

Background: Livestock production is central to rural livelihoods in Western Uganda, yet recurrent disease outbreaks cause substantial economic losses among small-scale cattle keepers. Mobile communication technologies offer promising avenues for strengthening disease surveillance, advisory services, and farmers' access to timely veterinary support.
Problem Statement: Despite rising mobile phone penetration, livestock farmers in Kyenjojo District face persistent gaps in disease information systems and veterinary service delivery, including limited surveillance data, delayed advisory support, and inadequate access to qualified veterinarians. These weaknesses hinder timely disease management. This study assessed the challenges, opportunities, and farmer readiness for adopting mobile-based livestock disease management solutions.
Methodology: A cross-sectional survey was conducted among 397 small-scale cattle keepers across five parishes in Kyenjojo District. Data were collected using structured questionnaires administered to farmers. Responses were analysed using descriptive and inferential statistics, with chi-square tests, analysis of variance, and t-tests examining associations between farmer characteristics and readiness to adopt mobile-based solutions.
Results: Most farmers (63.5%) had experienced major disease outbreaks, citing high treatment costs (mean = 4.32/5), limited vaccine access (4.18/5), and inadequate government support (4.12/5) as primary challenges. Mobile phone ownership was high (86.1%), although smartphone penetration was lower (53.8%) and current use of livestock applications was limited (27.2%). Interest in mobile-based solutions was substantial (81.6%), particularly for disease alerts (89.7%) and vaccination reminders (81.6%). Significant associations emerged between mobile ownership and advisory service access ($\chi^2 = 11.24$, $p = 0.001$), education level and app comfort ($F = 8.42$, $p < 0.001$), and age and app interest ($t = 3.84$, $p < 0.001$). Key barriers included cost constraints (75.1%), limited network coverage (67.3%), and concerns about information reliability (58.9%).
Conclusion: Farmers in Kyenjojo District demonstrate substantial demand and readiness for mobile-based livestock disease management. Realizing this potential requires interventions that address cost barriers, ensure offline functionality, provide local-language support, and integrate with existing traditional knowledge and extension systems. A phased implementation approach, starting with basic SMS services and progressing to smartphone applications, combined with supportive policy frameworks and strengthened veterinary services, is recommended to enhance adoption and impact.

Keywords*: Mobile communication, Livestock disease management, Small-scale farmers, Veterinary services, Digital adoption, Farmer readiness.*

Assessing the contribution of Eastward Electric Field estimates to Artificial Neural Network modelling of the Swarm derived Equatorial Electrojet

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ABSTRACT

Background: The Equatorial Electrojet (EEJ) is a narrow eastward current flowing in the daytime E-region ionosphere near the geomagnetic equator and is a key component of the equatorial ionospheric electrodynamics.
Problem Statement: Accurate modelling of EEJ variability remains challenging due to complex geophysical drivers and limited ground-based observations, particularly over Africa. This study develops the first Artificial Neural Network (ANN)-based empirical EEJ model using Swarm Absolute Scalar Magnetometer (ASM) observations during geomagnetic ally quiet conditions (Kp ≤ 3) from 2014 to 2024 and evaluates the contribution of Equatorial Electric Field (EEF) estimates to model performance.
Methodology: ANN models were developed for South America (60°-80°W), West Africa (10°W-10°E), East Africa (30°–50°E), and India (65°-85°E). Two configurations were trained, validated, and tested: one using geophysical parameters (local time, day of year, F10.7, lunar tidal parameters, latitude, and longitude) and another incorporating EEF estimates. Model performance was evaluated using RMSE and correlation coefficient (R).
Results: The geophysical-driver-only model achieved correlation coefficients of 0.71, 0.76, 0.65, and 0.78 for South America, West Africa, East Africa, and India, respectively. Inclusion of EEF improved correlations to 0.99, 0.98, 0.83, and 0.81 while reducing RMSE by 75.65%, 67.08%, 25.72%, and 9.29%. Globally, RMSE decreased from 27.26 mA/m to 22.42 mA/m, and R increased from 0.74 to 0.89. Both models reproduced the observed diurnal, seasonal, longitudinal, and wavenumber-4 EEJ variability.
Conclusion: Incorporating EEF substantially improves ANN-based EEJ modelling. The results demonstrate the potential of machine learning and satellite observations to enhance EEJ representation, ionospheric modelling, and space weather prediction, particularly in data-sparse regions.
Keywords*: Equatorial Electrojet, Artificial Neural Networks, Equatorial electric field.*

Siamese Networks for Low-Shot Entomological Insect Categorization

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ABSTRACT

Background: Insects represent an immense share of global biodiversity, and automated visual classification could accelerate species monitoring. However, deep learning classifiers are data-hungry, requiring large labelled datasets that are unavailable for many rare or undescribed insect species.
Problem Statement: Collecting vast annotated datasets for thousands of rare insect species is biologically impractical and economically infeasible, restricting conventional deep learning in entomology. This study aimed to develop a few-shot learning framework for accurate fine-grained insect categorization from very limited examples, including species unseen during training.
Methodology: A Siamese network trained with a triplet loss function was developed to learn a discriminative embedding space in which images of the same species cluster according to morphological features. The model was trained and evaluated on a dataset of 1000 visually similar insect species (58,742 images) and

benchmarked against standard transfer learning and contemporary meta-learning baselines using 5-way 1-shot and 5-way 5-shot classification tasks.
Results: The proposed model achieved state-of-the-art accuracy of 78.3% on the 5-way 1-shot task and 89.6% on the 5-way 5-shot task, outperforming both the transfer learning and meta-learning baselines by an average percentage of 31.1% points. A t-SNE visualisation of the embedding space confirmed that the model captured subtle, taxonomically relevant distinctions from minimal data.
Conclusion: The framework enables accurate automated insect identification in data-scarce environments, contributing a practical solution to fine-grained categorization where labelled data is limited. It supports rapid deployment of reliable models for biodiversity conservation monitoring, agricultural pest management, and citizen-science initiatives.
Keywords: *Few-shot learning, Siamese networks, Triplet loss, Fine-grained visual categorization, automated species identification*

Fort Portal E-Shop: A Free Digital Marketplace for Inclusive Local Commerce in Western Uganda

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ABSTRACT

Background: Small and Medium Enterprises (SMEs) in Fort Portal City and the wider Western Uganda region predominantly operate within informal and largely undigitized markets. Most businesses rely on physical stalls, word-of-mouth marketing, and fragmented social media networks to reach customers, limiting market access and participation in the digital economy. Existing national e-commerce platforms are often costly, payment-dependent, and inadequately adapted to the realities of low-income local markets.
Problem Statement: The absence of a free, accessible, and locally contextualized digital marketplace limits the online visibility of SMEs and constrains digital trade in Western Uganda. Existing platforms do not adequately accommodate low digital literacy levels, limited internet affordability, or the WhatsApp-based communication practices commonly used by local entrepreneurs and consumers.
Methods: This study employed a Design Science Research (DSR) approach involving community needs assessment, iterative system design, development, and deployment. A WhatsApp-first digital marketplace model was developed, allowing vendors to register and list products at no cost while enabling buyers to communicate directly with sellers through WhatsApp. The platform incorporates vendor registration, product listing, category-based search, district-level filtering across ten districts, vendor verification, and mobile-responsive functionality.
Results: The platform (**www.fortportaleshop.online)**, launched in May 2026, successfully attracted vendors from multiple sectors, including agriculture, food, clothing, electronics, and general merchandise. Key outcomes included enhanced digital visibility for SMEs, a scalable vendor management system, improved product discoverability across districts, and a cost-free mechanism for buyer-seller interaction. The WhatsApp-first model facilitated rapid adoption by eliminating transaction fees and technical barriers associated with conventional e-commerce platforms.
Conclusion: Fort Portal E-Shop demonstrates the potential of frugal digital innovation to promote inclusive local commerce and digital market participation. The platform provides a scalable model for strengthening SME competitiveness and advancing digital transformation in resource-constrained settings across Uganda and Sub-Saharan Africa.
Keywords: *Digital Marketplace, E-Commerce, SMEs, Digital Transformation, Frugal Innovation, WhatsApp Commerce, Uganda.*

A Design Thinking Approach to Developing a Hybrid Mathematics Laboratory Integrating Physical Manipulatives and Digital Learning Tools for Mathematics Education in Uganda

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ABSTRACT

Background: The implementation of Uganda's Competency-Based Curriculum (CBC) has increased the need for learner-centered, practical, and technology-enhanced approaches to mathematics teaching and learning. However, many secondary schools continue to face challenges associated with abstract mathematical concepts, inadequate instructional resources, limited opportunities for hands-on learning, and restricted access to contextualized digital learning tools.
Problem Statement: Existing mathematics teaching resources often address either physical or digital learning needs in isolation, limiting opportunities for learners to connect concrete experiences, visual representations, and abstract mathematical concepts. This study sought to develop a contextually relevant Hybrid Mathematics Laboratory that integrates physical manipulatives and digital learning tools to support competency-based mathematics education in Uganda.
Methods: A Design Thinking approach was employed involving the stages of empathizing, defining, ideating, prototyping, and validation. Mathematics teachers, curriculum specialists, researchers, and pre-service teachers participated in stakeholder consultations to identify instructional challenges and resource needs. Insights generated informed the co-design and iterative refinement of physical and digital learning resources aligned to the lower secondary mathematics curriculum.
Results: The project developed a Hybrid Mathematics Laboratory comprising physical manipulatives across ten mathematics thematic areas and the Uganda MathToolkit, an offline interactive digital learning platform. The toolkit incorporates dynamic visualizations, simulations, exploratory activities, real-life applications, career pathways, and UNEB-style assessments. Qualitative findings revealed that teachers perceived the innovation as highly relevant to CBC implementation, particularly for improving conceptual understanding, learner engagement, visualization of abstract concepts, and access to practical learning resources. Stakeholders emphasized its potential to enhance classroom participation and support mathematics instruction in resource-constrained schools.
Conclusion: The Hybrid Mathematics Laboratory demonstrates the potential of Design Thinking to generate contextually relevant educational innovations that integrate physical and digital learning experiences, thereby strengthening competency-based mathematics education in Uganda.

Keywords: *Design Thinking, Hybrid Mathematics Laboratory, Uganda MathToolkit, Physical Manipulatives, Digital Learning Tools, Competency-Based Curriculum, Mathematics*

Leveraging Digital Transformation for Early Adoption of Emerging ICT Technologies to Improve Competency-Based Curriculum Innovations in Uganda Universities: A Review

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ABSTRACT

Background: This paper asserts that digital transformation is an imperative for higher education policy globally, including the use of Artificial Intelligence (AI), cloud computing, big data analytics, the Internet of Things (IoT), virtual laboratories, academic libraries, and learning management systems. Uganda's higher education system serves over 300,000 students from about 65 universities. During and even after the COVID-19 pandemic, universities and HEIs adopted e-learning systems, digital libraries, and blended learning activities to support interdisciplinary research, education, and training.
Problem Statement:
Despite increasing investments in digital technologies and the ongoing implementation of Competency-Based Education and Training (CBET) in Uganda, there is limited synthesized evidence on how digital transformation and emerging ICT technologies are influencing curriculum innovation, teaching and learning practices, and graduate competency development in higher education institutions. This evidence gap limits informed decision-making and strategic investments aimed at strengthening digital transformation within the higher education sector.
This study reviewed existing evidence on the role of digital transformation in facilitating the adoption of emerging ICT technologies for enhancing competency-based curriculum innovations in Ugandan universities.
Methods: A systematic literature review and policy analysis were conducted using publications sourced from Scopus, Web of Science, Google Scholar, UNESCO, World Bank reports, and Government of Uganda policy documents. A total of 87 publications published between 2015 and 2025 were identified, of which 52

met the inclusion criteria. Thematic content analysis was employed to synthesize evidence on digital transformation practices, emerging technologies, implementation challenges, and policy implications for higher education.

Results: The review revealed that institutions adopting digital learning technologies reported improved access to learning resources, increased student participation in blended learning environments, enhanced digital literacy, and strengthened critical thinking, communication, and problem-solving competencies. Successful implementation was associated with investments in digital infrastructure, continuous faculty development, and multi-stakeholder partnerships. However, inadequate funding, limited infrastructure, weak implementation capacity, digital inequality, and policy-practice gaps continue to constrain effective adoption across many institutions.

Conclusion: Digital transformation is a critical enabler of competency-based curriculum implementation in higher education. Strengthening digital infrastructure, faculty competencies, inclusive technology access, and university-industry partnerships can enhance graduate preparedness for the digital economy and support sustainable higher education reforms in Uganda.

Keywords: *Digital transformation, higher education, competency-based education, emerging ICT technologies, Uganda, systematic review.*

ENTREPRENEURSHIP, INDUSTRIALIZATION AND COMMERCIALIZATION

Digital Financial Payment Systems and Financial Inclusion: Evidence from Youth in the Rwenzori Region, Western Uganda

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ABSTRACT

Background: Digital financial payment systems have emerged as a critical mechanism for expanding access to financial services and promoting financial inclusion, particularly among underserved populations. In developing economies, digital finance offers opportunities to overcome traditional barriers to accessing formal financial services, thereby enhancing participation in economic activities.

Problem Statement: Despite the growing adoption of digital financial technologies, limited empirical evidence exists on the extent to which digital payment systems contribute to financial inclusion among young people in developing-country contexts. Consequently, the role of digital payment systems in addressing youth financial exclusion remains inadequately understood.

Methods: This study employed a convergent parallel mixed-methods design guided by the critical realism paradigm. Quantitative data were collected from 186 youth council members in the Rwenzori Region of Western Uganda, while qualitative data were obtained from 11 Chief Executive Officers of selected banks and microfinance institutions. Quantitative data were analyzed using regression analysis, while qualitative findings were used to enrich the interpretation of the results.

Results: The findings revealed a positive and statistically significant relationship between digital payment systems and financial inclusion among youth in the Rwenzori Region. Increased access to and utilization of digital payment platforms enhanced youth participation in formal financial services, thereby improving their engagement in economic and entrepreneurial activities. Qualitative findings further highlighted the importance of youth-centered digital financial products in promoting financial accessibility and participation.

Conclusion: Digital financial payment systems play a significant role in advancing financial inclusion among young people. Strengthening digital financial infrastructure and developing youth-focused financial products can enhance participation in the formal financial sector and contribute to broader socio-economic development.

Keywords: *Financial Inclusion, Digital Finance, Digital Payment Systems, Financial Services, Youth, Rwenzori Region, Uganda.*

A Hybrid Model for User Requirements Elicitation in Enterprise Resource Planning Systems Implementation: A Case Study of Mountains of the Moon University

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ABSTRACT

Background: Effective user requirements elicitation is a critical determinant of Enterprise Resource Planning system implementation success in higher education institutions. In Uganda, universities have increasingly adopted ERP systems to integrate academic, administrative, and financial operations, yet implementation failures linked to inadequate requirements gathering remain prevalent.

Problem Statement: Existing approaches, namely Goal-Oriented Requirements Engineering and Scenario-Based Approach, demonstrate significant limitations when applied independently. GORE restricts user participation while SBA lacks systematic traceability, creating a gap between institutional objectives and actual user needs. This study developed and validated a hybrid GORE–SBA model to address this gap.

Methodology: A mixed-methods design was employed. Structured questionnaires were administered to 40 lecturers across six faculties, and semi-structured interviews were conducted with 29 key informants. The hybrid model was operationalized through a designated framework validated via simulation and stakeholder assessment. Descriptive statistics, paired-sample t-tests, repeated-measures ANOVA, and Structural Equation Modeling were applied.

Results: The hybrid model achieved significantly higher effectiveness ratings (mean = 4.49, $p < 0.001$) compared to GORE (2.51) and SBA (2.60) applied independently. User participation ($\beta = 0.71$) and goal traceability ($\beta = 0.63$) were the strongest predictors of ERP success. The model explained 68 percent of the variance in implementation outcomes, with SEM confirming excellent fit (CFI = 0.96, RMSEA = 0.045).
Conclusion: The hybrid GORE–SBA model offers a validated, replicable methodology for ERP requirements elicitation in higher education. Its demonstrated uptake by UTAMU, another Ugandan university, following this study indicates potential for broader adoption across African universities pursuing digital transformation agendas.
Keywords: *Enterprise Resource Planning, requirements elicitation, user participation, higher education.*

Between Knowledge and the Market: Consumer Awareness, Attitudes, and Barriers to Agroecological Vegetable Consumption in Fort Portal Tourism City, Uganda

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ABSTRACT

Background: Agroecological farming systems are increasingly promoted as pathways for improving food safety, nutrition, and environmental sustainability. However, the success of agroecological production depends not only on farmer adoption but also on consumer demand. This study assessed consumer knowledge, attitudes, practices, and barriers related to agroecologically grown vegetables in Fort Portal Tourism City and surrounding areas.
Methods: A mixed-methods study was conducted in December 2025 involving 181 survey respondents across five sub-counties and divisions. Data were complemented by seven focus group discussions, fifteen key informant interviews, and market observations conducted across thirteen agroecology vegetable stalls. Quantitative data were analyzed using descriptive statistics and chi-square tests, while qualitative data were analyzed thematically.
Results: Awareness of agroecological vegetable production was high, with 91% of respondents demonstrating knowledge of agroecological practices. Positive attitudes were also evident, with 75.1% strongly agreeing that agroecologically grown vegetables possess higher nutritional value. Despite these favorable perceptions, purchasing behavior remained constrained. Limited market availability (68%), high prices (32%), and inadequate information on where products could be obtained (27%) were the major barriers to purchase. The Wenzo (Rwenzori) Fresh brand had low visibility, with 69.1% of respondents uncertain about its credibility. Market observations confirmed weak product differentiation and limited agroecological branding. A significant association was observed between occupational category and perceptions of product pricing ($\chi^2 = 25.21$, $p = 0.014$).
Conclusion: Consumer awareness and attitudes toward agroecological vegetables in Fort Portal City are generally positive. However, market uptake remains constrained by limited availability, weak branding, and inadequate product differentiation. Strengthening market infrastructure, improving product visibility, expanding branding initiatives, and enhancing vendor capacity are likely to have greater impact on agroecological vegetable consumption than awareness campaigns alone.
Keywords*: Agroecology, Consumer behaviour, Sustainable food systems, Urban food markets, Fort Portal City, Uganda*

Industrial Parks, Entrepreneurship Development, and Job Creation in Eastern Uganda: A Mixed Methods Study

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ABSTRACT

Background: Industrial parks are strategic tools for promoting industrialization, entrepreneurship, and employment in developing countries. In Uganda, industrial parks are key to the National Development agenda, promoting private-sector growth, value addition, investment, and sustainable opportunities. Eastern Uganda hosts the Mbale, Soroti, and Jinja Industrial Hubs and Business Parks.

Problem Statement: Despite sustainable investments in industrial infrastructure, Eastern Uganda continues to experience high levels of unemployment, persistent poverty, limited entrepreneurial growth, and growing concerns about the effectiveness of industrial parks in fostering local economic transformation. This study examined the relationship between industrial parks, entrepreneurship development, and job creation in Eastern Uganda.

Methodology: A mixed-methods design was employed. Quantitative data were collected from 290 entrepreneurs using structured questionnaires, while qualitative data were obtained through 10 focus group discussions and 30 key informant interviews involving Industrial park managers, local government officials, and community stakeholders. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data underwent thematic analysis. Findings from both strands were integrated during interpretation.

Results: Findings indicated that 68% of entrepreneurs reported business growth and market expansion, while 61% reported improved access to business networks and supply chains. Industrial parks generated approximately 4,800 direct jobs and 7,500 indirect jobs in transport, trade, construction, logistics, and related enterprises. However, skills gap, policy weaknesses, limited financing, and poor value chain integration remain key challenges.

Conclusion: Industrial parks can serve as effective catalysts for entrepreneurship development and job creation when supported by inclusive policies, entrepreneurship capacity-building programs, and strengthened linkages among industries, local businesses, and educational institutions.

Keywords: *Industrial Parks, Entrepreneurship Development, Job Creation, Industrialization, Eastern Uganda.*

Business Resilience Strategies in Africa: A Systematic Literature

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ABSTRACT

Background: Small and medium enterprises (SMEs) play a fundamental role in the economic development of nations. This has attracted considerable scholarly attention towards strengthening business resilience, particularly in the post-COVID-19 era characterized by increased volatility and uncertainty.

Problem statement: Much as existing literature identifies Africa as the fastest-growing continent, external crises and disruptions have caused significant damage to the business environment, particularly among small and medium enterprises that face unique challenges and high failure rates.

Methodology: To understand the resilience and recovery strategies adopted by businesses in the post-COVID-19 era, this study employed a Systematic Literature Review (SLR) guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. The review covered peer-reviewed English-language studies published between 2016 and 2026. The initial search yielded 795 articles. After screening for relevance and eligibility, 677 records were excluded, leaving 118 articles. A further assessment removed 15 irrelevant grey literature sources, resulting in 103 studies. Following full-text review, 60 articles were found ineligible, and 43 articles were retained for final thematic analysis.

Results: The reviewed studies identified financing, human resource development, operations management, technology adoption, marketing strategies, and external support as the key resilience and recovery strategies. Access to finance, technology adoption, and human resource development emerged as the most influential resilience measures.

Conclusions: The findings highlight the importance of resilience strategies in improving business survival and performance in volatile environments. Policymakers should strengthen financial support mechanisms,

business development services, and digital infrastructure, while managers should invest in workforce development, innovation, and adaptive business models. The review also revealed gaps in sector-specific resilience studies, digital resilience, long-term recovery outcomes, and cross-regional comparisons, which informed the future research agenda

Keywords: *Business resilience, recovery, strategies, micro, small, and medium enterprises.*

Resilient Family Businesses: Evidence on Succession Planning Practices and Long-Term Sustainability of SMEs in Kampala, Uganda

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ABSTRACT

Background: Family-owned businesses (FOBs) play a critical role in employment creation, wealth generation, and economic development worldwide. Despite their economic significance, many family businesses struggle to survive beyond the founding generation, often due to inadequate succession planning and leadership transition mechanisms.

Problem Statement: The failure of many family-owned businesses to achieve intergenerational continuity remains a major challenge in Uganda. Although succession planning is widely recognized as a key determinant of business continuity, empirical evidence on its contribution to the long-term sustainability of family-owned businesses in Uganda remains limited.

Methods: This study examined the relationship between succession planning and the sustainability of family-owned businesses in Nakawa Division, Kampala. Guided by Family Systems Theory and Social Exchange Theory, the study employed a cross-sectional mixed-methods design. Data were collected from 172 respondents, comprising 164 business owners and 8 business leaders. Quantitative data were analyzed using descriptive statistics, Pearson correlation, and regression analysis, while qualitative insights complemented the interpretation of findings.

Results: The findings revealed widespread adoption of formal succession planning practices, including documented succession plans, clearly defined successor roles, transparent selection criteria, regular plan reviews, family involvement, and contingency arrangements. Respondents reported a high level of agreement regarding the existence of structured succession mechanisms (Mean = 4.17). Pearson correlation analysis indicated a significant positive relationship between succession planning and business sustainability ($r = 0.628$, $p < 0.001$). Regression analysis showed that succession planning explained 39.4% of the variation in business sustainability ($R^2 = 0.394$), highlighting its substantial contribution to business continuity and resilience.

Conclusion: Formal succession planning is significantly associated with the sustainability of family-owned businesses. Institutionalizing succession processes, investing in successor development, and regularly reviewing succession strategies can enhance business continuity and long-term organizational resilience.

Keywords: *Family-owned businesses, succession planning, sustainability, business continuity, leadership transition, Uganda.*

Credit Risk Management Practices and Loan Portfolio Quality in Uganda's Commercial Banks. A Survey of Selected Commercial Banks.

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ABSTRACT

Background: Extending loans and advances to borrowers ranks as the primary business of commercial banks across the globe, and as such, lending is the core source of income for banks through earnings of interest income by the credit multiplication process. However, loan portfolio quality in commercial banks

continues to decline despite the measures commercial banks put in place to maintain the desired asset quality.
Problem Statement: Despite growth in loan activity and geographical coverage, Uganda's banking sector continues to trade with a growing volume of NPLs and an increasing risk of loan loss. The specific loan loss provisions grew by almost 10% from 37.75% in 2020 to 47.18% in 2024. The country's banking sector has also, over the years, seen mergers, acquisitions, takeovers, and industrial exits due to the declining primary asset quality (Bank of Uganda, Annual Supervisory Report, 2024). Yet all this manifests amidst the continued execution of credit risk management practices.
Methodology: A pragmatic mixed methods strategy combining both qualitative and quantitative approaches was adopted. Quantitative data were collected from 204 bank staff drawn from twelve (12) departments in seven (7) commercial banks using structured questionnaires, while qualitative data were obtained through 3 key informant interviews with Managing Directors and Heads of Credit. Quantitative data were analyzed using Structural Equation Modeling and Hierarchical Moderated Multiple Regression analysis, while qualitative data were analyzed thematically. Findings from both strands were integrated during interpretation.
Results: Findings indicate that Credit risk identification (CRI) and Credit risk monitoring and controls (CRM) significantly affected loan portfolio quality (LPQ) in Commercial banks before and after moderation with adverse selection (ADS). In particular, CRI showed a prediction of $\beta = 0.493$, $p<0.05$, and $\beta = 0.284$, $p<0.001$ before and after moderation, respectively. Relatedly, CRM showed a prediction power of $\beta = -0.621$, $p<0.05$, and $\beta = -0.422$, $P<0.05$ before and after moderation, respectively. However, CRA exhibited a statistically insignificant direct effect on LPQ ($\beta = 0.517$, $p = 0.429>0.05$). Surprisingly, upon moderation with ADS, the effect became statistically significant ($\beta = 0.343$, $p<0.05$). Overall, results indicate that ADS significantly moderated the effect of CRMP on LPQ in commercial banks with interaction terms of CRI×ADS = -0.367, $p<0.05$; CRA × ADS = - 0.337, and CRM × ADS = - 0.422, $p<0.05$, respectively.
Conclusion: CRI and CRM significantly predict LPQ, while CRA is insignificant in predicting LPQ in commercial banks. ADS significantly moderated the effect of CRMP on loan portfolio quality.
Keywords: *Credit Risk Management Practices, Loan Portfolio Quality, Adverse Selection, Mixed Methods, Commercial Banks.*

Asymmetric Information on Cost of Debt among commercial banks, tier 2, and Tier 3 Financial Institutions in Uganda.

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ABSTRACT
Background: Due to asymmetric information between the financial institutions and borrowers, premiums demanded by lenders expose both clients and institutions to risk of unsustainability which sabotages all aspects of NDP-IV.
Problem Statement: Although the loan amortization schedule is the objective feature in bargaining loan contracts, the cumulative algorithmic interest arising from upfront deduction remains undisclosed and unclear in the literature. Initial deductions are not included in the applied amortization algorithms. Yet their exclusion arises from compounded interest. Although literature presents several amortization models, no consideration has been made to account for such hidden costs. This paper, therefore, exposes accumulated interest arising from initial deductions among all commercial banks, Tier 2, and Tier 3 financial institutions in the country
Methodology: An embedded experimental exploratory research design was employed. Prototyping began with a design team of 5 experts that reviewed published models and developed a deduction-inclusive model. A survey was made on 54 institutions, accounting for 75% response rate, to test and validate the model. All the identified initial deductions were expressed as a percentage of the loan disbursed.
Results: Findings indicate that the overall average percentage of hidden interest accruing from the upfront payment accounts for 2.9% of the total interest charged. This cost is not disclosed in the loan contracts.
Conclusion: Initial deductions should be disclosed in both the loan contract and amortization schedules. Perhaps a separate contract for initial deductions should be provided.
Keywords: *Upfront payment, loan amortization, hidden costs.*

Pushed Limits: Effect of Visitor Density and Seasonality on the Diet and Stress Behaviours of free-ranging Black and White Colobus Monkeys at Uganda Wildlife Education Conservation Centre (UWEC), Entebbe, Uganda.

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ABSTRACT

Background & Problem Statement: This study assessed how seasonal visitor density, noise, and weather impact the behaviour and diet of *Colobus guereza* at UWEC to inform animal welfare and visitor management strategies.
Methodology: From May to August 2025, data from an estimated 5 to 8 monkeys were gathered using focal and scan sampling. Observations tracked diet, environmental conditions, and specific behavioural states. The analysis deployed chi-square tests and correlational models to evaluate the data.
Results: Chi-square analyses found no significant overarching behavioural shifts linked to weather ($\chi^2 = 4.73$, $p = .786$), noise ($\chi^2 = 0.63$, $p = .960$), or season ($\chi^2 = 1.37$, $p = .849$). Foraging remained uninfluenced by weather or noise, showing a consistent preference for young leaves across seasons. However, correlational models revealed that peak visitor seasons significantly escalated stress indicators: aggression ($r = 0.471$), self-scratching ($r = 0.432$), and restlessness ($r = 0.398$). Conversely, off-peak periods positively correlated with calmer maintenance activities like resting and grooming.
Conclusion: Despite stable broad routines, elevated stress during peak visitor periods demands action. UWEC should adopt comprehensive visitor management strategies, enhance environmental enrichment, and integrate behavioural monitoring into welfare assessments.
Keywords: *Black and White Colobus Monkeys, Feeding Behaviour, Peak and Off-Peak Visitor sessions*

Cost Management Practices and Financial Performance of Agro-Processing Firms in Acholi Sub-Region

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ABSTRACT

Background: Agro-processing plays a critical role in economic transformation through value addition, industrialization, employment creation, and rural development, thereby contributing significantly to the achievement of the Sustainable Development Goals. Despite this contribution, many agro-processing firms in Uganda continue to experience financial performance challenges, raising concerns regarding the effectiveness of their managerial practices. Cost management practices have been identified as a potential mechanism for enhancing organizational performance; however, empirical evidence on their influence within agro-processing firms in the Acholi sub-region remains limited.
Problem Statement: Although agro-processing firms are expected to contribute to economic growth and competitiveness, many continue to face financial constraints characterized by low profitability, liquidity challenges, and operational inefficiencies. The extent to which cost management practices influence financial

performance in these firms remains inadequately understood. This study, therefore, examined the relationship between cost management practices and the financial performance of agro-processing firms in the Acholi sub-region of Uganda.

Methodology: The study was anchored in the pragmatic paradigm and employed a convergent mixed-methods design. Data were collected from 70 agro-processing firms using structured questionnaires and interview guides. Both probability and non-probability sampling techniques were used in selecting firms and respondents. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data were analyzed thematically. Findings from both strands were integrated during interpretation.

Results: The findings revealed a strong and statistically significant positive relationship between cost management practices and financial performance ($\beta = 0.642$, $t = 12.972$, $p < 0.001$), indicating that improvements in cost management practices are associated with enhanced financial performance among agro-processing firms. Qualitative findings further revealed that effective planning, budgeting, cost control, and resource utilization contributed to improved operational outcomes and profitability.

Conclusion: The study concludes that cost management practices are critical determinants of financial performance among agro-processing firms in the Acholi sub-region. Strengthening cost management systems and aligning them with organizational capabilities and environmental conditions can enhance financial sustainability and competitiveness.

Key Words: Financial Performance, Agro Processing firms, Acholi Sub-Region, & Cost Management.

Strategic Value-Chain Approach to Niche Tourism Product Development

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ABSTRACT

Background: The contemporary experiential economy has expanded tourism beyond traditional sightseeing to encompass immersive experiences based on human lifestyles, wellness, and personal transformation. Activities such as walking, running, and sleeping are increasingly being packaged as specialized tourism products that attract diverse market segments and contribute to destination competitiveness.

Problem Statement: Despite the growing popularity of niche tourism products, there remains limited understanding of how fundamental human activities can be systematically transformed into high-value tourism experiences that support sustainable destination development and regional economic growth.

Methodology: This paper employed a conceptual and comparative case-study approach grounded in a tourism value-chain framework. Evidence was synthesized from established international tourism products, including the Camino de Santiago pilgrimage routes, the World Marathon Majors, and luxury sleep and wellness retreats. The analysis examined the processes through which ordinary human activities are converted into marketable tourism experiences through destination planning, infrastructure development, service integration, and branding.

Results: The study demonstrates that successful niche tourism products emerge through the strategic integration of interpretive infrastructure, event management systems, wellness-oriented facilities, and destination storytelling. Four interrelated stages were identified in the tourism product development process: commodification of the activity, infrastructure and accessibility development, service wrapping, and narrative branding. These stages collectively enhance visitor experience, increase destination attractiveness, and generate opportunities for local economic participation.

Conclusion: Walking, running, and sleeping can be transformed into high-value tourism products when supported by appropriate infrastructure, experiential design, and destination branding strategies. The proposed value-chain framework provides practical guidance for tourism planners and destination managers seeking to diversify tourism offerings, strengthen destination competitiveness, and promote sustainable regional development.

***Keywords**: Tourism Product Development, Experiential Economy, Sleep Tourism, Sports Tourism, Value Chain Framework, Destination Branding.*

Food Supply Chain Technologies: Lessons from Milk ATM on Consumers' Attitude as Determinant for Preference and Purchase Intentions

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ABSTRACT

Background: Market practices and consumer preferences have drastically changed due to market de-regulation and increased dominance of multinational new technologies in food sector. This has led introduction of milk ATMs in the dairy industry.
Problem Statement: Though consumer studies have received significant attention in the field of marketing management, research on consumer attitude towards food supply technologies is needed. This paper investigates the relationship between consumer attitude and preference of buying of milk from a 'milk ATM.
Methodology: Based on quantitative data obtained from 296 consumers through a convenient sampling technique. This data was later analyzed using PLS-SEM. In addition, multiple group analysis was conducted to test for group differences between male and female consumers.
Results: PLS-SEM provides standardized path coefficients for the hypothesized relationships. It was observed that milk ATM purchasers' utilitarian value has a significant positive effect on preference ($t = 9.109$, $p < 0.05$). The results suggest that milk TMs are perceived as useful in quality improvement and convenience options for purchasing milk. Furthermore, in regard to hypothesis 2 (H2), hedonic consumer value has a significant positive effect on preference ($t = 4.103$, $p < 0.05$). The results imply that experiential emotions of milk ATM purchasers such as fun, excitement and easiness, influence consumers' preference. The two variables significantly influence the preference for purchasing milk from milk ATMs. Overall, utilitarian value observed a higher coefficient on preference towards the milk ATM than hedonic values.
The gender distribution was relatively even, 144 (48.6%) males and 152 (51.4%) females. The results of the multiple group analysis indicate that there are significant differences among male ($t = 2.712$, $p < 0.05$) and female ($t = 1.962$, $p < 0.05$) purchasers with respect to the relationship between utilitarian consumer attitude and preference.
Conclusion: Notably, the current research focused on purchaser's perspective, targeting buyers' utilitarian value and hedonic value on preference and purchase intentions. Future research question can investigate the views of different stakeholders of the dairy value chain. Nevertheless, the study provides novel and positive insights on milk ATMs at its infancy stage, which could lay a foundation for future investments in food supply chain technologies.
Keywords*: Supply chain technologies, Milk ATMs, Consumer Attitude, Preference, intensions, Hedonic, utilitarian*.

The Influence of Relational Capital on Business Performance in Agro-Food Processing SMEs in Western Uganda

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ABSTRACT

Background:
Agro-food processing SMEs play an important role in employment creation, value addition, and economic development in Uganda. Relational capital, reflected in networks and stakeholder relationships, can enhance business performance through improved market access, resource mobilization, and competitiveness. However, evidence from Western Uganda remains limited

Problem Statement: Despite their contribution to employment, value addition, and income generation, many agro-food processing SMEs in Western Uganda continue to experience poor business performance. Limited empirical evidence exists on how relational capital influences SME success, constraining evidence-based strategies for improving competitiveness and sustainability. This study filled this information gap by examining the relationship between relational capital and SME performance, guided by the Resource-Based View (RBV).

Methodology: A cross-sectional mixed-methods study methodology was used to collect quantitative data from 179 family-owned, small, and medium-sized agro-food processors using structured questionnaires and qualitative key informant interviews. Respondent categories mostly consisted of firm owners and production managers. A construct that included both non-financial indicators (customer happiness, customer retention) and financial measurements (sales growth, profit growth, financial efficiency) was used to measure business performance.

Results: Path analysis was used to assess the direct linkages of latent variables within a structural equation modeling (SEM) framework. Relational capital has a positive and statistically significant direct impact on business performance ($\beta = 0.433$, $t = 3.255$, $p = 0.001$, 95% CI [0.172, 0.694]), according to the path analysis. In practical terms, this high positive coefficient indicates that fostering external trust-based networks like supplier credit lines, bank-farmer partnerships, and customer recommendations directly improves cash flow management, organic market expansion, and customer loyalty while reducing transaction costs. In order to keep a tight, objective focus, unrelated human capital findings were eliminated.

Conclusion: In emerging economies, relational capital is a key factor in determining the success of SMEs. While governments should create frameworks that support formal trade networks and regional value-chain ecosystems above classroom-based training, managers should prioritize collaborative networks to promote sustained industrialisation.

Keywords: *Relational Capital, Agro-food Processing, Business Performance, SMEs, SEM, Western Uganda.*

HUMAN CAPITAL, GOVERNANCE AND SOCIAL INCLUSION

Household Behaviours and Gender Dynamics in Urban Homemade Organic Waste Compost Quality: Pathways to Circular Economy; A Systematic Review

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ABSTRACT

Background: Rapid urban waste growth and global sustainability efforts underscore the critical need for effective household organic composting. This practice mitigates environmental risks from growing waste streams and dumping sites while reducing reliance on synthetic fertilizers.
Problem Statement: Compost quality depends on technical factors such as methods and waste type, but household behaviour and gender roles dictate how organic waste is segregated, managed, and composted. This review evaluated how household waste sorting and gender roles affect the stability, nutrient profiles, and contamination levels of homemade compost.
Methodology: This review followed the PRISMA framework. We searched Google Scholar and PubMed for English studies published between 2015 and 2026 using keywords related to waste sorting, gender dynamics and compost quality. Both quantitative and qualitative designs were eligible. Screening narrowed the initial 57 records down to 9 final studies for synthesis.
Results: Morals and individual motivation positively predict waste sorting, which is critical for compost quality. Sorting organic waste away from glass, metals, and plastics maintains a stable C:N ratio, whereas poor segregation leaves 106.7kg/ha of plastic and metal contaminants in amended soils, increasing pollution. Composting efficiency is further hindered by gendered divisions of labour. Women face a cumulative chore burden that limits their sorting and turning capacity, while men's preoccupation with other agricultural duties delays heap turning, slowing down decomposition.
Conclusion: Active household source separation yields high-quality, contaminant-free compost. Since gender dynamics position women as primary waste managers, targeted training, policy incentives, and convenient infrastructure are critical to increasing composting efficiency.
***Key words**: Efficacy; waste segregation; sorting*

Contract Management Practices and Service Delivery in Local Governments: Evidence from Structural Equation Modelling

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ABSTRACT

Background: Effective contract management is essential for improving service delivery in local governments through enhanced accountability, value for money, and timely execution of public contracts. Despite procurement reforms, many local governments continue to experience project delays, cost overruns, and poor-quality outputs that undermine citizen satisfaction with public services.
Problem Statement: Citizen Satisfaction with public services remains below the national target, partly due to weaknesses in contract management practices. This study examined the influence of contract management practices on service delivery in local governments.
Methods: An explanatory cross-sectional design employing a quantitative approach was adopted. Data were collected from 181 respondents using structured questionnaires and documentary review. Structural Equation Modelling (SEM) was used to test the hypothesized relationships between contract management practices and service delivery. The measurement and structural models satisfied established reliability, validity, and model fit requirements.

Results: Effective contract monitoring significantly improved service delivery by strengthening compliance and accountability in contract implementation (β = 0.271, t = 4.314, p < 0.001). Likewise, proper management of contract changes and variations enhanced project performance and service outcomes (β = 0.254, t = 4.000, p < 0.001). Contract performance evaluation emerged as the strongest predictor of service delivery, suggesting that continuous assessment of contractor performance is critical for achieving desired public service outcomes (β = 0.321, t = 5.156, p < 0.001). Together, these practices explained 47.2% of the variation in service delivery (R^2 = 0.472).
Conclusion: Contract management practices significantly influence service delivery in local governments. Strengthening contract monitoring, variation management, and performance evaluation mechanisms can improve efficiency, accountability, and citizen satisfaction with public services.
Keywords*: Contract management, service delivery, local governments, public procurement, Structural Equation Modelling.*

Urbanization and Female Labour Force Participation in Sub-Saharan Africa: Evidence from Dynamic Panel Analysis (2009–2023)

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ABSTRACT

Background: Female labour force participation (FLFP) is a critical driver of inclusive economic growth and sustainable development. However, despite rapid urbanization across Sub-Saharan Africa (SSA), female labour force participation rates have remained stagnant or declined in several countries. As urbanization continues to transform labour markets, understanding its influence on women's economic participation is essential for designing gender-responsive development policies.
Problem Statement: Although urbanization is expected to expand employment opportunities and improve access to economic resources, empirical evidence on its effect on female labour force participation in SSA remains limited and inconclusive. This study examined the relationship between urbanization and female labour force participation across Sub-Saharan Africa.
Methods: The study utilized panel data for 41 SSA countries covering the period 2009–2023, obtained from the World Development Indicators (WDI). A dynamic panel data approach was employed, with the one-step Difference Generalized Method of Moments (GMM) estimator serving as the primary estimation technique. Fixed Effects and two-step Difference GMM models were used to test the robustness of the findings.
Results: Urbanization was found to have a positive and statistically significant effect on female labour force participation. A one-percentage-point increase in urbanization was associated with a 0.215% increase in female labour force participation. In contrast, a higher rural population share significantly reduced female labour force participation. GDP per capita growth positively influenced women's labour market participation, while age dependency ratios exerted a significant negative effect. Although foreign direct investment and male labour force participation exhibited positive coefficients, their effects were not statistically significant in the main model.
Conclusion: Urbanization plays a significant role in enhancing female labour force participation in Sub-Saharan Africa by expanding access to non-agricultural employment opportunities and economic resources. Policies that promote inclusive urban development, investment in women-intensive sectors, and reductions in dependency burdens can contribute to greater female participation in labour markets and support sustainable economic development.
Keywords: *Urbanization, Female Labour Force Participation, Labour Markets, Dynamic Panel Analysis, Generalized Method of Moments, Sub-Saharan Africa.*

Thinking through Toro's Tea Industry: Past, Present and Future

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ABSTRACT

Background: Tea growing has been the main agricultural farming activity that the Tooro region has embraced. Tooro's tea industry has not only been providing household incomes and export revenue to the country but has also been a contributing factor to tourism.

Statement of the problem: However, over the years, the Tooro tea industry has experienced a downward trend in production and revenue generated from sales. The study sought to document the past, present, and future of the tea industry in the Tooro region.

Methodology: This study adopted a qualitative research method. The informants included the tea factory administrators and NARO. Purposive sampling was used to identify the study informants.

Results: The emerging themes showed that missionaries and colonial officials introduced tea growing. The collapse of the tea industry was attributed to a lack of laws that regulate the conduct of farmers. Toro's comparative advantage lies in favorable weather and fertile soils.

Conclusion. The tea industry is experiencing a downward trend due to a lack of a regulatory framework to streamline tea growing. Therefore, there is a need to enact an enabling law to streamline the tea industry in the country.

Keywords: *Tea growing, Tooro region, Tea factories.*

Leadership for University-Affiliated Think Tanks and Socio-Economic Transformation in the Ugandan Higher Education Space

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ABSTRACT

Background: University-affiliated think tanks are increasingly recognized as strategic platforms for generating policy-relevant knowledge, fostering innovation, and supporting socio-economic transformation. As universities expand their mandate beyond teaching and research, these entities play a critical role in bridging academic knowledge, public policy, and societal development. In Uganda, university-based research and policy centres have emerged as important contributors to evidence-informed decision-making and development processes.

Problem Statement: Despite their growing prominence, limited empirical and conceptual attention has been devoted to understanding how leadership influences the effectiveness of university-affiliated think tanks and their contribution to socio-economic transformation within the higher education sector.

Methods: This study employed a qualitative discourse analysis approach. Scholarly literature and published studies on think tanks in higher education were purposively reviewed. Data were analysed through thematic interpretation of recurring narratives, concepts, and representations relating to leadership, institutional structures, and knowledge-production practices. Particular attention was given to university-affiliated centres in Uganda and comparable contexts engaged in policy research, innovation, and community-oriented knowledge production.

Results: Findings reveal a shift in the discourse surrounding university think tanks from traditional research centres to knowledge intermediaries that connect academic research, policy processes, and societal needs. Effective leadership was found to facilitate knowledge dissemination through policy dialogues, media engagement, and policy briefs; promote innovation and professional learning ecosystems; strengthen stakeholder partnerships; and enhance interdisciplinary collaboration. The analysis further highlights think tanks as hybrid institutional structures that balance academic rigor with policy relevance while participating in regional and global knowledge networks. These functions position university-affiliated think tanks as key contributors to evidence-based decision-making and socio-economic transformation.

Conclusion: Strategic leadership is essential for enhancing the effectiveness, sustainability, and policy influence of university-affiliated think tanks. Strengthening governance frameworks, institutional support, and sustainable funding mechanisms can enhance their contribution to national development.

Keywords: *Think tanks, higher education, leadership, knowledge translation, socio-economic transformation.*

The role of indigenous knowledge in conflict resolution. A case of selected Rutooro proverbs in Uganda, 1830-1900

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ABSTRACT

Background: Conflict remains a barrier to socioeconomic transformation. While colonial rule undermined African indigenous knowledge systems, revisiting original values is crucial for social cohesion. Studying Rutooro proverbs and documenting their utilitarian value in conflict resolution is imperative to safeguard Toro's endangered heritage in the form of proverbs as part of indigenous knowledge.
Problem Statement: Tooro has experienced recurrent conflicts since precolonial times. Scholars attribute this to the reliance on Western conflict resolution methods at the expense of indigenous systems. While proverbs are known to prevent and resolve disputes across Africa, no study has specifically focused on Rutooro proverbs. This study attempts to bridge this gap by examining the role of Rutooro proverbs in conflict resolution from 1830 to 1900.
Methodology: This study adopted a qualitative historical research design. Data were collected from 20 clan leaders using an interview guide. The respondents were selected using the purposive sampling technique. Three focus group discussions were also conducted to obtain more data on the utilitarian value of Rutooro proverbs as part of indigenous knowledge in relation to conflict resolution.
Results: Findings reveal that Rutooro proverbs embody shared beliefs, values, and worldviews. Rich in literary elements like similes and metaphors, they leave lasting impressions on listeners. Clan leaders, as custodians of indigenous knowledge, utilized these proverbs to pass judgment and offer advice. They bore the responsibility of preserving and transmitting this wisdom to younger generations during marriage negotiations, community assemblies, and family gatherings.
Conclusion: Rutooro proverbs form a vital component of indigenous knowledge. The study will contribute remarkably to ongoing scholarly discourses in conflict resolution and indigenous knowledge
Keywords*: Proverbs, Indigenous knowledge, conflict resolution.*

When Conflict Turns Toxic: Wildlife Poisoning Around Toro-Semliki Wildlife Reserve, Uganda

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ABSTRACT

Background: Wildlife poisoning is an emerging conservation and public health concern in agricultural landscapes adjoining protected areas, where pesticides are misused following crop damage and livestock losses, resulting in devastating consequences for wildlife populations and broader ecosystem health.
Problem Statement: Around Toro-Semliki Wildlife Reserve, evidence on poisoning prevalence, drivers, affected species, and health risks remains limited. This study assessed wildlife poisoning practices among adjacent smallholder farmers, focusing on the prevalence, targeted species, drivers, and health risks associated with wildlife poisoning.
Methodology: A cross-sectional mixed-methods study surveyed 215 households using questionnaires, field observations, and the Randomized Response Technique (RRT) from January to March 2023. RRT protected anonymity to improve disclosure of a sensitive illegal behavior. Bivariate and multivariate logistic regression models were fitted to identify factors associated with wildlife poisoning. Data analysis was conducted in R Studio.
Results: Direct questioning showed higher poisoning prevalence than RRT (26% vs 15%), suggesting that local trust may have encouraged disclosure, while RRT comprehension challenges may have lowered indirect estimates. Poisoning was significantly associated with perceived wildlife-damage severity ($\chi^2 = 6.98$, df = 2, $p \leq 0.05$), and mortality varied significantly among targeted species, mainly affecting baboons and village

weavers. Carbamate pesticides, particularly carbofuran products, predominated. Farmers with no formal education (AOR = 4.95), growing biennial crops (AOR = 4.37), and operating on small farms (AOR = 3.84), and having limited farming experience (AOR = 0.48) were more likely to engage in wildlife poisoning. Unsafe handling of poisoned carcasses, including scavenging of poisoned carcasses, was reported. 44.4% of those who consumed such meat experienced symptoms consistent with pesticide exposure, including stomach pain, diarrhea, dizziness, vomiting, and headache.
Conclusion: Wildlife poisoning around Toro-Semliki threatens biodiversity, livelihoods, and public health. Addressing wildlife poisoning and related consequences requires strengthened regulation of hazardous agrochemicals, targeted farmer awareness on safe pesticide handling and carcass disposal, and the implementation of effective human-conflict mitigation strategies to promote coexistence.
Keywords*: Wildlife poisoning; human-wildlife conflict; pesticide misuse; public health.*

Establishing the Interrelationship between Human Capital, Governance, Social Inclusion, and Sustainable Development in Ankole Region, Western Uganda

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ABSTRACT

Background: Sustainable development is a global priority, yet developing countries face persistent challenges including weak governance, inequality, and limited human capital. Existing studies have largely examined human capital, governance, and social inclusion independently, leaving a gap in understanding their interrelationships within a unified framework.
Problem Statement: The interrelationship among human capital, governance, social inclusion, and sustainable development remains underexplored in the Ankole Region. This study examined how these factors jointly influence sustainable development outcomes.
Methodology: A cross-sectional, correlational design with a quantitative approach was employed. Data were collected from 218 respondents using structured questionnaires. Descriptive statistics, Pearson correlation, and multiple regression analysis were used for analysis.
Results: Human capital strongly correlated with sustainable development (r = 0.81), while governance (r = 0.77) and social inclusion (r = 0.79) also showed significant positive relationships. Skills development (β = 0.55), resource utilization efficiency (β = 0.52), and social protection (β = -0.58) were the strongest predictors within their respective domains. The combined model explained 74% of the variation in sustainable development outcomes.
Conclusion: Human capital, governance, and social inclusion are mutually reinforcing determinants of sustainable development. Integrated policy interventions investing in education and skills, strengthening transparent governance, and expanding social protection programs are essential for achieving sustainable development.
Keywords: *Human Capital, Governance, Social Inclusion, Sustainable Development, Ankole Region.*

Governance Factors Influencing Social Inclusion and Human Capital Development in Rural Uganda: Evidence from Ntungamo District

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ABSTRACT

Background: Human capital development, encompassing education, health, and livelihood skills, is central to inclusive growth and sustainable development. However, many rural communities in Uganda continue to experience social exclusion despite the existence of national social protection frameworks.
Problem Statement: Although Uganda has implemented policies aimed at promoting social protection and inclusion, vulnerable populations remain disproportionately excluded from essential services and development opportunities. Limited evidence exists on how local governance mechanisms influence social inclusion and human capital outcomes in rural communities.

Methods: A convergent mixed-methods design was employed in three rural sub-counties of Ntungamo District. Quantitative data were collected from 384 randomly selected households, while qualitative data were obtained through 12 focus group discussions and 20 key informant interviews. Logistic regression and thematic analysis were used to examine governance factors associated with inclusive service delivery.
Results: Only 38% of vulnerable households reported accessing social protection benefits within the previous year. Households residing in communities with regular dialogue meetings were more likely to report social inclusion than those without such platforms (OR = 2.4, $p < 0.05$). Functional grievance redress mechanisms were also associated with improved access to services and participation in local decision-making. Qualitative findings revealed that inadequate disaggregated data limited the inclusion of persons with disabilities, while partnerships between local governments and community-based organizations enhanced access to skills development and social protection programmes.
Conclusion: Inclusive governance mechanisms play a critical role in strengthening social inclusion and improving access to human capital development opportunities. Strengthening community engagement, accountability systems, and inclusive data management practices can enhance the effectiveness of social protection interventions and contribute to sustainable rural development.
Keywords: *Human capital, social protection, governance, social inclusion, rural development, Uganda.*

Strengthening Human Capital through NGO Support to Secondary Education in Rwanda: Evidence from Gasabo District.

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ABSTRACT

Background: Human capital development is widely recognized as a critical driver of socio-economic transformation and national development. Secondary education plays a central role in equipping learners with the knowledge, skills, and competencies required for productive participation in society. In Rwanda, Non-Governmental Organizations (NGOs) complement government efforts by supporting secondary schools through financial assistance, provision of learning materials, infrastructure development, and community engagement initiatives aimed at improving educational outcomes.
Problem Statement: Despite notable progress in expanding access to secondary education, many schools continue to face challenges related to enrolment, quality of education, equity, and resource adequacy. Limited empirical evidence exists regarding the contribution of NGO interventions to human capital development through secondary education, particularly in Gasabo District, Rwanda.
Methodology: The study employed a convergent parallel mixed-methods design. Quantitative and qualitative data were collected concurrently using questionnaires, interviews, and document review. Of the targeted sample of 387 respondents, 350 participated in the study, yielding a response rate of 90.4%. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data were subjected to thematic analysis to complement and explain quantitative findings.
Results: The findings revealed a strong and statistically significant relationship between NGO interventions and improvements in secondary education outcomes. Financial support ($r = .871$), provision of learning materials ($r = .896$), and teacher and community support programmes ($r = .939$) were positively associated with educational improvement. Financial assistance contributed to increased student enrolment (63.9%), while the provision of learning materials enhanced teaching and learning effectiveness by 60.5%. Community and teacher support initiatives improved educational inclusion and participation (66.7%). Qualitative findings further indicated improved student retention, enhanced teacher capacity, and increased community involvement in school activities.
Conclusion: NGO interventions significantly contribute to human capital development by enhancing access to secondary education, improving educational quality, and promoting inclusion. Strengthened collaboration among government, schools, communities, and development partners is essential for sustaining educational gains and advancing long-term human capital development in Rwanda.
Keywords: *Human capital development, Non-Governmental Organizations, Secondary education, & Educational inclusion.*

Interrogating Unemployment amid Growth: Tracking Youth Unemployment in Neo-Liberal Uganda, 1990–2019

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ABSTRACT

Background: The paper traces the paradox of youth unemployment amid an upswing of economic growth ever since Uganda adopted neo-liberal reforms in the 1980s. This impacted the ever-increasing youthful human resources' inclusion for sustainable development and spiraled into the socio-political landscape as youth agency strove for better positioning.

Problem Statement: While economic growth is expected to increase employment, Uganda's growth yielded a contradictory trajectory of increasing unemployment, especially among the youth. Over time, the government undertook targeted interventions to address youth unemployment, which, however, escalated. But why was the growing economy failing to absorb labour? Why were government interventions failing?

Methodology: This work blended secondary, documentary, and field research in districts of Rubirizi – Western region, Luwero in the Central, and Arua in the North to interrogate the paradox of persistent youth unemployment amidst economic growth between 1990 and 2019.

Results: The skewed global and domestic neo-liberal architecture did not enable domestic actors and sectors to optimally, sustainably, and inclusively absorb and utilize labour against the declining traditional labour absorbing sectors after the reforms. The interplay deflated interventions as growth was largely aid/loan-driven; limited service 'enterprises' and import consumerism, and the controversial, debilitating, syncretic 'informal' sector.

Conclusion: The reconstituted state needs to realign the neo-liberal structure for sustainable domestic development, labour absorption, and utilisation.

Keywords: *Neoliberalism, state, employment, youth.*

INNOVATIONS FOR HEALTH WELL-BEING, AND SOCIAL PROTECTION

Ergonomic and Environmental Predictors of Low Back Pain among Floriculture Workers in Central Uganda

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ABSTRACT

Background: Low back pain (LBP) is one of the leading occupational health disorders worldwide and is associated with reduced productivity, absenteeism, disability, and substantial economic costs. Workers in the floriculture industry are particularly vulnerable due to prolonged standing, repetitive movements, manual handling of loads, and exposure to demanding work environments.

Problem Statement: Despite the rapid growth of Uganda's floriculture sector, limited evidence exists on the prevalence of low back pain and its associated occupational risk factors among floriculture workers. This evidence gap constrains the development of targeted workplace health and safety interventions aimed at reducing musculoskeletal disorders and improving worker well-being.

Methods: A cross-sectional study was conducted among 486 workers at Fiduga Flower Farm, Uganda, between February and May 2024, yielding a response rate of 98.3%. Data were collected using structured questionnaires and interview guides and analyzed using SPSS version 16. Chi-square tests were used to assess associations between low back pain and selected risk factors, while binary logistic regression was employed to identify independent predictors of low back pain. Statistical significance was considered at $p \leq 0.05$.

Results: The prevalence of low back pain among floriculture workers was 13.2% (n = 64). Significant associations were observed between low back pain and gender ($p < 0.001$), cigarette smoking ($p < 0.001$), engagement in heavy labour ($\chi^2 = 6.997$, $p = 0.001$), department of work ($\chi^2 = 21.598$, $p = 0.005$), prolonged working hours ($p < 0.001$), and job description ($p < 0.001$). In contrast, age ($p = 0.069$), height ($p = 0.067$), and alcohol consumption ($p = 0.109$) were not significantly associated with low back pain.

Conclusion: Low back pain remains a significant occupational health challenge among floriculture workers and is primarily associated with ergonomic and workplace-related factors. Strengthening occupational health programmes through ergonomic interventions, mechanized lifting support, and improved work scheduling could reduce the burden of low back pain and enhance worker productivity and well-being.

Keywords: *Low back pain, floriculture workers, occupational health, ergonomic risk factors, musculoskeletal disorders, Uganda.*

Antibacterial Activity of Phytolacca Dedocandra Extracts on Sphingomonas Paucimobilis

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ABSTRACT

Background: Antimicrobial resistance (AMR) has emerged as a major global public health challenge, necessitating the search for novel and effective antibacterial agents from medicinal plants. *Phytolacca dodecandra* (Endod), a plant widely used in African traditional medicine, possesses documented pharmacological properties; however, its antibacterial activity against emerging opportunistic pathogens remains inadequately explored.

Problem Statement: *Sphingomonas paucimobilis* is an emerging opportunistic pathogen characterized by intrinsic resistance to multiple antibiotics, posing challenges to infection management. Despite the widespread traditional use of *P. dodecandra*, limited scientific evidence exists regarding its efficacy against

this clinically important bacterium. This study evaluated the antibacterial activity of aqueous and ethanolic extracts of *P. dodecandra* roots and leaves against *S. paucimobilis*.
Methods: Plant materials were collected from Mugoma Sub-county, Kabarole District, Uganda, and extracted by maceration using distilled water and 96% ethanol for eight days. Antibacterial activity was assessed using agar disc diffusion and broth microdilution techniques. Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) were determined using serial dilutions ranging from 100 mg/mL to 0.078 mg/mL.
Results: The ethanolic root extract exhibited the strongest antibacterial activity, producing inhibition zones ranging from 21.7 mm at 100 mg/mL to 1.0 mm at 0.78 mg/mL, with an MIC of 6.25 mg/mL and an MBC of 12.5 mg/mL. The ethanolic leaf extract demonstrated moderate activity, with an MIC of 5.0 mg/mL and an MBC of 10.0 mg/mL. In contrast, aqueous extracts showed substantially lower antibacterial activity. Aqueous root extracts recorded MIC and MBC values exceeding 100 mg/mL, while aqueous leaf extracts exhibited an MIC of 10 mg/mL and an MBC exceeding 10 mg/mL. Antibacterial activity increased with extract concentration, with ethanolic extracts consistently outperforming aqueous extracts and root extracts exhibiting greater potency than leaf extracts.
Conclusion: *Phytolacca dodecandra* possesses significant antibacterial activity against *Sphingomonas paucimobilis*, particularly in ethanolic root extracts. These findings provide scientific evidence supporting its traditional medicinal use and highlight its potential as a source of affordable antibacterial agents for managing opportunistic bacterial infections.
***Keywords**: Antibacterial activity, Phytolacca dodecandra, Sphingomonas paucimobilis, antimicrobial resistance, minimum inhibitory concentration, medicinal plants.*

Genomic Source Tracking of Antimicrobial Resistance Genes in Escherichia coli isolates from the Lake Victoria Ecosystem

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ABSTRACT

Background: Antimicrobial resistance (AMR) is a major global public health challenge, threatening both humans and animals. Globally, 1.27 million fatalities have been annually attributed to AMR; as a result, it has led to a sharp rise in healthcare expenses.
Problem statement: Currently, there is a noted increase in the prevalence of AMR. This highlights the presence of Antimicrobial Resistant Genes, and some resist last-line drugs, such as the ESBLs and Carbapenems.
Methodology: The study was conducted at Kasenyi and Ggaba landing sites on Lake Victoria, involving 540 fecal, soil, fish gills, and water samples. Antimicrobial susceptibility testing was conducted on *E. coli* isolates from all sample types, and further confirmed using VITEK 2.0. Whole Genome Sequencing was done for 24 isolates with noted Carbapenem and ESBL resistance, to detect and identify specific genetic markers unique to different sources.
Results; The frequency and distribution of key AMR genes among the isolates had a total of 10 resistance genes identified with sul2 14/24 (58.3 %), tet(A) 13/24 (54.2 %), qnrS111/24 (45.8 %), blaTEM-1 10/24 (41.7 %), blaCTX-M-15 5/24 (20.8 %), sul3with 5/24 (20.8 %), gyrA_S83L 4/24 (16.7 %); qnrS13, sul1 and dfrA1 each had 3/24 (12.5 %). Source-specific patterns indicated that effluent and shoreline isolates harbored the most diverse and complex resistance profiles, often exhibiting multidrug resistance.
Conclusion: High frequencies of resistance genes such as *sul2*, *tet(A)*, *qnrS1*, and *blaTEM-1* correspond with observed resistance to commonly used antibiotics, while the presence of clinically important genes like *blaCTX-M-15* highlights environmental infiltration of priority resistance mechanisms.
***Keywords:** Antimicrobial resistance, Escherichia coli, Genomic source tracking, extended spectrum beta-lactamases, Carbapenems.*

Ethnobotanical Study of Medicinal Plants Used by Herbalists in Kyondo Sub-County, Kasese District, Western Uganda

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ABSTRACT

Background: Medicinal plants remain an important source of primary healthcare for many rural communities, particularly in developing countries where access to modern healthcare services is often limited by financial, geographical, and infrastructural constraints. Traditional medicinal knowledge plays a vital role in healthcare delivery, yet much of this knowledge remains undocumented and is increasingly threatened by socio-cultural change and biodiversity loss.
Problem Statement: Despite the widespread use of traditional medicine in Kyondo Sub-county, Kasese District, the diversity of medicinal plants and associated indigenous knowledge have not been systematically documented. This knowledge gap increases the risk of cultural erosion and loss of potentially valuable medicinal resources.
Methods: A sequential exploratory mixed-methods design was employed. Semi-structured interviews were conducted with eight purposively selected herbalists to document medicinal plant species, preparation methods, and modes of administration. Guided field walks facilitated the collection and identification of 52 voucher specimens. A structured household survey involving 120 respondents from four parishes was conducted to assess plant recognition and utilization patterns. Quantitative analyses included the computation of Use Value (UV), Informant Consensus Factor (FIC), Fidelity Level (FL), and comparisons of knowledge across demographic groups.
Results: A total of 52 medicinal plant species belonging to 29 families were documented, with Asteraceae being the most represented family (13.5%). Leaves were the most frequently utilized plant part (50.3%), boiling was the predominant preparation method (52.1%), and oral administration was the most common route of application (75.2%). The documented species were used to treat 42 ailments, with ulcers (13 species), sexual dysfunction (11 species), malaria (10 species), and fresh wounds (10 species) showing the highest treatment diversity. *Prunus africana* (UV = 2.17) and *Cymbopogon citratus* (UV = 2.16) emerged as the most culturally important species.
Conclusion: Kyondo Sub-county possesses a rich ethnobotanical heritage characterized by substantial medicinal plant diversity and strong indigenous knowledge systems. However, this knowledge is vulnerable to erosion, underscoring the need for documentation, conservation, and further pharmacological investigation of high-value medicinal species.
Keywords: *Ethnobotany, medicinal plants, traditional medicine, herbalists, indigenous knowledge, Kyondo Sub-county.*

Nephroprotective Activity of Naringenin in Gentamicin-Induced Nephrotoxicity in Male Wistar Rats: An In Vivo and In Silico Evaluation

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ABSTRACT

Background: Drug-induced nephrotoxicity remains a major clinical challenge, particularly with the use of aminoglycoside antibiotics such as gentamicin. Natural bioactive compounds, including flavonoids, have attracted considerable interest due to their potential antioxidant and nephroprotective properties. Naringenin, a naturally occurring flavonoid, has been reported to possess diverse pharmacological activities that may protect against renal injury.
Problem Statement: Gentamicin-induced nephrotoxicity limits the therapeutic use of this widely prescribed antibiotic. However, evidence regarding the protective effects and underlying mechanisms of naringenin against gentamicin-induced renal dysfunction remains limited. This study evaluated the nephroprotective activity of naringenin using both in vivo and in silico approaches.

Methods: Twenty male Wistar rats were randomly assigned to four groups (n = 5). The control group received food and water only. Group II received gentamicin (80 mg/kg, intraperitoneally), Group III received naringenin (50 mg/kg orally), while Group IV received both gentamicin and naringenin for seven days. Urine output, serum electrolytes, creatinine, and blood urea nitrogen were assessed. Kidney tissues were subjected to histopathological examination, and molecular docking was performed to evaluate interactions between naringenin and selected receptor targets.
Results: Gentamicin administration significantly increased urine volume, serum sodium and potassium levels, creatinine, and blood urea nitrogen compared with the control group ($p < 0.05$). Naringenin treatment significantly attenuated these alterations and improved renal histological architecture by reducing glomerular damage and distortion. Molecular docking analysis revealed strong receptor interactions, with a maximum binding affinity of −7.1 kcal/mol.
Conclusion: Naringenin exhibits significant nephroprotective activity against gentamicin-induced renal injury, likely mediated through its antioxidant properties. These findings highlight its potential as a complementary therapeutic agent for preventing drug-induced nephrotoxicity.
Keywords: Naringenin, nephrotoxicity, gentamicin, renal protection, molecular docking, antioxidants.

Malaria Dynamics in Pregnancy and Targeted Nursing Interventions at Kagadi Hospital, Uganda: A Mixed-Methods Study

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ABSTRACT

Background: Malaria in pregnancy remains a major public health challenge in Uganda and is associated with adverse maternal and neonatal outcomes. Despite ongoing prevention efforts, the burden of malaria among pregnant women remains high, particularly in rural settings. This study examined the prevalence and determinants of malaria in pregnancy, assessed its effects on pregnancy outcomes, and developed targeted nursing interventions to improve fetomaternal health at Kagadi Hospital, Uganda.
Methods: A convergent mixed-methods study was conducted among 190 pregnant women attending antenatal and maternity services at Kagadi Hospital. Quantitative data were obtained from 176 participants selected through simple random sampling and analyzed using descriptive statistics and multivariable logistic regression. Qualitative data were collected through three focus group discussions and six key informant interviews involving pregnant women, healthcare providers, community leaders, and policymakers. Data were analyzed thematically to identify barriers to malaria prevention and inform intervention design.
Results: Malaria prevalence among pregnant women was 33.0% (58/176). Significant predictors included adolescent age (AOR=2.48; p=0.016), lack of formal education (AOR=2.94; p=0.016), rural residence (AOR=2.71; p=0.006), and primigravidity (AOR=2.04; p=0.024). Malaria infection significantly increased the likelihood of low birth weight (AOR=5.81; p=0.002), maternal anaemia (AOR=6.75; p=0.001), preterm delivery (AOR=6.90; p=0.003), and adverse pregnancy outcomes (AOR=6.90; p=0.024). Preventive intervention uptake was low, with only 55.8% reporting insecticide-treated net use and 16.8% receiving at least three doses of intermittent preventive treatment. Major barriers included financial constraints, long distances to health facilities, inadequate health education, and limited access to preventive commodities.
Conclusion: Malaria prevalence remains high and is associated with substantially increased risks of adverse maternal and neonatal outcomes. Strengthening targeted nursing interventions, malaria education, and access to preventive services is essential for improving pregnancy outcomes in malaria-endemic settings.
***Keywords**: Malaria, pregnancy, nursing interventions, maternal health.*

Laboratory evaluation of the Repellent Efficacy of selected indigenous plants from Western Uganda against Anopheles gambiae

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ABSTRACT

Background Mosquito-borne diseases, particularly malaria, remain a major public health challenge in Uganda, which ranks among the top ten high-burden countries globally. With increasing insecticide resistance and outdoor biting limiting conventional vector control tools, there is renewed interest in plant-based repellents. This study evaluated the repellent efficacy and duration of protection of essential oils from nine indigenous plants traditionally used in the Rwenzori region of Western Uganda against laboratory-reared Anopheles gambiae.

Problem Statement: Malaria remains a major public health crisis in Uganda, contributing 4.7% of global cases and ranking among the top three highest-burden countries. Despite LLINs and IRS, transmission persists due to insecticide resistance and outdoor biting. No standardized studies have evaluated the efficacy of indigenous plant-based repellents in Western Uganda, leaving a critical gap in sustainable, locally acceptable vector control tools.

Methodology: Essential oils were extracted from fresh leaves by steam hydro-distillation using a Clevenger apparatus. Repellent efficacy was assessed using the WHO-adapted arm-in-cage bioassay. Oils (0.5 ml per 600 cm^2) were applied to the forearms of ten healthy adult volunteers (male:female ratio 3:2). Each essential oil was tested on at least four different volunteers with four replicates per plant. Complete Protection Time (CPT) and percentage repellency were determined against 50 nulliparous 5–8-day-old female *An. gambiae* over an 8-hour period. 20% DEET served as the positive control. Data were analysed using one-way ANOVA, Welch's ANOVA, and Kruskal-Wallis tests.

Results: All plant essential oils provided 100% repellency in the first hour post-application. *Tetradenia riparia* demonstrated the highest efficacy with a mean CPT of 7.23 ± 0.26 hours and 99.94 ± 3.41% mean repellency, followed by Eucalyptus globulus (CPT 5.38 ± 0.73 h; 99.71 ± 11.56%). *Mentha spicata* and *Ocimum gratissimum* also showed strong activity (CPT 5.75 ± 0.55 h and 6.27 ± 1.29 h, respectively). These top performers compared favourably with the 20% DEET positive control, which maintained 100% repellency throughout the 8-hour observation. *Rosmarinus officinalis* and *Mentha piperita* showed the weakest performance. One-way ANOVA ($F(10,481) = 19.12$, $p < 0.001$) and Kruskal-Wallis test ($\chi^2 = 112.01$, $df = 10$, $p < 0.0001$) confirmed highly significant differences among treatments. The superior performance of *Tetradenia riparia and Eucalyptus globulus* is likely linked to their higher essential oil yields and favourable bioactive compound profiles.

Conclusion: This study provides the first standardized laboratory evidence supporting the repellent potential of several indigenous plants from Western Uganda. Tetradenia riparia, Eucalyptus globulus, Mentha spicata, and Ocimum gratissimum are promising candidates for development into affordable, culturally acceptable, and sustainable mosquito repellents. These findings have important implications for malaria prevention programmes by offering locally available tools that can complement LLINs and IRS, while supporting local commercialization through cultivation and formulation of high-performing plants. Further formulation optimization, safety studies, and field evaluations are warranted.

Keywords *Anopheles gambiae, essential oils, mosquito repellent, Tetradenia riparia, Eucalyptus globulus, plant-based repellent, arm-in-cage assay, Complete Protection Time, indigenous plants, natural vector control.*

Safety Challenges in Fort Portal City: Evidence from Laboratory Analysis of Commonly Consumed Foods

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ABSTRACT

Background: Foodborne contaminants remain a significant public health challenge in Uganda, particularly in rapidly urbanizing areas where food safety monitoring systems are limited. In Fort Portal City, consumers increasingly depend on informal markets for fresh produce, milk, meat, and processed foods, yet evidence regarding contamination levels in these products remains scarce. This study assessed the prevalence of microbial, chemical, and pesticide contaminants in commonly consumed foods sold in major markets in Fort Portal City.

Methods: A laboratory-based cross-sectional study was conducted using 54 food samples collected from Kabundaire, Kisenyi, and Mpanga markets. Samples included milk, meat, vegetables, and groundnuts. Heavy metals were analyzed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS), aflatoxins using Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS), pesticide residues using Gas Chromatography Tandem Mass Spectrometry (GC-MS/MS), and microbial contaminants using standard microbiological techniques.

Results: Milk samples from Kabundaire Market recorded the highest Escherichia coli contamination levels (up to 4.0×10^4 CFU/ml), far exceeding the recommended threshold of 100 CFU/ml. Meat samples from Mpanga Market contained elevated coliform counts, indicating poor hygiene and possible fecal contamination. Groundnut samples from Kabundaire and Kisenyi Markets contained cadmium concentrations as high as 5.58 ppm, exceeding the permissible limit of 0.2 ppm. Aflatoxin contamination in groundnuts from Kabundaire and Mpanga Markets surpassed the recommended maximum limit of 10 µg/kg in several samples. Although most vegetable samples met European Union safety standards, elevated concentrations of Profenofos and Cypermethrin were detected in selected samples from Kabundaire and Kisenyi Markets.

Conclusion: The study reveals significant food safety concerns in Fort Portal City markets, including microbial contamination, heavy metal accumulation, aflatoxin contamination, and pesticide residues. Strengthening food safety surveillance, enforcing quality standards, improving vendor hygiene practices, and increasing consumer awareness are necessary to reduce exposure to foodborne hazards and protect public health.

Keywords: *Food safety, Food contamination, Aflatoxins, Heavy metals, Pesticide residues, Fort Portal City.*

From Training to Enterprise: A Narrative Review of Entrepreneurship Training and Nurse Self-employment in Sub-Saharan Africa

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ABSTRACT

Background: Entrepreneurship education increasingly addresses unemployment, innovation, and self-reliance among healthcare professionals globally. However, sustainable nurse self-employment remains inadequately documented in Sub-Saharan Africa (SSA) despite expanding entrepreneurship-oriented educational reforms.

Problem statement: Nursing institutions have introduced entrepreneurship education and training into nursing curricula to promote self-employment and reduce unemployment. Despite these efforts, many qualified nurses remain unemployed. This study aimed to synthesize contemporary evidence on entrepreneurship training and nurse self-employment in SSA.

Methodology: A narrative review informed by PRISMA principles was conducted. Literature was searched in PubMed, Scopus, Web of Science, Google Scholar, ScienceDirect, African Journals Online, and grey literature sources. Eligible studies included peer-reviewed articles, studies, and policy reports focusing on entrepreneurship training, entrepreneurial intentions, entrepreneurial self-efficacy, and nurse self-employment in Sub-Saharan Africa. The retrieved evidence was screened and synthesized thematically.

Results: A total of 426 records were identified, 312 remained after duplicate removal, and 38 studies met the inclusion criteria. Reviewed studies demonstrated that entrepreneurship education improves entrepreneurial intentions, confidence, enterprise readiness, and start-up engagement among trainees.

Experiential approaches involving mentorship, enterprise incubation, exposure, and learner-centred pedagogies produced stronger outcomes than theoretical methods. However, financing barriers, entrepreneurial ecosystems, inadequate mentorship, and examination-oriented entrepreneurship implementation continued to constrain sustainable nurse-led enterprise development across Sub-Saharan African healthcare environments. Ugandan evidence revealed persistent gaps between entrepreneurial intentions and sustainable self-employment outcomes among nursing graduates.
Conclusion: Entrepreneurship training remains for strengthening entrepreneurial capability and self-employment potential among nurses. Sustainable nurse entrepreneurship requires experiential learning, mentorship, financing access, enterprise incubation, and entrepreneurial ecosystems within healthcare systems.
Keywords: *Entrepreneurship training, nurse self-employment, entrepreneurship education, Sub-Saharan Africa, nurses.*

Interventions Addressing Unwanted Adolescent Pregnancies, Effectiveness, Implementation Barriers and Enablers in Africa: A Scoping Review

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ABSTRACT

Background: Africa bears the highest burden of unwanted adolescent pregnancies globally, contributing substantially to maternal and neonatal morbidity, mortality, school dropout, and socioeconomic disadvantage. Despite numerous interventions aimed at reducing adolescent pregnancies, progress has remained uneven, partly due to implementation challenges and limited evidence on the factors influencing intervention effectiveness.
Problem Statement: Although various interventions have been implemented across Africa to address unwanted adolescent pregnancies, evidence on their effectiveness and the contextual factors influencing implementation remains fragmented. This limits the ability of policymakers and practitioners to design and scale interventions that effectively address the multifaceted drivers of adolescent pregnancy.
Methods: A scoping review was conducted following the PRISMA-ScR guidelines. Literature searches were undertaken in Google Scholar, MEDLINE, Scopus, EMBASE, CINAHL, Cochrane Library, and Web of Science for studies published between January 2020 and March 2025. Eligible studies included peer-reviewed articles and reports examining interventions addressing unwanted adolescent pregnancy in Africa. Data were extracted using a standardized tool and synthesized narratively. The Consolidated Framework for Implementation Research (CFIR) guided data organization and interpretation.
Results: Thirteen studies met the inclusion criteria, comprising randomized controlled trials, programme evaluations, cross-sectional studies, case studies, and systematic reviews. Multi-component interventions integrating educational support, economic empowerment, sexual and reproductive health education, and youth-friendly health services were consistently associated with reductions in adolescent pregnancy and childbirth. Educational support through scholarships, school fee subsidies, and conditional school attendance programmes emerged as one of the most effective intervention strategies. Major implementation barriers included sociocultural norms, stigma surrounding adolescent reproductive health services, inadequate funding, weak monitoring systems, and low programme participation. Key enablers included stakeholder engagement, peer-support approaches, adolescent-friendly services, incentives for participation, and strong multi-sectoral collaboration.
Conclusion: Multi-component and context-specific interventions demonstrate the greatest potential for reducing unwanted adolescent pregnancies in Africa. Sustainable impact requires coordinated strategies that address educational, socioeconomic, health system, and sociocultural barriers.
Keywords: *Adolescent pregnancy, intervention effectiveness, implementation barriers, reproductive health, Africa, scoping review.*

"They could ...distance themselves from me, claiming I still had Ebola": Experiences of Ebola Virus Disease survivors in Central Uganda.

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ABSTRACT

Background: Ebola continues to be a great public health challenge in Uganda, where it is vulnerable to future Ebola outbreaks. Survivors are likely to continue experiencing the aftereffects of Ebola during the recovery period. The study was conducted to explore the experiences of Ebola survivors during and after the recovery period.

Problem statement: Ebola disease is a severe, often fatal illness in humans. Uganda has been an epicenter of outbreaks. Most researchers had focused on the biomedical aspects of the illness; however, my study underscored the need to understand the health concerns and experiences of survivors, given that they experience widespread stigma and rejection. A deeper understanding of experiences could lead to designing community-based and psychosocial health interventions and integrating them within a broader package of care for EVD survivors

Methods: A descriptive qualitative study was conducted in central Uganda. We purposively recruited 14 participants who had previously had a diagnosis of EVD and used in-depth interviews to collect data. Data was collected from 18th November to 28th November 2024. Thematic deductive analysis was applied to analyze the data.

Results: Participants had varied responses to Ebola diagnosis; this included hesitancy to seek care, compliance with treatment, and self-awareness about Ebola. Misconceptions; that included misconceptions about the diagnosis, misconceptions about survivors and witchcraft. Support systems for victims and survivors of Ebola; Support systems for victims and survivors of Ebola such as health care support during admission, support after discharge, support from support groups, and emotional trauma during admission and discharge. Participants also faced challenges by Ebola victims, such as emotional trauma during admissions and discharge, long-term physical and financial challenges, social challenges, and privacy concerns.

Conclusions: EVD survivors experience significant health concerns and poor coping mechanisms. This is mainly a result of the fatal and stigmatizing nature of Ebola virus Disease. Ensuring patients understand and adopt coping mechanisms reduces this stigma. There is a need for community-based mental health and psychosocial interventions integrated within a broader package of care for EVD survivors.

The findings underscore the need for public awareness campaigns needed to dispel the myths and promote accurate information about EVD, which will prevent hesitancy to seek care.

It informs the government of Uganda to implement contact-based interventions among survivors to humanize the experience and challenge stereotypes, and advocate for policy changes that integrate survivors into community settings.

***Keywords**: Ebola Virus Disease, survivors, stigma, psychosocial support, survivor experiences, and recovery sessions.*

Regulating Digital Health Innovation for Inclusive Healthcare Access in Uganda: A Legal and Policy Perspective

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ABSTRACT

Background: Access to equitable healthcare remains a significant challenge in Uganda despite constitutional guarantees and policy commitments towards universal health coverage. Rural and vulnerable populations

continue to experience barriers arising from inadequate healthcare infrastructure, limited human resources, and high healthcare costs. Digital health innovations, including telemedicine and mobile health platforms, present opportunities to improve healthcare delivery and bridge existing access gaps.
Problem Statement: Despite the growing adoption of digital health technologies in Uganda, the absence of a comprehensive and harmonized regulatory framework limits their effectiveness and sustainability. This study examines the adequacy of Uganda's legal and policy frameworks in regulating digital health innovations and their capacity to promote inclusive healthcare access while safeguarding fundamental rights such as privacy and health.
Methodology: The study employs a doctrinal and qualitative research design. It analyses relevant laws, policies, and regulatory instruments governing health, information technology, and data protection in Uganda. Comparative insights from international best practices are also examined to identify regulatory gaps and opportunities for reform.
Results: The findings indicate that digital health innovations have substantial potential to enhance healthcare accessibility and service delivery. However, fragmented regulatory frameworks, weak enforcement mechanisms, inadequate digital infrastructure, and concerns relating to data privacy, cybersecurity, and ethical standards constrain their effective integration into the national healthcare system.
Conclusion: Effective regulation of digital health innovation is essential for achieving inclusive healthcare access and sustainable development in Uganda. Strengthening institutional capacity, enhancing digital literacy, developing a harmonized legal framework, and adopting inclusive policies that prioritize marginalized populations will promote responsible innovation, protect fundamental rights, and improve equitable health outcomes.
Keywords: *Digital Health Innovation, Healthcare Access, Health Law, Data Protection, Uganda*

Job Demands, Mental Health, and Turnover Intention among Nurses and Midwives in Kampala District, Uganda.

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ABSTRACT

Background: Healthcare systems are increasingly challenged by high job demands, poor mental health, reduced well-being, and rising turnover intentions among nurses and midwives, highlighting the need for healthcare innovations such as supportive work environments, wellness programs, and staff empowerment initiatives to enhance employee well-being and retention.
Problem statement: Nurses and midwives in Kampala District experience high job demands, such as heavy workloads, long working hours, and staffing shortages, which may adversely affect their mental health and increase turnover intentions. However, limited empirical evidence exists on these relationships, creating a knowledge gap that this study seeks to address.
Methodology: A cross-sectional survey design was used involving 326 nurses and midwives selected through stratified random sampling, with data collected via self-administered questionnaires and analyzed using SPSS, where correlation analysis tested hypotheses, reliability coefficients were acceptable and confirmatory factor analysis ensured validity; Mental health was measured and higher scores indicated poorer mental health status.
Findings: The results indicated significant positive relationships between job demands and mental health($r = .497$, $p < .01$), mental health and turnover intention($r = .226$, $p < .01$), and job demands and turnover intention($r = .304$, $p < .01$), suggesting that increased workplace demands are linked to poorer mental health outcomes and greater turnover intentions among nurses and midwives.
Conclusion: The study concluded that high job demands negatively affect mental health and increase turnover intentions among nurses and midwives, calling for improved staffing, healthcare innovations, workload management, and well-being interventions to enhance retention and service delivery.
Keywords: *Job Demands, Mental Health, Turnover Intention, Significance, Nurses and Midwives.*

Knowledge, Attitudes, and Practices Regarding CAUTI Prevention among Healthcare Professionals at Ntara Health Centre IV, Uganda

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ABSTRACT

Background: Catheter-associated urinary tract infections (CAUTIs) are a primary driver of healthcare-related morbidity at Ntara Health Centre IV, Uganda.

Problem Statement: Facility records indicate that 80% of catheterized patients develop infections, with 90% of audited septic shock deaths (2020–2024) linked to catheter-related complications. This study assessed the knowledge, attitudes, and practices (KAP) of healthcare professionals (HCPs) regarding CAUTI prevention.

Methodology: A descriptive cross-sectional study was conducted among 73 purposively selected HCPs (nurses, midwives, and clinicians). Data were collected using a pre-tested, self-administered structured questionnaire and analysed using descriptive statistics and Chi-square tests.

Results: Participants had a mean age of 38.4 years and 12.8 years of experience. While 67.1% demonstrated adequate knowledge (mean score 69.7%), attitudes and practices were significantly lower. Only 50.7% held a positive attitude (mean 65.0%), and only 54.8% demonstrated good clinical practices (mean 67.3%). Critical gaps were noted in hand hygiene adherence (28.8% failure rate) and aseptic insertion techniques. No statistically significant associations were found between demographics and KAP outcomes ($p > 0.05$), indicating that deficits are systemic across all professional cadres.

Conclusion: A profound "knowledge-practice gap" exists at Ntara HCIV; theoretical awareness is high, but bedside application remains sub-optimal due to professional fatalism and systemic constraints. Facility management should establish a functional Infection Prevention and Control committee and implement nurse-driven catheter removal protocols. National policy must prioritize the consistent supply of essential catheterization materials and integrate CAUTI prevention into pre-service medical curricula.

Keywords: *Catheter-associated Urinary Tract Infections (CAUTIs), Knowledge-practice, Gaps, Infection Prevention and Control (IPC).*

EDUCATION INNOVATIONS AND INCLUSIVE DEVELOPMENT

Could Solutions Lie Within and Without?

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ABSTRACT

Background: Due to the changing economic markets and pressures that could be attributed to globalisation, higher education has been inevitably going through restructuring so as to remain relevant to the changing needs of the global markets and society in general. This has seen the emergence of competency-based education (CBE) across the globe.

Problem Statement: There are fears that the ongoing education restructuring and adoption of CBE, especially for academic institutions in Africa, is driven by globalisation and is mainly a response to the global market demands, which may create a mismatch in the local needs, especially in rural-based agricultural economies. Therefore, higher education in agricultural studies ought to recognize these complex local realities.

Methodological Approach: This chapter is based on a deskwork literature review of published papers, books, and online reports on the globalization of higher education in general and in Africa in particular. The literature review was supplemented with project documents from the Agroecology Rwenzori project (AER) that showcased glocalization in practice.

Results/Lessons Learned: The AER project showcased glocalization through a bottom-up approach to curriculum development and review of the Master of Science in Agroecology programme at MMU, agroecology research agenda development, and innovative and interactive pedagogical approaches. To avoid losing contextual issues, we found it easier to start from the local perspective and then explore how local realities fit into the global agenda.

Conclusion: To produce locally relevant and globally exposed graduates, competence-based agricultural education must be globally aware and locally grounded. This delicate balance does not happen by chance but has to be deliberately planned for in all teaching and learning, research processes, and infrastructure.

Keywords: *Globalization; Agricultural education; Glocalization, AER project, Competency-Based Education.*

Competence Mapping and Staff Retention in Public Universities in Uganda: Evidence from Makerere, Kyambogo, and Uganda Management Institute.

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ABSTRACT

Background: Competence mapping is gradually recognised as a critical talent management practice in improving staff retention and institutional stability. In Uganda, initiatives have been implemented in public universities to reduce staff turnover; however, empirical evidence on their effectiveness remains limited.

Problem Statement: Despite increasing investments by the government through increased remuneration for staff in public universities in Uganda, these institutions continue to experience increased staff turnover. Limited attention paid to competence mapping as a strategy for enhancing staff retention may contribute to high staff turnover. This study, therefore, examined the effect of competence mapping on staff retention in public universities in Central Uganda.

Methodology: A convergent mixed-methods design was employed, where quantitative data were supported by qualitative data. Quantitative data were collected from 346 academic and administrative staff using structured questionnaires, while qualitative data were obtained from 15 key informant interviews involving deans, heads of departments, and human resource directors. Quantitative data were analysed using the Structural Equation Model (SEM), while qualitative data were analysed thematically. Findings from both strands were integrated during interpretation.

Results: Quantitative findings revealed that competence mapping had a significant positive effect on staff retention ($\beta = 0.39$, $p < .003$), with Model indices (CFI=0.957, TLI=0.952, PNFI=0.890, RMSEA=0.049,

SRMR=0.061, GFI=0.982). Qualitative findings also indicated that effective alignment of staff competencies with job requirements enhances commitment, hence reducing turnover intentions.
Conclusion: Competence mapping significantly contributes to improved staff retention in public universities. Effective competence mapping by public universities through the utilisation of competency-based recruitment and deployment can improve staff retention.
Keywords: *Competence Mapping, Staff Retention, Public Universities, Uganda.*

Strengthening Competency-Based Curriculum Implementation in Low-Performing Secondary Schools: A Study of University-School Partnerships in Ntoroko District, Uganda

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ABSTRACT

Background: Disparities in secondary school performance remain a challenge in Uganda's hard-to-reach districts. Despite the introduction of the Competency-Based Curriculum (CBC) and broader education reforms, many secondary schools continue to register low learner achievement due to limitations in teacher capacity, inadequate instructional resources, weak professional development systems, and contextual socio-cultural challenges.
Problem Statement: CBC implementation requires teachers to effectively apply learner-centered pedagogies, competence-based assessment, ICT integration, and project-based learning. However, evidence suggests that many schools in hard-to-reach areas face substantial barriers that hinder effective implementation, prompting this study to explore the community-related factors influencing CBC implementation in low-performing secondary schools in Ntoroko District. The study sought to explore the pedagogical competencies of teachers, identify barriers affecting effective CBC implementation, and propose a sustainable university-led community engagement framework to support instructional improvement in hard-to-reach secondary schools.
Methodology: A qualitative multiple-case study design was employed in five purposively selected low-performing secondary schools identified based on consistently low academic performance and their location in hard-to-reach communities within Ntoroko District. Data were collected through semi-structured interviews with school leaders and teachers, focus group discussions with learners, and document review of school and curriculum implementation records. Data were analysed using thematic analysis, involving coding, categorization, and identification of recurring themes across cases.
Results: Four key themes emerged: teacher pedagogical competencies, institutional and resource constraints, professional development challenges, and community-contextual influences. Teachers reported difficulties with competence-based assessment, ICT integration, differentiated instruction, and project-based learning. CBC implementation was further constrained by limited digital technologies, inadequate teaching materials, overcrowded classrooms, and insufficient professional development opportunities. Low teacher motivation, coupled with pastoralist livelihoods, seasonal migration, learner absenteeism, and limited parental understanding of CBC, negatively affected learner participation and achievement.
Conclusion: Effective CBC implementation in hard-to-reach schools requires integrated interventions that strengthen teacher competence, improve resource availability, and enhance community engagement. The proposed university-led community engagement framework emphasizes continuous professional development, school-based mentoring, action research, curriculum support, and university–school partnerships.
Keywords: *Competency-Based Curriculum, Teacher Professional Development, University–School Partnerships, Community Engagement, Hard-to-Reach Secondary Schools.*

Education Innovations and Inclusiveness through Research-Driven Policy and Practice: Evidence from Inclusive Public Primary Schools in Bushenyi District, Uganda

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ABSTRACT

Background: Inclusive education is increasingly recognized as a critical strategy for promoting equitable learning opportunities for children with disabilities. Despite policy commitments in Uganda, learner achievement among children with disabilities remains low, particularly in resource-constrained inclusive public primary schools.

Problem Statement: Although educational interventions such as teacher support, peer-assisted learning, and infrastructural adaptations are widely implemented, evidence regarding their effectiveness in improving learner achievement among children with disabilities in Greater Bushenyi remains limited.

Methodology: A convergent parallel mixed-methods cross-sectional design was employed. Quantitative data were collected from 185 respondents using structured questionnaires, while qualitative data were obtained through key informant interviews with nine head teachers from inclusive public primary schools in Greater Bushenyi. Quantitative data were analyzed using descriptive statistics, Pearson correlation, and regression analysis, whereas qualitative data were analyzed thematically. Findings from both strands were integrated during interpretation.

Results: The results revealed that teacher–learner educational interventions had the strongest positive and statistically significant effect on learner achievement ($\beta = .26$, $p < .001$), explaining 6.8% of the variance. Peer-to-peer educational interventions also had a significant positive effect ($\beta = .19$, $p < .01$), accounting for 3.6% of the variance. School infrastructural interventions demonstrated a weaker but significant effect ($\beta = .15$, $p < .05$), explaining 2.1% of the variance. Qualitative findings corroborated these results, highlighting teacher competence, supportive peer relationships, and accessible learning environments as key facilitators of learner achievement.

Conclusion: The findings suggest that learner achievement among children with disabilities is influenced by multiple educational interventions, with teacher–learner interactions exerting the greatest influence. Strengthening teacher capacity, peer-support mechanisms, and implementation of disability-inclusive policies may enhance learner achievement in inclusive primary schools.

Keywords: *Inclusive Education, Children with Disabilities, Learner Achievement, Educational Interventions, Uganda.*

Utilizing Talent-Based Innovative Localized Constructivism in Inclusive Pedagogy in Uganda's Private and Public Universities as a Strategy for Combating Graduate Unemployment

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ABSTRACT

Background: Graduate unemployment is a critical challenge in a world where, paradoxically, high demand for talent coexists with a surplus of unemployable degree holders, where many university graduates cannot find jobs due to being unemployable. Inclusive pedagogy can help address this paradox through higher education to achieve its economic goal of preparing all students to become gainfully employable and create jobs for talent development using Innovative Localized Constructivism (ILC), which involves students' practical creation of new knowledge and active acquisition of skills using local context.

Problem statement: Prior research has, however, touted this pedagogy as a promoter of social justice through fostering flexible, learner-centred, and equitable educational access for all students, regardless of ability or disability. Research into the extent to which inclusive pedagogy utilizes ILC as a strategy for curbing graduate unemployment is limited in Uganda, which motivated the research.

Methodology: A cross-sectional study comprising 250 lecturers and 384 students selected from two public and two private universities in central Uganda using stratified sampling was used, with data collected using a structured questionnaire and analysed using descriptive cross-tabulation and Chi-Square methods.

Results: ILC was utilized in the inclusive pedagogy implemented to develop students' talents to a negligible extent, which did not significantly differ across private and public universities, and between lecturers and students. Less than 9% of lecturers, of whom 4% were from public universities and 3.7% from private

universities, and less than 10% of students, of whom 6% were from public and 4% from private universities, revealed the utilisation of ILC in this pedagogy to develop learners' talents. Moreover, the larger proportions of lecturers and students showed that the extent of the utilisation was below their expectations.
Conclusion: ILC is not used in the inclusive pedagogy implemented to develop the talents of the majority of the students in Uganda's private and public universities, explaining why graduate unemployment is rising in Uganda. University management as a way of responding to competence based education, should improve the use of ILC in the inclusive pedagogy they implement to develop students' productive talents, admit students after identifying their talents, ensure university enrolment match the identified talents, students are facilitated by their lecturers' use of mother tongues, learning tasks, aids, illustrations, demonstrations, experiments and activities identified from local cultural, social, economic, technological and scientific contexts.
Keywords: *Inclusive Pedagogy, Innovative Localized Constructivism, Talent Development, University Education*

Reforming the Performance Management Practices to Enhance the Performance of Part-Time Teachers in Secondary Schools of Mbarara District, Uganda

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ABSTRACT

Background: Global performance management systems evolved to boost teacher accountability and education quality. In Uganda, universal education policies caused a surge in enrolments, leading to overcrowded classrooms and severe teacher shortages. To fill these gaps, secondary schools started relying on part-time teachers, who comprise about 33% of the workforce. Despite their numbers, legal frameworks, and the 2020 Ministry guidelines, they remain silent on how to manage, pay, and appraise part-time staff. This study, therefore, examined how performance management practices can be reformed to properly integrate part-time teachers in secondary schools within Mbarara District.

Problem Statement: Despite their critical role in filling subject gaps, part-time teachers face conflicting loyalties that lead to high absenteeism and uneven commitment to core institutional responsibilities. This problem is severely worsened by a lack of structured performance management systems and policy gaps to monitor, support, and hold part-time teachers accountable.
Methodology: This study adopted an interpretivist paradigm with a qualitative phenomenological design to explore the lived experiences of a sample of 30 part-time teachers and 10 school administrators. Data were collected using interview guides for administrators and focus group discussions for teachers across. While maintaining strict ethical considerations regarding participant confidentiality and anonymity, the gathered data underwent rigorous validation, triangulation, and thematic analysis to identify recurring themes.
Results: The findings show that part-time teachers are vital for daily school operations and remedial support across core subjects. However, these educators hold highly negative perceptions of performance management due to systemic exclusion, volatile pay, and a lack of professional growth. To manage them, administrators rely on localized, informal strategies like selective hiring, supervision, and mentorship to maintain academic standards. Ultimately, constant job uncertainty, multi-school schedules, and an absence of formal supervision trap part-time teachers in purely instructional roles, limiting their involvement in roles outside the class.
Conclusion: Integrating part-time teachers into formal performance management systems is essential for improving education quality and building a competent workforce. Ensuring fair treatment, continuous professional support, and clear development pathways strengthens teacher commitment and enhances learning outcomes.
Keywords: Performance management, part-time teachers, secondary schools, teacher accountability.

Digital Technologies in Kiswahili Education: Opportunities and Challenges in Ugandan Secondary and Tertiary Institutions

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ABSTRACT

Background: The integration of digital technologies into education has transformed teaching and learning by promoting interactive, learner-centered, and inclusive pedagogical approaches. In language education, digital tools offer opportunities to enhance communication, content delivery, learner engagement, and access to educational resources. However, evidence on the integration of digital technologies in Kiswahili teaching and learning within Ugandan educational institutions remains limited.
Problem Statement: Despite increasing adoption of digital technologies in education, little is known about the availability, utilization, and effectiveness of digital tools in Kiswahili pedagogy in Uganda. This knowledge gap constrains efforts to develop effective strategies for technology-enhanced language instruction and inclusive learning.
Methods: This study employed a cross-sectional mixed-methods design involving 26 respondents from secondary schools and tertiary institutions. Data were collected using structured questionnaires administered through Kobo Toolbox and analyzed using descriptive statistics and thematic analysis. The study was guided by the Technological Pedagogical Content Knowledge (TPACK) framework.
Results: Findings revealed that 88.5% of participating institutions utilized digital tools in Kiswahili instruction, with smartphones (84%) being the most accessible devices. While 76.9% of respondents considered the available digital tools culturally relevant, only 53.8% reported full alignment with the national curriculum. Additionally, 77% of educators expressed confidence in using digital technologies, although 46.1% had not received formal training in digital pedagogy. Digital tools were primarily used for instructional content development, communication, record management, and learner engagement. Key challenges included poor internet connectivity (66.7%), inadequate Kiswahili-specific digital content (54.2%), limited access to digital devices, and insufficient professional training.
Conclusion: Digital technologies have considerable potential to enhance Kiswahili teaching and learning in Uganda. However, their effectiveness is constrained by infrastructural limitations, inadequate localized content, and gaps in teacher capacity. Strengthening digital literacy, improving internet infrastructure, and developing curriculum-aligned Kiswahili digital resources are critical for promoting inclusive and effective language education.
Keywords: *Kiswahili, digital literacy, language education, digital pedagogy, educational technology, inclusive education, Uganda.*

From "Jua-kali" to Classroom: An Integrated Framework for Connecting Informal Technical Sectors with Formal STEM Education

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ABSTRACT

Background: STEM education in African secondary schools suffers a persistent disconnect between theory and practice, worsened by resource limitations. Meanwhile, East Africa's informal "Jua-kali" technical sectors apply scientific principles daily but remain untapped by formal education.
Problem Statement: The persistent gap between abstract classroom instruction and practical application in resource-constrained Ugandan secondary schools undermines student engagement, conceptual understanding, and knowledge transfer to real-world contexts. This study aimed to develop an integrated framework connecting informal technical sectors with formal STEM education.

Methodology: A mixed-methods approach unfolded in three phases. Phase one involved curriculum content analysis of Ugandan Secondary Physics and Mathematics concepts aligned with informal sector applications

in the Rwenzori region. Phase two comprised structured engagement with ten informal enterprises through interviews and workplace observations. Phase three involved quasi-experimental framework implementation in four secondary schools using pre/post-tests, and qualitative follow-up feedback.

Results: Informal technical sectors provided authentic learning environments where STEM concepts naturally apply. Framework implementation yielded substantial improvements: experimental group participants demonstrated 35% greater proficiency in applying STEM concepts to real-world problems and 28% higher engagement in Physics and Mathematics compared to control groups. Educators also reported increased confidence in teaching practical STEM applications.
Conclusion: The framework offers a replicable pathway for addressing STEM education challenges by leveraging informal sector practices. The three-phase implementation model, conceptual alignment, school-sector partnerships, and systematic evaluation, provides a robust approach for developing regions. The study recommends reorienting curriculum toward authentic learning, redesigning teacher professional development to include engagement with informal technical institutions, and developing assessment systems that value practical application and problem-solving alongside knowledge recall.
Keywords: *Experiential learning; Informal sector; STEM education; Curriculum alignment.*

ORDER OF PRESENTATIONS

Session 1: Research and Innovation for Sustainable Agri-food Systems

Venue: **RB3 (17 Presentations)**

Session Chair: **Prof. Wesana Joshua**

Time	Activity/Presentation	Presenter(s)
Day 1-Thursday 25th June 2026		
12:00–12:45	Keynote Address	Dr. Stanely Nkalubo
12:45–1:00	**Discussion**	**Session Chair**
1:00-2:00	**Lunch Break**	**Nyakahuma Charles**
2:00–2:15	Systematic Review of Determinants of Adoption of Soil and Water Conservation Practices among Smallholder Farmers in Highland Areas	Nakanwagi Josephine & Tugume Esau
2:15-2:30	External Factors Affecting Agro-Processing Firms in Africa: A Systematic Review and the Future Research Agenda	Paddyblick Ariiyo, Judith Bijurenda Asiimwe & Ssenyonjo Moses
2:30-2:45	Unlocking Anthracnose Resistance in Farmer-Preferred Common Bean Market Classes to Advance Bean Breeding in Uganda	Jorem Alipa, Geoffrey Tusiime & Clare Mukankusi
2:45-3:00	**Discussion**	Session Chair
3:00-3:15	Effect of Maize and Oyster Mushroom Blending Ratio on Nutritional and Sensory Quality of Maize-Mushroom Composite	Godfrey Kilama et al.
3:15-3:30	Consumer Acceptability of Onion Powder: Reducing Postharvest Losses of Horticultural Crops for Increased Farm Income	Geoffrey Candia Levuason et al.
3:30-3:45	Production of Green Biorefinery Protein Concentrate Derived from Perennial Napier Grass as an Alternative Feed for Pigs	Job Twinomujuni, Martin Sserwada, Ronald Buwa, et.al.
3:45- 4:00	**Discussion**	Session Chair
4:00-4:15	Determinants of Smallholder Farmers' Intention to Adopt Edible Insect Farming in Northern Uganda	Martha F. Alaroker et al.
4:15-4:30	Towards Breed-Responsive and Season-Specific Precision Feeding for Dairy Cattle in Uganda	Atusasiibwe John Mary et al.
4:30-5:00	**Discussion**	Session Chair
5:00-5:30	**Evening Tea**	**Nyakahuma Charles**
Day 2-Friday 26th June 2026		
9:00-9:15	Supplementation of Maize Bran with Either Sunflower or Oil Palm Seed Cakes Improves Growth and Nutritional Value of the Edible House Cricket	Francis Sengendo et al.
9:15-9:30	Growth Performance of African Catfish Fingerlings after Feeding Fermented Banana, Jackfruit Seed and Sweet Potato Diets	Bruce Robin Nyamweha et al.
9:30-9:45	The Diversity and Distribution of Cuscuta L. in Mubuku Irrigation Scheme, Kasese Municipality	Derrick Bwambale et al.
9:45-10:00	**Discussion**	Session Chair
10:0–10:15	Development and Pilot Evaluation of the Farm Care Group Agritech Model for Improving Smallholder Farmer Productivity and Market Access in Kyenjojo District	Byamukama Keron
10:15-10:30	Location-Specific Performance of Tropical Maize Hybrids for Grain Yield and Resistance to Striga hermonthica	Simon Zziwa et al.
10:30-10:45	Effects of Coffee-Husk-Based Soil Amendments on the Growth and Yield of Collards on Andosols in the Rwenzori Region	Pius Lugonja et al.
10:45-11:00	**Discussion**	**Session Chair**
11:00-11:30	**Break Tea**	**Nyakahuma Charles**
11:30-11:45	Biomass Yield and Nutritive Value of Mulberry (Morus alba) and Guatemala Grass	Kabaseke Clovis et al.
11:45-12:00	Co-application of Biochar and Cow Manure Enhances Growth, Yield and Soil Chemical Properties under Spinach Production	Cosmas Wacal et al.
12:00-12:15	Oil Palm Empty Fruit Bunch Amendments on Okra Yield on Coastal Savannah Acrisols in Central Region, Ghana	Ebenezer Manso et al.
12:15-1:00	Discussion and Track Synthesis	**Session Chair**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00-5:00	Plenary Session	Dr. Katende David

Session 2: Environmental Sustainability, Climate Action and Green Innovation

Venue: **Main Hall Block C (18 Presentations)**

Session Chair: Prof. Moses Muhumuza

Time	Activity/Presentation	Presenter(s)
Day 1-Thursday 25th June 2026		
12:00–12:45	Keynote Address	Prof. Dominic Byarugaba
12:45–1:00	**Discussion**	**Session Chair**
1:00-2:00	**Lunch Break**	**Nyakahuma Charles**
2:05-2:20	Systematic Review of Determinants of Adoption of Soil and Water Conservation Practices among Smallholder Farmers in Highland Areas	Nakanwagi Josephine & Tugume Esau
2:20–2:35	Optimizing Genomic Selection for Drought Tolerance in Common Bean: Multi-Trait Models and Environment-Specific Strategies	Ronald Buwa, Abel Arinaitwe Byarugaba & David S.O. Osiru
2:35–2:50	Adoption, Financial Viability, and Efficiency of Climate-Smart Agriculture Practices among Smallholder Farmers for Improved Food Security in Kenya	Rodgers Oyugi, Lydia Nyambok & Christopher Gor
2:50-3:05	A Comparative Analysis of the Effectiveness of Flood Risk Management Strategies in a Mountainous Environment: The Case of the Nyamwamba and Nyamughasana Riverine Systems, Kasese District, Uganda(**online**)	Agatha Ninshaba, John Sekajugo, Cosmas Wacal & Albert Alexander Muller
3:05-3:30	**Discussion**	**Session Chair**
3:30–3:45	Development of Biodegradable Materials from Milk Casein and Beeswax as a Sustainable Alternative to Plastic	Ainembabazi Able, Efrance Najjuma, Paul Matovu, Clement Nyakoojo & Winston Kabiswa
3:45–4:00	Integrating the Adoption of Ecological Approaches and Economic Instruments to Strengthen Climate Resilience in the Lake Victoria Basin, Uganda	Moses Kakungulu, Phelister Mudondo, James Omongot & Elly N. Sabiiti
4:00-4:15	Controls of the Spatial Distribution of Land Degradation in Mountainous Agro-Ecosystems: The Case of Bududa District in Mount Elgon, Uganda	Sufyan Bisangabasaija, Shafiq Nedala, Jaco Kotzé & John Sekajugo
4:15-4:30	Impacts of Farm-Made Biofertilizers on Sorghum Growth, Yield, and Soil Health of Semi-Arid Soils	David Ojuu, Angela G. Mkindi, Akida I. Meya, Steven J. Vanek, Andrew J. Margenot & Steven R. Belmain
4:30-5:00	**Discussion**	**Session Chair**
5:00-5:30	**Evening Tea**	**Nyakahuma Charles**
Day 2-Friday 26th June 2026		
9:00-9:15	The Nexus between Safe Water Access and Environmental Degradation: A Case of Mpanga Catchment, Western Uganda	Violet Kisakye & Deous Mary Ekyaligonza
9:15-9:30	*Analysis of Rainfall Patterns and Implications on Water Sustainability in Mpanga Catchment, Western Uganda-*	Violet Kisakye & Deous Mary Ekyaligonza
9:30-9:45	Assessment of Current and Projected Surface Water Quantity and Quality in the Mpanga Catchment-	John Mirembe, Violet Kisakye & Raymond Bakame
9:45-10:00	**Discussion**	**Session Chair**
10:0–10:15	*Analysis of Economic Values of Water Resources and Potential of Sustainable Livelihoods in Mpanga Catchment*	Violet Kisakye & John Sekajugo
10:15-10:30	*Assessment of the Nature and Limitations of Conservation Interventions in the Mpanga River Catchment-*	Moses Muhumuza, Catherine Kente & Paul Matovu
10:30-10:45	*Social Structural Barriers to Participation in Water Resources Management in the Mpanga Catchment-*	Athanasius Ssekyanzia, Asiimwe Moureen & David Agole
10:45-11:00	**Discussion**	**Session Chair**

11:11:30	**Break Tea**	**Nyakahuma Charles**
11:30-11:45	Relationship Between Social Structures and Participation of Social Groups in River Mpanga Catchment Resource Management in the Rwenzori Region	Asiimwe Moureen, David Agole & Athanasius Ssekyanzi
11:45-12:00	An Investigation of the Roles of Education and Awareness Programs in Promoting Sustainable Water Resource Management in the Mpanga Catchment	Clovis Kabaseke & Moses Muhumuza
12:00-12:15	Assessing the Nexus between Wetland Conservation and Tourism Development in Rwanda: A Case Study of Rugezi Wetland	Kalulu Ronald, Dufitumukiza Joseph Desire, Musoke Aggrey & Basemera Lucy Khamis
12:15-12:30	Evaluating the Effectiveness of Fisheries Policy in Controlling Immature Fish Trading along Western Uganda's Fish Trading Corridor (2015-2023)	Brian James Baguma, Mary Nantogo, Asiimwe B. Godfrey
12:30-1:00	**Discussion**	**Session Chair**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00-5:00	Plenary Session	Dr. Katende David

Session 3: Digital Transformation, Emerging Technologies, and the Innovation Ecosystem

Venue: **RA5-2 (9 Presentations)**

Session Chair: Dr. Edwin Akugizibwe & Dr. Jack Turihohabwe

Time	Presentation Title	Presenter(s)
Day 1-Thursday 25th June 2026		
12:00–12:45	Keynote Address	Dr. SIMON KAWUMA
12:45–1:00	**Discussion**	**All Participants**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00–2:30	Design and Fabrication of a Biogas Upgrading Unit and Storage System for Powering Agricultural Machinery	Opio Phillip & Wilson Babu Musinguzi
2:30–3:00	A Real-Time Air Quality Monitoring and Prediction System for Urban Environmental Sustainability in Uganda	Mugambe John
3:00–3:30	DeltaSense: Africa's Remote Sensing Guardian of Landscape Degradation	Joseph Okello et al.
3:30-4:00	Mobile Communication for Livestock Disease Management: Challenges, Opportunities, and Farmer Readiness in Kyenjojo District, Western Uganda	Godfrey G. Tumwebaze, Fred Kaggwa, Ronald Kabbiri, & Jane Katusiime
4:00-5:00	**General Discussion and Session Synthesis**	**Session Chair**
5:00-5:00	**Evening Tea**	**Nyakahuma Charles**
Day 2-Friday 26th June 2026		
9:00-9:30	Assessing the Contribution of Eastward Electric Field Estimates to Artificial Neural Network Modelling of the Swarm-Derived Equatorial Electrojet (**online**)	Daphine Ayebare et al.
9:30-10:00	Siamese Networks for Low-Shot Entomological Insect Categorization	Samuel Ocen & Florence Tushabe
10:00-10:30	Fort Portal E-Shop: A Free Digital Marketplace for Inclusive Local Commerce in Western Uganda	David Isingoma et al.
10:30-11:00	**Discussion**	**Session Chair**
11:00-11:30	**Break Tea**	**Nyakahuma Charles**
11:30-12:00	A Design Thinking Approach to Developing a Hybrid Mathematics Laboratory Integrating Physical Manipulatives and Digital Learning Tools for Mathematics Education in Uganda	Issa Ndungo & Edwin Akugizibwe
12:00-12:30	Leveraging Digital Transformation for Early Adoption of Emerging ICT Technologies to Improve Competency-Based Curriculum Innovations in Uganda Universities: A Review	Wilson Okaka, Celia Amanya, & Grace Ankunda
12:15-1:00	**Discussion**	**Session Chair**
1:00-2**:00**	**Lunch**	**Nyakahuma Charles**
2:00-5:00	Plenary Session	Dr. Katende David

Session 4: Entrepreneurship, Industrialization and Commercialization

Venue: **RB4 (13 Presentations)**

Session Chair: Dr. Rwakihembo John and Dr. Prisca Kyalisima

Time	Presentation Title	Presenter(s)
Day 1-Thursday 25th June 2026		
12:00–12:45	Keynote Address	Professor Tumwine Sulait
12:45–1:00	**Discussion**	**All Participants**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00–2:20	Digital Financial Payment Systems and Financial Inclusion: Evidence from Youth in the Rwenzori Region, Western Uganda	Moses Akugizibwe, Pereez Nimusima, Bernard Wakabi Muhangi & Robert Kisembo
2:20–2:40	A Hybrid Model for User Requirements Elicitation in Enterprise Resource Planning Systems Implementation: A Case Study of Mountains of the Moon University	Mujuni Patrick
2:40-3:00	Between Knowledge and the Market: Consumer Awareness, Attitudes, and Barriers to Agro ecological Vegetable Consumption in Fort Portal Tourism City, Uganda	Nalunkuuma Sharona, Kanyiginya Violeta, Lieven Peters, Collins Tweheyo
3:00–3:20	**Discussion**	**Session Chair**
3:20-3:40	Industrial Parks, Entrepreneurship Development, and Job Creation in Eastern Uganda: A Mixed Methods Study	Okello Francis Xavier
3:40-4:00	Cost Management Practices and Financial Performance of Agro-Processing Firms in Acholi Sub-Region	Gladys Angee, John Baguma Muhunga Kule, John Rwakihembo, Pereez Nimusima, Mshilla Maghanga, Charles Kaggwa
4:00-4:20	Business Resilience Strategies in Africa: A Systematic Literature Review	Paddyblick Ariiyo, Asiimwe Judith Bijurenda, Ssekandi Joseph & Ssenyonjo Moses
4:20-4:40	The Influence of Relational Capital on Business Performance in Agro-Food Processing SMEs in Western Uganda	Tashobya Crispus, Abel Mucunguzi, John Bosco Turyasingura, Alice Ngele
4:40-5:00	**Discussion**	**All Participants**
5:00-5:30	**Evening Tea**	**Nyakahuma Charles**
Day 2-Friday 26th June 2026		
9:00-9:20	Resilient Family Businesses: Evidence on Succession Planning Practices and Long-Term Sustainability of SMEs in Kampala, Uganda	Immaculate Nabulya, Alex Nduhura & John Paul Senyondo
9:20-9:40	Credit Risk Management Practices and Loan Portfolio Quality in Uganda's Commercial Banks	Kasenge Martin
9:40-10:10	Asymmetric Information on Cost of Debt among Commercial Banks, Tier 2 and Tier 3 Financial Institutions in Uganda	Nickson Nagaaba, Nuwaha Moreen & Natukunda Marion
10:10-11:00	**Discussion**	**Session Chair**
11:00-11:30	**Break Tea**	**Nyakahuma Charles**
11:30-11:50	Pushed Limits: Effect of Visitor Density and Seasonality on the Diet and Stress Behaviours of Free-Ranging Black and White Colobus Monkeys at UWEC, Entebbe, Uganda	Taddeo Rusoke & Dorothy Makobore
11:50-12:10	The Art of Movement and Rest: A Strategic Value-Chain Approach to Niche Tourism Product Development	Taddeo Rusoke
12:10-12:30	Food Supply Chain Technologies: Lessons from Milk ATM on Consumers' Attitude as Determinant for Preference and Purchase Intentions	Joanita Kataike, Jowel Kulaba, Andrew Ronnie Mugenyi, Hans De Steur & Xavier Gellynck
12:30-1:00	**Discussion**	**Session Chair**
1:-0-2:00	**Lunch**	**Nyakahuma Charles**
2:00-5:00	Plenary Session	Dr. Katende David

Session 5: Human Capital, Governance and Social Inclusion

Venue: **BA4 (11 Presentations)**

Track Chair: Dr. Mutabaruka Fredrick Assoc. Prof. Consolata Kabonesa

Time	Presentation Title	Presenter(s)
Day 1-Thursday 25th June 2026		
12:00–12:45	Keynote Address	Associate Prof. Barigye Godfrey
12:45–1:00	**Discussion**	**Session Chair**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00–2:20	Household Behaviours and Gender Dynamics in Urban Homemade Organic Waste Compost Quality: Pathways to Circular Economy; A Systematic Review	Esau Tugume & Josephine Nakanwagi
2:20-2:40	Contract Management Practices and Service Delivery in Local Governments: Evidence from Structural Equation Modelling	Alex Gerald Muheesi et al.
2:40-3:00	Urbanization and Female Labour Force Participation in Sub-Saharan Africa: Evidence from Dynamic Panel Analysis (2009–2023)	Obuk Charles
3:00-3:30	**Discussion**	**Session Chair**
3:30-3:50	Thinking through Toro's Tea Industry: Past, Present and Future	Evarist Ngabirano et al.
3:50-4:10	Leadership for University-Affiliated Think Tanks and Socio-Economic Transformation in the Ugandan Higher Education Space	Katende David
4:10-4:30	The Role of Indigenous Knowledge in Conflict Resolution: A Case of Selected Rutooro Proverbs in Uganda, 1830–1900 (**Online**)	Tumwine Jesse
4:30-5:00	**Discussion**	**Session Chair**
5:00-5:30	**Evening Tea**	**Nyakahuma Charles**
Day 2-Friday 26th June 2026		
9:00-9:20	Establishing the Interrelationship between Human Capital, Governance, Social Inclusion and Sustainable Development in Ankole Region, Western Uganda	Turyamureeba Silaji
9:20-9:40	Governance Factors Influencing Social Inclusion and Human Capital Development in Rural Uganda: Evidence from Ntungamo District	Arinaitwe Enid
9:40-10:00	Strengthening Human Capital through NGO Support to Secondary Education in Rwanda: Evidence from Gasabo District	Kamukama Jimmy Spice
10:00-10:20	When Conflict Turns Toxic: Wildlife Poisoning Around Toro-Semliki Wildlife Reserve, Uganda	Moses Kihembo et al.
10:20-11:00	**Discussion**	**Session Chair**
11:00-11:30	**Break Tea**	**Session Chair**
11:30 -12:00	Interrogating Unemployment amid Growth: Tracking Youth Unemployment in Neo-Liberal Uganda, 1990–2019	Asiimwe Berinde Godfrey
12:00-1:00	**Discussion**	**Session Chair**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00-5:00	Plenary Session	Dr. Katende David

Session 6: Innovations for Health, Well-being and Social Protection

Venue: **RA21 (14 Presentations)**

Session Chair: Dr. Kimera Emanuel and Enos Mirembe

Time	Presentation Title	Presenter(s)
Day 1-Thursday 25th June 2026		
12:00–12:45	Keynote Address	Prof. James K Tumwine
12:45–1:00	**Discussion**	**Session Chair**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00–2:20	Ergonomic and Environmental Predictors of Low Back Pain among Floriculture Workers in Central Uganda	Deogratias Mugisha, Barbrah Consonet Najjuma, Tedson Kandole, Ojoma Racheal Akwu & Bala Peter Akwu
2:20-2:40	Antibacterial Activity of Phytolacca dodecandra Extracts on Sphingomonas paucimobilis	Ssekanwagi Emmanuel, Clement Nyakoojo, Paul Matovu, Efrance Najjuma & Winston Kabiswa
2:40-3:00	Genomic Source Tracking of Antimicrobial Resistance Genes in Escherichia coli Isolates from the Lake Victoria Ecosystem	Winston Kabiswa, Joseph M. Kungu, John B. Kalule, Jim Ayorekire, Immaculate Nakalembe & Samuel Majalija
3:00-3:20	**Discussion**	**Session Chair**
3:20-3:40	Ethnobotanical Study of Medicinal Plants Used by Herbalists in Kyondo Sub-County, Kasese District, Western Uganda	Abdul-Nour Hussein, Clement Nyakoojo, Paul Matovu, Efrance Najjuma & Winston Kabiswa
3:40-4:00	Interventions Addressing Unwanted Adolescent Pregnancies, Effectiveness, Implementation Barriers and Enablers in Africa: A Scoping Review	Enos Mirembe Masereka et al.
4:00-4:20	"They Could Distance Themselves from Me Claiming I Still Had Ebola": Experiences of Ebola Virus Disease Survivors in Central Uganda	Brenda Nabawanuka et al.
4:20-5:00	**Discussion**	**Session Chair**
5:00-5:30	**Evening Tea**	**Nyakahuma Charles**
Day 2-Friday 26th June 2026		
9:00-9:20	Job Demands, Mental Health and Turnover Intention among Nurses and Midwives in Kampala District, Uganda (Online)	Kwetuma Perezi
9:20-9:40	Safety Challenges in Fort Portal City: Evidence from Laboratory Analysis of Commonly Consumed Foods	Oteba Erica anyiginya Violeta, Lieven Peters, Collins Tweheyo, Catherine Ndagire, Muhammed Lubowa
9:40-10:00	Regulating Digital Health Innovation for Inclusive Healthcare Access in Uganda: A Legal and Policy Perspective	Keith Busingye
10:00-10:20	Knowledge, Attitudes and Practices Regarding CAUTI Prevention among Healthcare Professionals at Ntara Health Centre IV, Uganda	Tedson Kandole et al.
10:20-11:00	**Discussion**	**Session Chair**
11:00-11:30	**Break Tea**	**Nyakahuma Charles**
11:30-11:45	Nephroprotective Activity of Naringenin in Gentamicin-Induced Nephrotoxicity in Male Wistar Rats: An In Vivo and In Silico Evaluation	William Bwambale et al.
11:45-12:00	Malaria Dynamics in Pregnancy and Targeted Nursing Interventions at Kagadi Hospital, Uganda: A Mixed-Methods Study	Tedson Kandole, Akugizibwe Ayesiga, Deogratias Mugisha, Grace Ellah, Ojoma Racheal Akwu & Bala Peter Akwu
12:00-12:15	**Discussion**	**Session Chair**
12:15-12:30	Laboratory Evaluation of the Repellent Efficacy of Selected Indigenous Plants from Western Uganda against Anopheles gambiae	Mugisa Tony, Kimera Emmanuel, Hussain Yahaya, Mathew Chibunna Igwe & Chinyere Anyanwu
12:30-12:45	From Training to Enterprise: A Narrative Review of Entrepreneurship Training and Nurse Self-employment in Sub-Saharan Africa	Emmanuel Ahimbisibwe
12:45-1:10	**Discussion**	**Session Chair**
1:10-2:00	**Lunch**	**Nyakahuma Charles**
2:00-5:00	Plenary Session	Dr. Katende David

Session 7: Education Innovations and Inclusive Development

Venue: RA1-1 (8 Presentations**)**

Session chair: Dr. Paul Muleke and Dr. Edith Namutebi

Time	Presentation Title	Presenter(s)
Day 1-Thursday 25th June 2026		
12:00–12:45	Keynote Address	Prof. James K Tumwine
12:45–1:00	**Discussion**	**Session Chair**
1:00-2:00	Lunch	**Nyakahuma Charles**
2:00–2:30	Could Solutions Lie Within and Without?	Violet Kisakye & Deous Mary Ekyaligonza
2:30–3:00	Competence Mapping and Staff Retention in Public Universities in Uganda: Evidence from Makerere, Kyambogo, and Uganda Management Institute	Cyprian Ssebagala
3:00-3:30	Strengthening Competency-Based Curriculum Implementation in Low-Performing Secondary Schools: A Study of University-School Partnerships in Ntoroko District, Uganda	David Katende, Paul Muleke & Robert Tomusange
3:30-4:30	**Discussion**	**Session Chair**
	Day 2-Friday 26th June 2026	
9:00-9:30	Education Innovations and Inclusiveness through Research-Driven Policy and Practice: Evidence from Inclusive Public Primary Schools in Bushenyi District, Uganda (**Online**)	Ahereza Madelean
9:30-10:00	From "Jua-kali" to Classroom: An Integrated Framework for Connecting Informal Technical Sectors with Formal STEM Education	Cissy Nazziwa
10:00-10:30	Utilizing Talent-Based Innovative Localized Constructivism in Inclusive Pedagogy in Uganda's Private and Public Universities as a Strategy for Combating Graduate Unemployment	Edith Namutebi
10:30-11:00	**Discussion**	**Session Chair**
11:00-11:30	**Break Tea**	**Nyakahuma Charles**
11:30-12:00	Digital Technologies in Kiswahili Education: Opportunities and Challenges in Ugandan Secondary and Tertiary Institutions	Martin Mulei
12:00-12:30	Reforming Performance Management Practices to Enhance the Performance of Part-Time Teachers in Secondary Schools of Mbarara District, Uganda (**Online**)	Ngabirano Zipora
12:30-1:00	**Discussion**	**Session Chair**
1:00-2:00	**Lunch**	**Nyakahuma Charles**
2:00-5:00	Plenary Session	Dr. Katende David

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4.	Diploma in Agriculture
5.	Diploma in Information Technology
6.	Diploma in Tourism, Travel & Hospitality Management
7.	Diploma in Public Administration & Management
8.	Diploma in Computer Science
9	Diploma in Primary Education
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7.	Bachelor of Human Resource Management
8.	Bachelor of Information Technology
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10	Bachelor of Education (Secondary)
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12	Bachelor of Arts with Education
13.	Bachelor of Public Administration & Management
14.	Bachelor of Social Work & Social Administration
15.	Bachelor of Tourism, Travel & Hospitality Management
16.	Bachelor of Banking & Development Finance
17.	Bachelor of Science in Software Engineering
18.	Bachelor of Science with Education
19.	Bachelor of Environmental Health Science
20.	Bachelor of Science in Accounting & Finance
21.	Bachelor of Nursing Science (Extension)
22.	Bachelor of Midwifery Science (Extension)
23.	Bachelor of Science in Public Health
24	Bachelor of Science in Agriculture
25	Bachelor of Science in Aquaculture & Water Resources Management
26	Bachelor of Nursing Science (Direct)
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2.	Postgraduate Diploma in Project Planning & Management
3.	Postgraduate Diploma in Monitoring & Evaluation
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5.	Postgraduate Diploma in Financial Management
6.	Postgraduate Diploma in Agricultural Risk Management & Finance
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2.	Master of Public Health
3.	Master of Business Administration
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