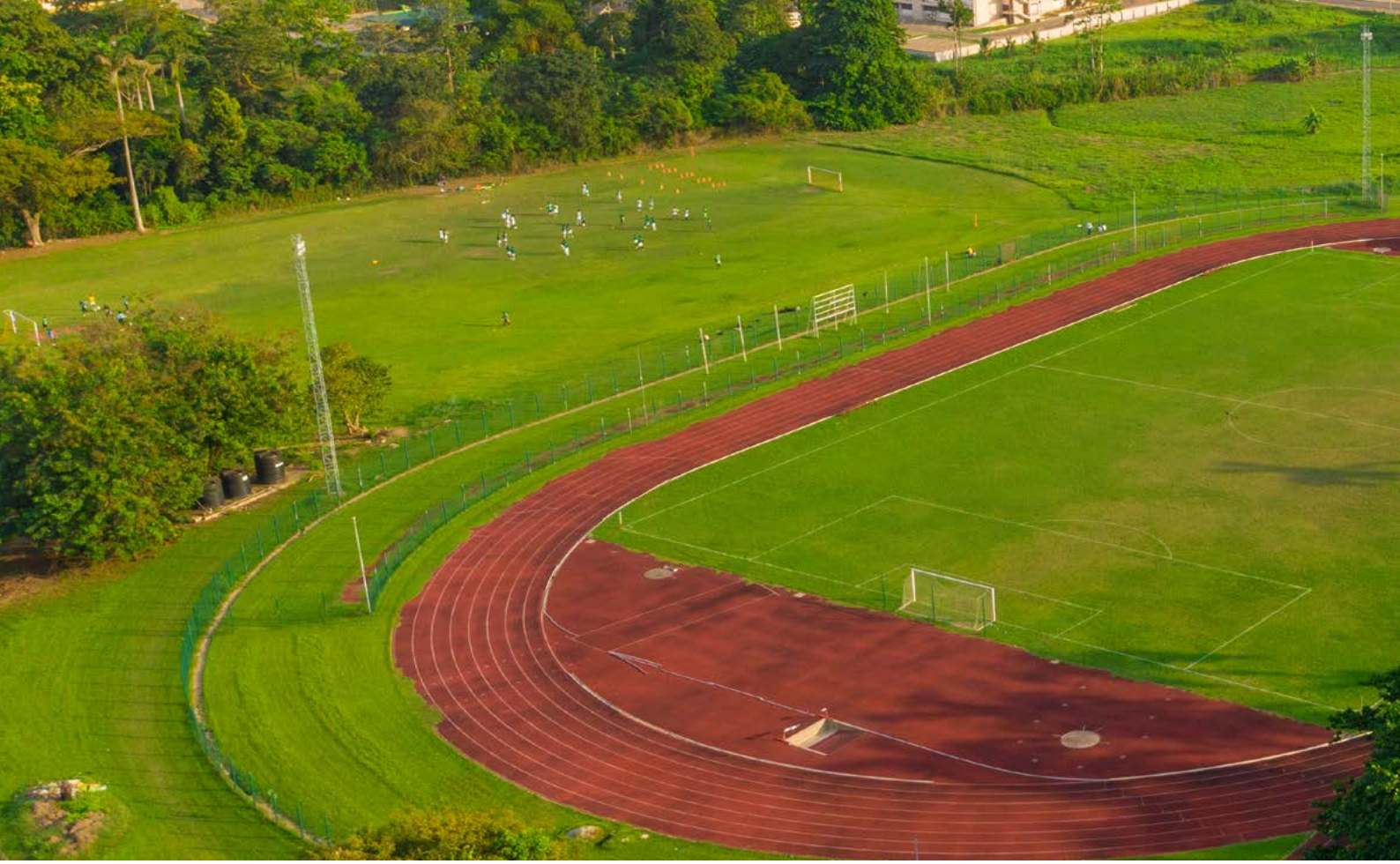
KNUST
Kwame Nkrumah
University of Science
and Technology, Kumasi

2023 Research Report



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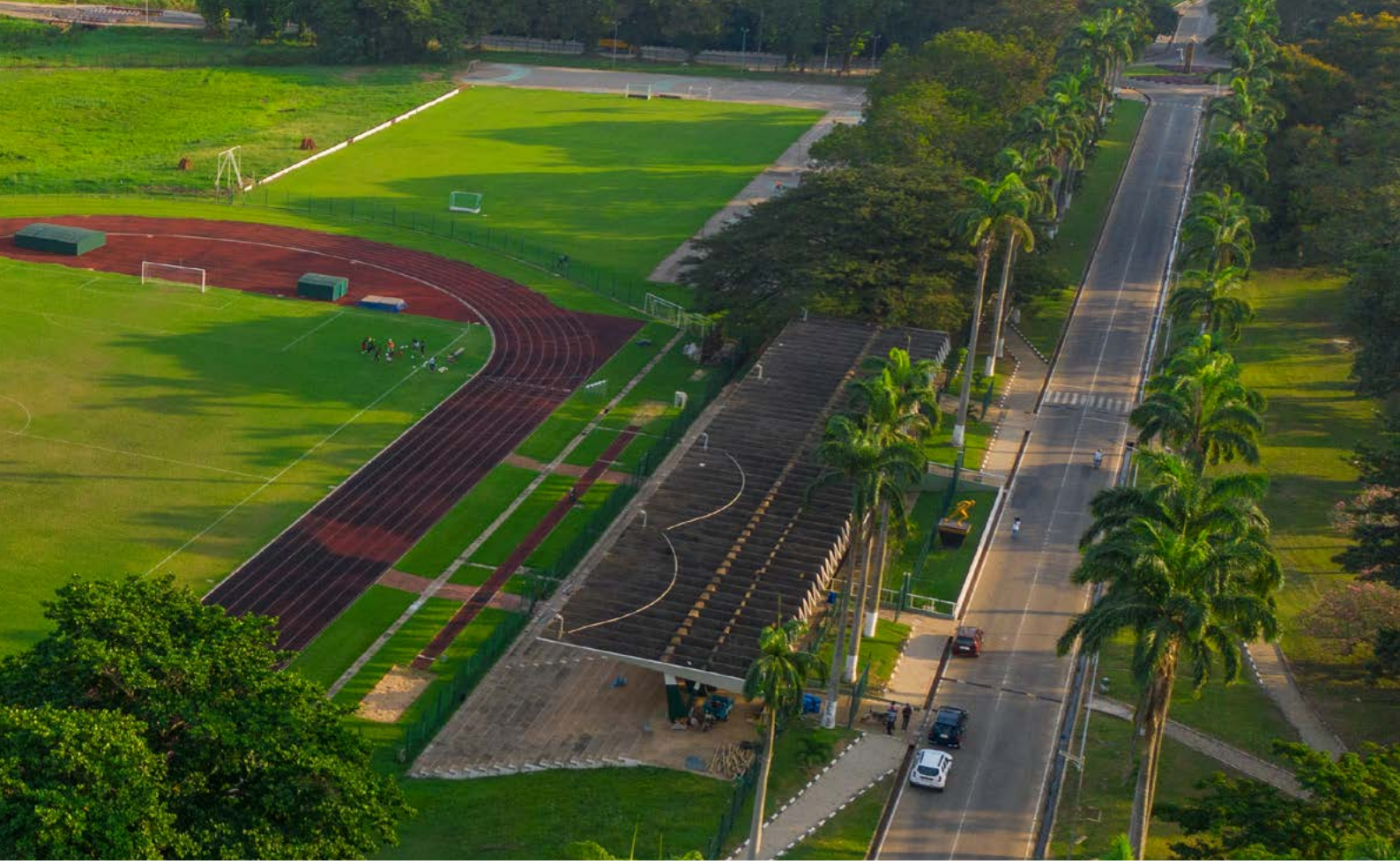


The past few years have been pivotal for the Kwame Nkrumah University of Science and Technology (KNUST) in many ways. We have sought to align with the global agenda of "building back better" in this post-pandemic era, with a clearer sense of purpose and direction in addressing the socio-economic challenges that face our societies. As a University, our over seventy year journey has also occasioned a renewed resolve to build on our leadership in the Science, Technology, Engineering, Arts and Mathematics (STEAM) space. These happenings have reinforced our commitment to being a research-intensive institution, leading cutting-edge research and providing evidence-based solutions to the complex problems we face.

In demonstrating our global citizenship, we have continued to prioritise the United Nations Sustainable Development Goals (SDGs) in our research mandate. This commitment to the global goals resulted in KNUST attaining the enviable position of the Best University globally in Quality Education (SDG 4)

Foreword

according to the 2023 Times Higher Education Impact Rankings, a testament to our exceptional performance in research, stewardship, outreach and teaching.

As we celebrate this enormous achievement, we take the opportunity to showcase the contribution of our diverse research efforts towards the attainment of the SDGs. The 6th KNUST Research Report features a selection of research conducted across our six Colleges. The report demonstrates our dedication to addressing both local and global needs, the creativity in our scholarly endeavours, and our ongoing commitment to advancing knowledge across diverse fields. The featured research highlights our multidisciplinary strength, collaborative practice, and innovative approaches to problem-solving. We have pursued continuous engagement with industry, governments, civil society organisations, and local communities in conducting our research and building collective ownership of the needs and research-informed solutions.

The University's research activities have not been limited to knowledge production. The University is placing greater emphasis on research dissemination and uptake by communities and industry to ensure that the knowledge produced creates the needed impact. Our resolve to take the gown to town remains paramount to us. We continue to provide the necessary frameworks to promote technology transfer, commercialisation, advocacy, and influencing policy and practice. Our core values of excellence, diversity, inclusion, integrity and stewardship of resources continue to characterise our research endeavours. Our commitment to these tenets and strategies and the unwavering dedication to innovative research has resulted in KNUST's many achievements, including an enviable membership of the Africa Research Universities Alliance (ARUA). Through this membership, KNUST joins the leading research universities on the continent to significantly increase the quantity and quality of research done in Africa by African researchers.

We are not resting on our laurels but pursuing bold initiatives to further advance our scientific footprint in global development efforts. We continue to invest in research leadership training, staff capacity enhancement, research infrastructure development and research visibility. Additionally, we are developing the KNUST Research Hill which is home to world-class research centres of excellence, multipurpose laboratories, and innovation centres. We are focused on developing research excellence in critical emerging areas such as artificial intelligence, pandemic sciences and climate adaptation in line with fast-moving trends.

I would like to extend my deepest gratitude to the Director of the Office of Grants and Research and his team as well as the School of Graduate Studies for their dedication and commitment to promoting the research intensiveness agenda of the University. I am grateful to our staff and students for their passion and perseverance that have advanced our research enterprise. I also wish to acknowledge the invaluable support of our collaborators, funders, and stakeholders whose investment and continuous engagement make our research endeavours possible. I am confident that the efforts reflected in this report will inspire an even greater commitment to impactful research and its meaningful contributions to the world around us.

Prof. (Mrs.) Rita Akosua Dickson

VICE-CHANCELLOR

From the Director's Desk

Since its establishment in 2013, the Office of Grants and Research (OGR) under the Vice Chancellor's Office, has played a central role in facilitating the provision of the necessary environment and policy frameworks to promote the research intensiveness agenda of the university.

KNUST researchers continue to play a critical role in addressing socioeconomic development challenges facing society through cutting-edge research. We share, through the pages of this report, some of the innovative and impactful research conducted by staff of KNUST in the period from 2022 to 2023.

I am pleased to report that the Office of Grants and Research implemented several initiatives within the period to advance KNUST's research enterprise. In line with the Vice-Chancellor's strategic mandate to promote research performance and visibility, we organised our maiden Research Week and the KNUST Scientific Conference (TEKCONFAB 2023) with the theme, "Innovation and Entrepreneurship in Science and Technology for a Sustainable Future". The Research Week and the Conference provided an opportunity for our researchers and collaborators to engage in thought-provoking ideas and showcase the wide range of research being carried out at KNUST. The week was climaxed with a Research Excellence Awards Ceremony where the hard work and dedication of staff, Colleges, and Research Centres who have made valuable contributions to the KNUST research and grants portfolio were celebrated. The week also marked a decade of the OGR's consistent provision of efficient research management support towards growing KNUST's research enterprise These activities have significantly enhanced research outputs and visibility, and created an increased awareness of grantsmanship among our early career researchers.

In the period under review, we received over $35 million in grant awards from global funders, collaborated with several institutions across all the continents. Three (3) award cycles of the KNUST Research Fund (KReF), with a total amount of GHC3,958,441.00, were successfully administered. A number of novel initiatives and programmes were rolled out to facilitate the University's research intensiveness agenda, including the development of a 5-year strategic plan for the OGR, residential proposal writing retreats, funder-specific seminars, tailored training in response to identified knowledge gaps, and the OGR Interactive Series. The Intellectual Property Unit of the Office continues to expand its crucial role including undertaking an institution-wide audit to identify and safeguard protectable intellectual property from our research outputs and innovations.

As we expand our research enterprise to align with our research intensiveness agenda, we will continue to strengthen our research governance framework including ensuring policy compliance to guarantee that research integrity remains our hallmark. We will maintain robust research management systems to facilitate efficient and responsible conduct of research.

This report has been put together with the help of several staff and Units across the University. On behalf of the OGR Board and the entire staff of OGR, I express my profound gratitude to the Vice-Chancellor and the entire management of the University for their unwavering commitment and support for research.

Our special appreciation goes to the KNUST Research Report Committee for their relentless efforts and demonstration of a high sense of professionalism. I am profoundly grateful to all Provosts, Directors, Deans, and Heads of Department for their support in promoting research and grantsmanship across the university. I acknowledge the tremendous support by the University Relations Office, the University Library, the Quality Assurance and Planning Office, and the University Printing Press.

I remain truly grateful to the staff at the Office of Grants and Research for their commitment and selfless dedication in providing exceptional research support services in pushing the research agenda of the University.

I am hopeful that the research outputs reported in this 6th edition of the KNUST Research Report will inspire various stakeholders and funding agencies in committing resources for impactful research at the University in meeting our collective needs.

Please, enjoy the reading of this research report.

Prof. Philip Antwi-Agyei

DIRECTOR, OFFICE OF GRANTS AND RESEARCH

KNUST

Our Strategic Mandate

The Act establishing the University defines its mandate, which essentially is to provide higher education, undertake research, disseminate knowledge and foster relationships with outside persons and bodies. The strategic mandate of the University is derived from the Science and Technology in its name.

Vision

To be among the top ten Universities in Africa building on KNUST's leadership as the premier science and technology university in Ghana.

Mission Statement

KNUST exists to advance knowledge in science and technology through creating an environment for undertaking relevant research, quality teaching, entrepreneurship training and community engagement to improve the quality of life.

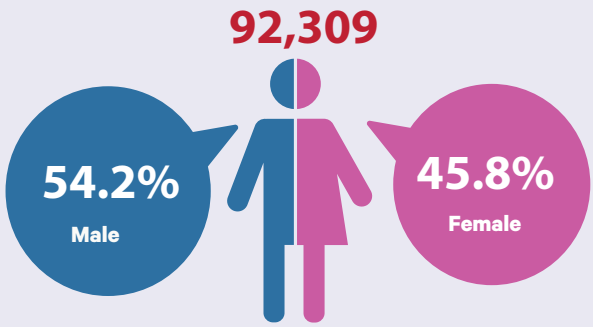
Core Values

KNUST is committed to attracting and developing excellent staff and students in order to contribute towards the achievement of the goals, targets and directions that the government has set for higher education.

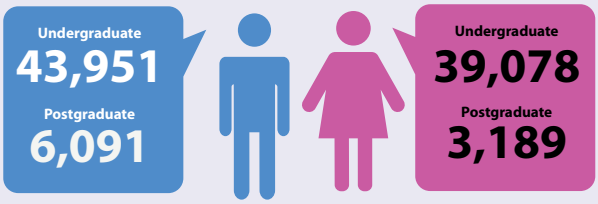
In fulfilling the Vision and Mission of the University, the following Core Values would be adhered to:

- Leadership in Innovation and Technology
- Culture of Excellence
- Diversity and Equal Opportunity for All
- Integrity and Stewardship of Resources

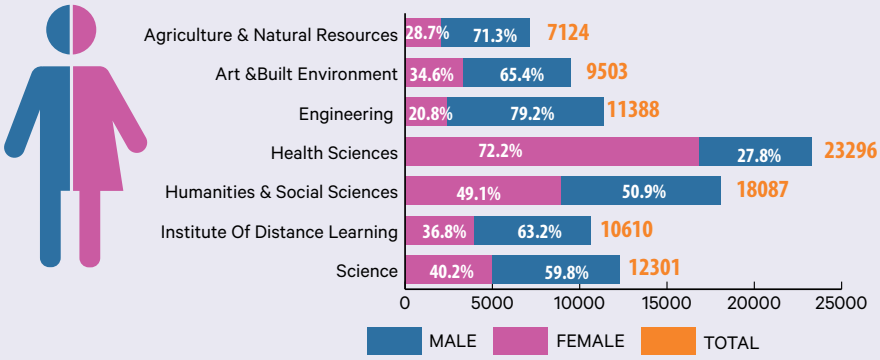
KNUST Student Population (2023)



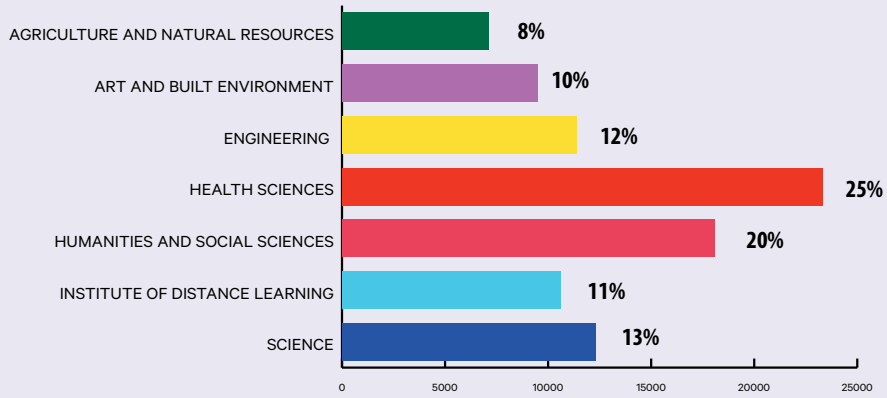
Undergraduate and Postgraduate Distribution



Student Population by Colleges (Gender)



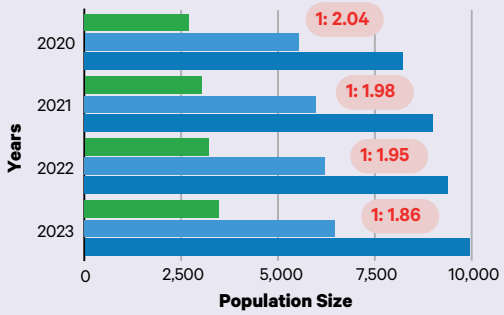
Student Population by Colleges (Percentages)



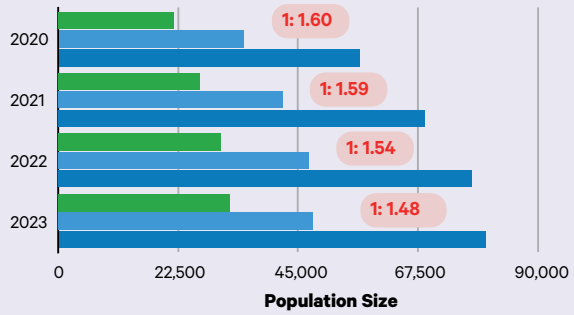
Basic Statistics

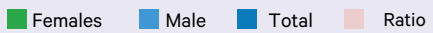
KNUST's Student Population Trend from 2020-2023

Female-to-male gender ratio for postgraduate students 2020-2023

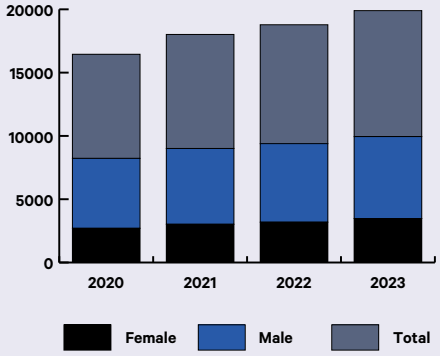


Female-to-male gender ratio for undergraduate students 2020-2023

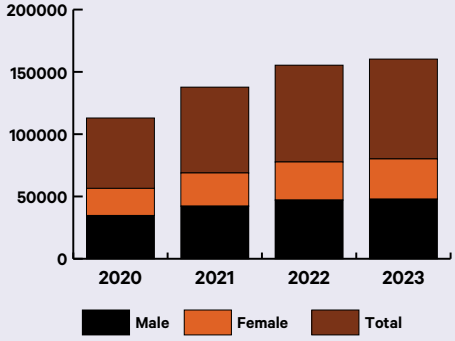




Postgraduate student population trend 2020-2023

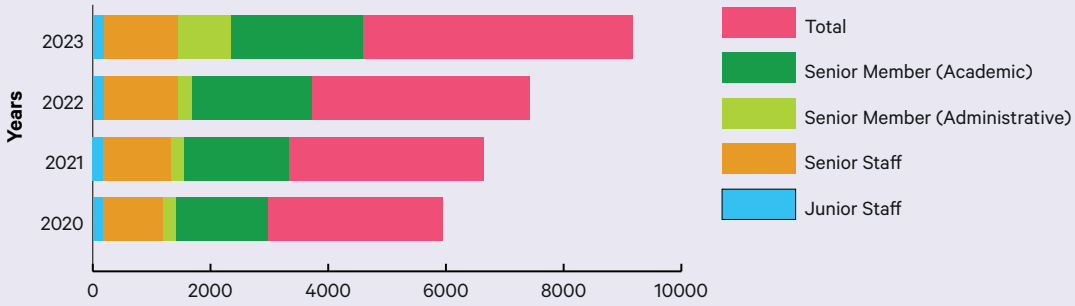


Undergraduate student population trend 2020-2023



Staff Population

Staff Data from 2020 -2023



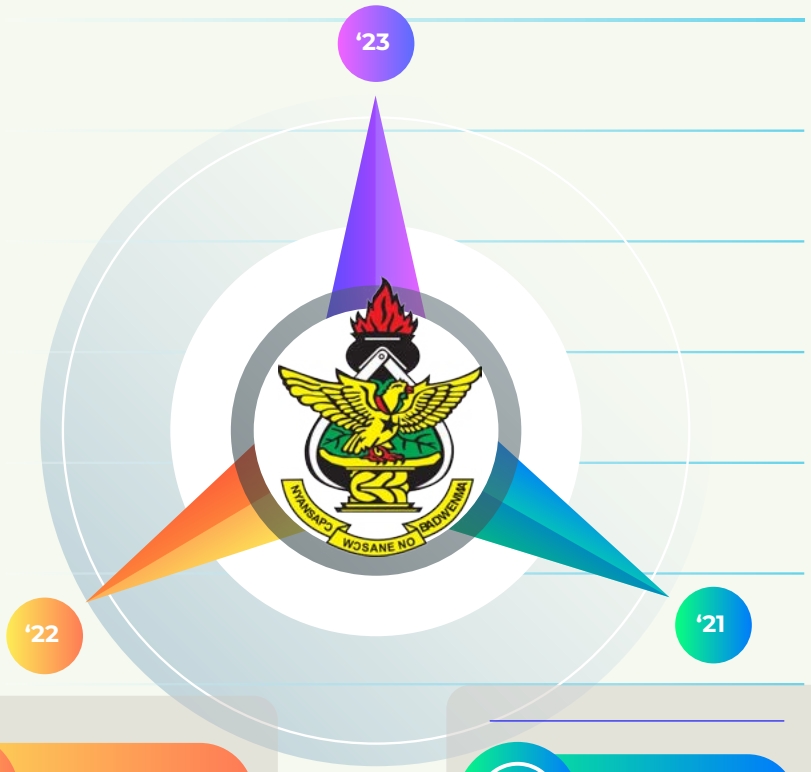
Year	Junior Staff	Senior Staff	Senior Member (Administrative)	Senior Member (Academic)	Total
2023	185	1253	915	2233	**4586**
2022	185	1253	248	2025	**3711**
2021	174	1145	228	1776	**3323**
2020	167	1025	220	1563	**2975**

Research Performance

2023

Best University in the World for the Provision of Quality Education (SDG 4).

The prestigious accolade was announced in the published 2023 Times Higher Education Impact Rankings.



2022

Best University in Africa for Quality Education (SDG 4)

2022 Times Higher Education Impact Rankings

2021

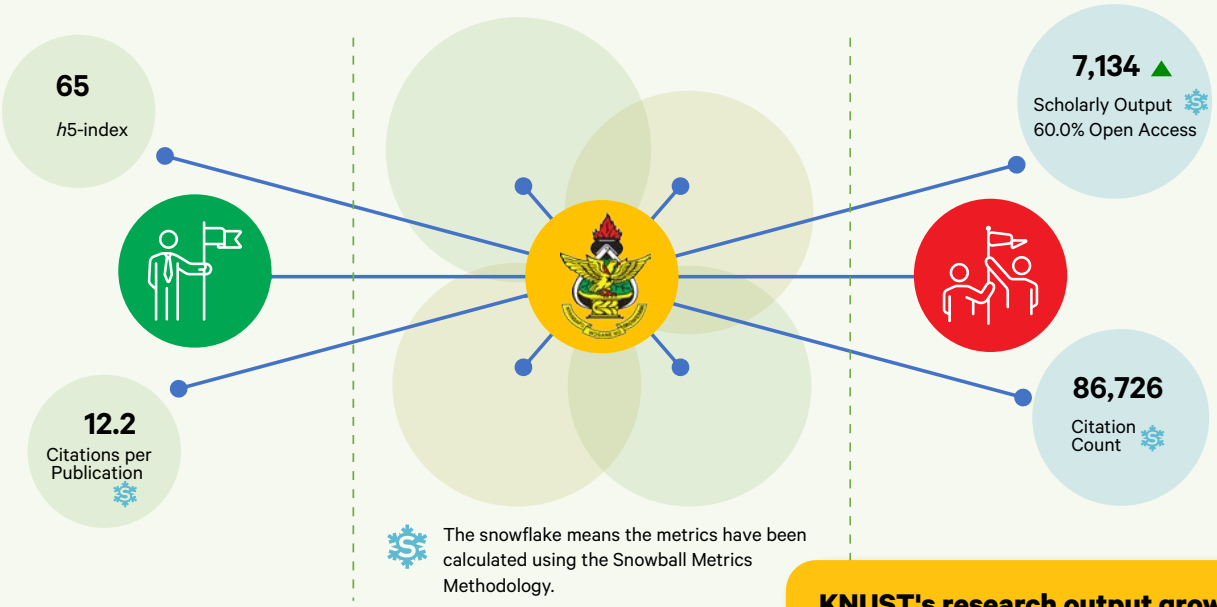
Best University in Ghana, 12th Best University in Africa

U.S. News and World Report; 2021 Best Global Universities Ranking

2021 Best Global Universities Rankings

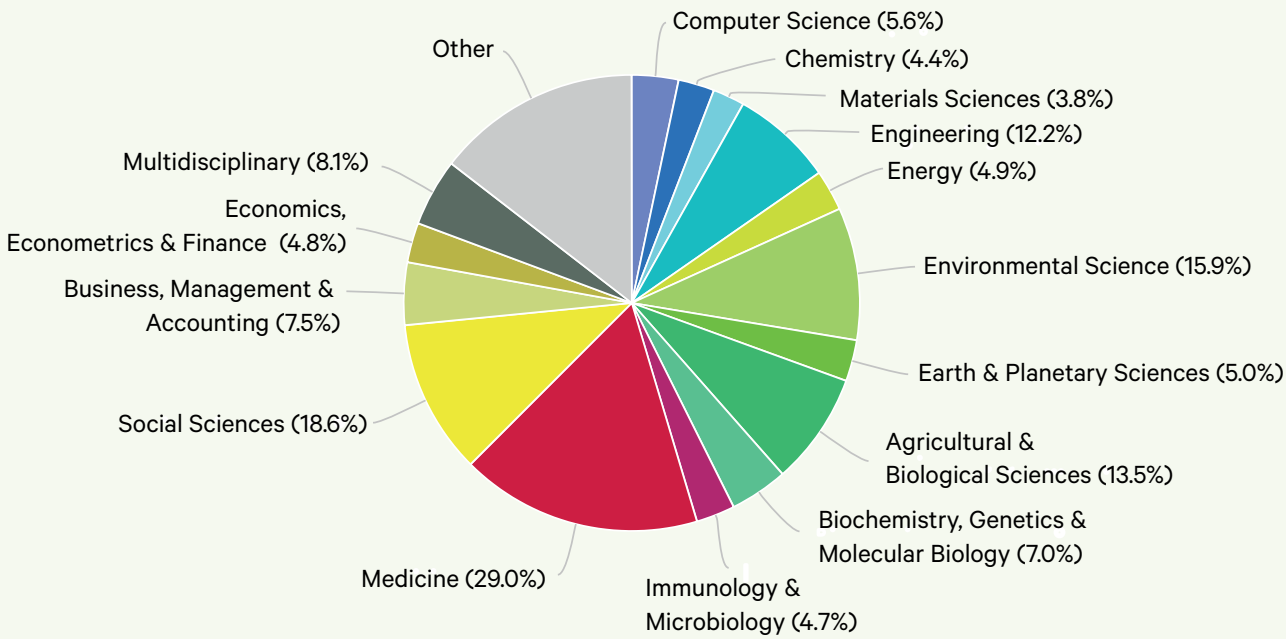
KNUST's Research Output (2018-2023)

Summary Metrics (Scopus Data)



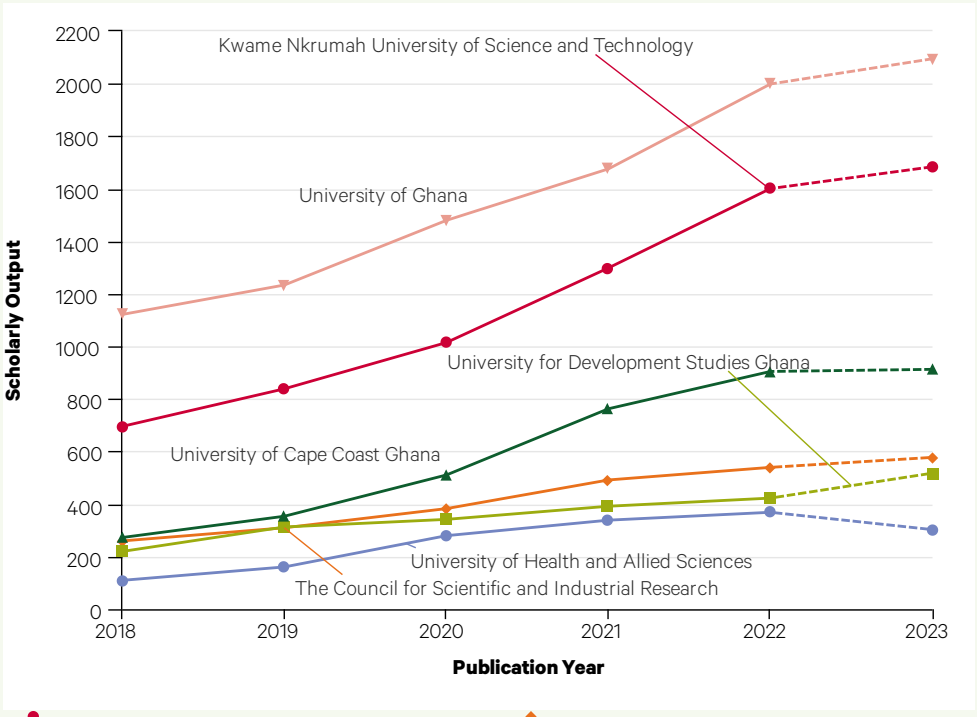
KNUST's research output growth has been significant at 12% Compound Growth Rate over the 5-year period.

Publication Share by Subject Areas

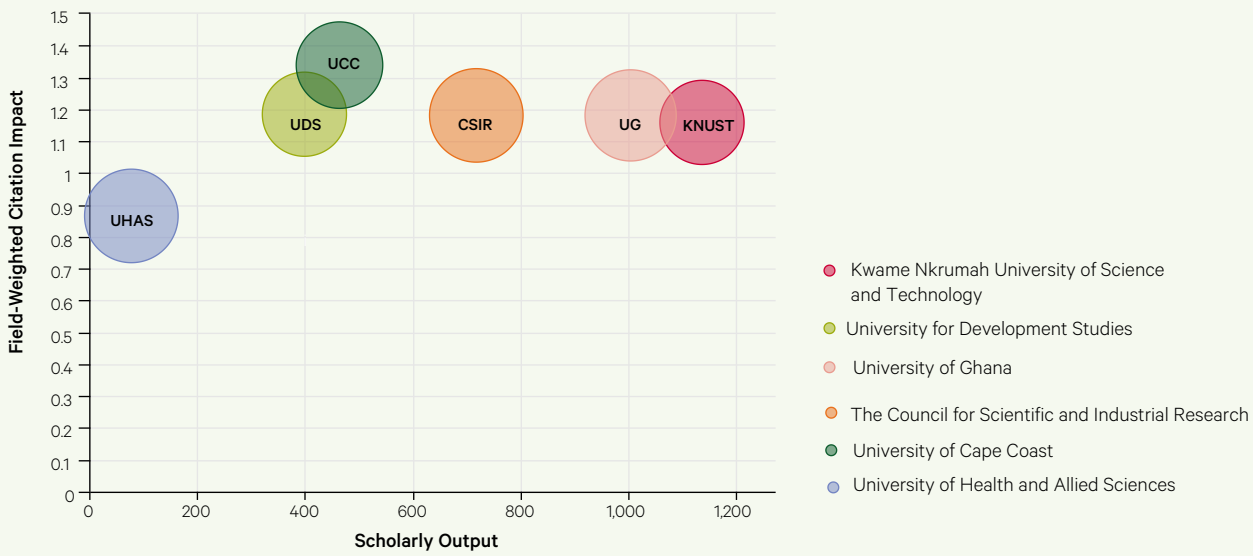


KNUST's Research Output Relative to Peers

KNUST research output growth has been consistent from 2018 to 2023

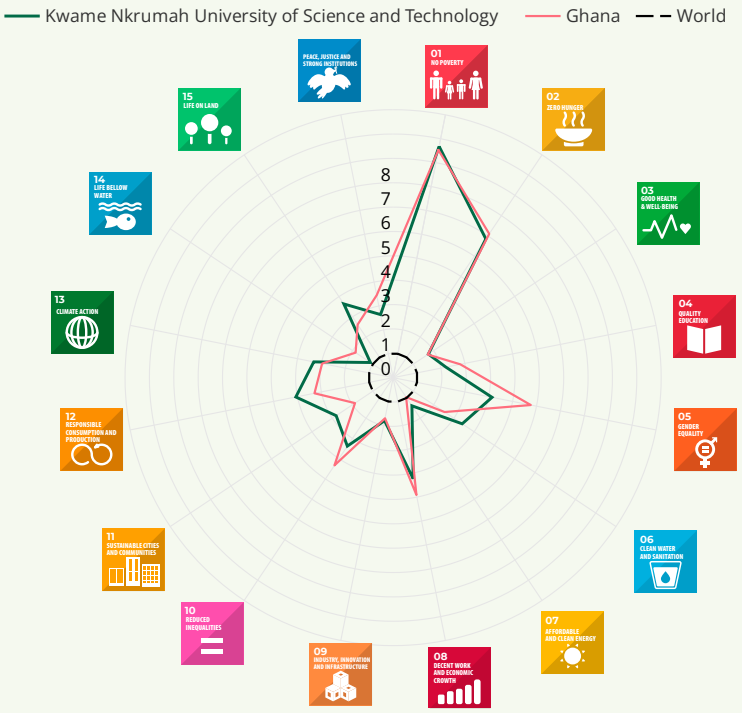


Peer Benchmarking on Impact



Field Weighted Citation Impact (FWCI) indicates how the number of citations received by an article compares to the average or expected number of citations received by other similar publications. Similar publications are determined by year, type, and discipline.

KNUST's Research Output Towards the Sustainable Development Goals **(SDGs)**

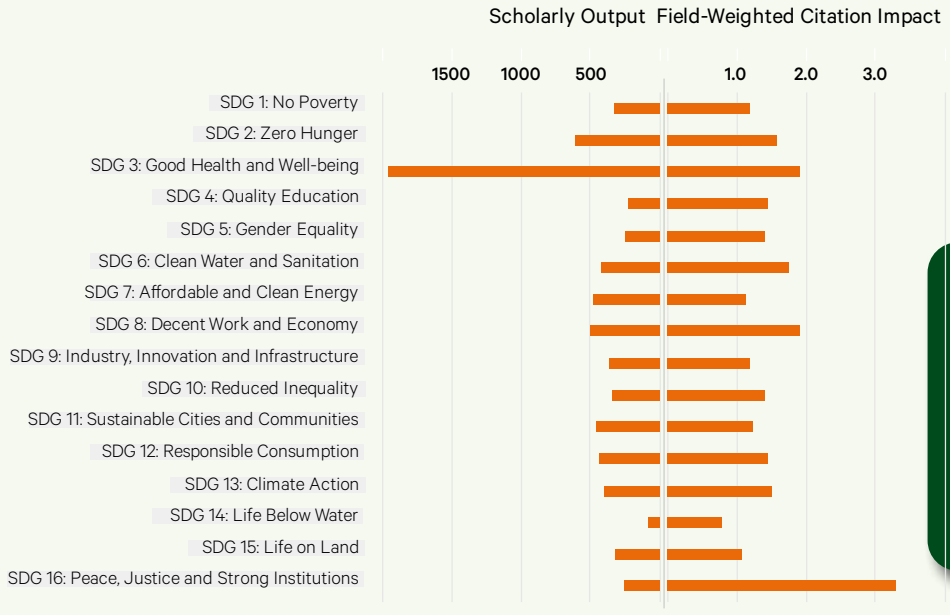


Relative to Ghana and the World, KNUST contributes more towards SDGs 01, 12, 13, and 15

Relative to World & Country

Mapping towards SDGs is based on keyword-based searches in Scopus.

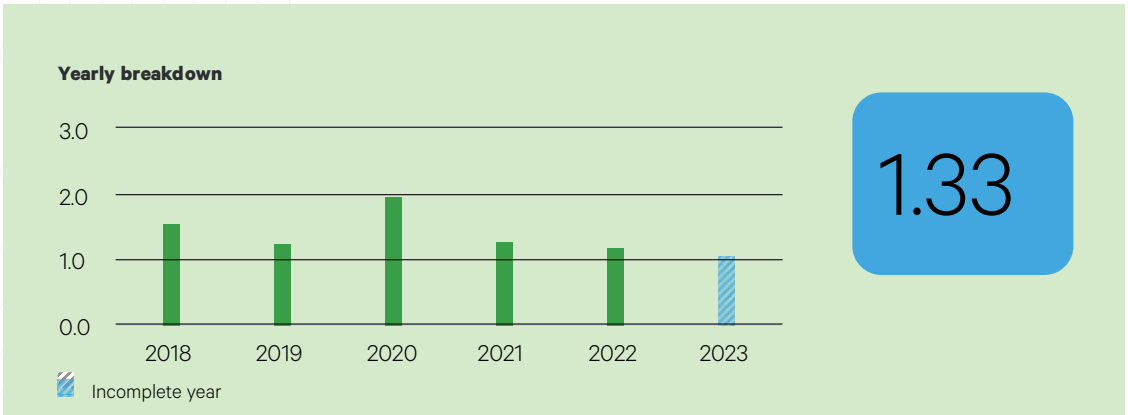
SDG Subject Distribution (Volume vs Impact)



Medicine is the most dynamic and most impactful research area with almost 3x the world average in citations

KNUST's Publication Impact

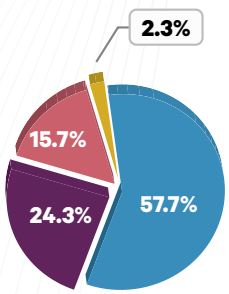
Field-Weighted Citation Impact



KNUST's Collaborations 2018 - 2023

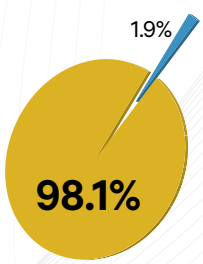
International, National and Institutional Collaborations

Metric	Scholarly Output	Citations	Citations per Publication	Field Weighted Citation Impact
International collaboration	4,114	68,908	16.7	1.77
Only national collaboration	1,733	9,594	5.5	0.69
Only institutional collaboration	1,123	7,253	6.5	0.80
Single authorship (no collaboration)	164	971	5.9	0.72



Academic–Corporate Collaboration

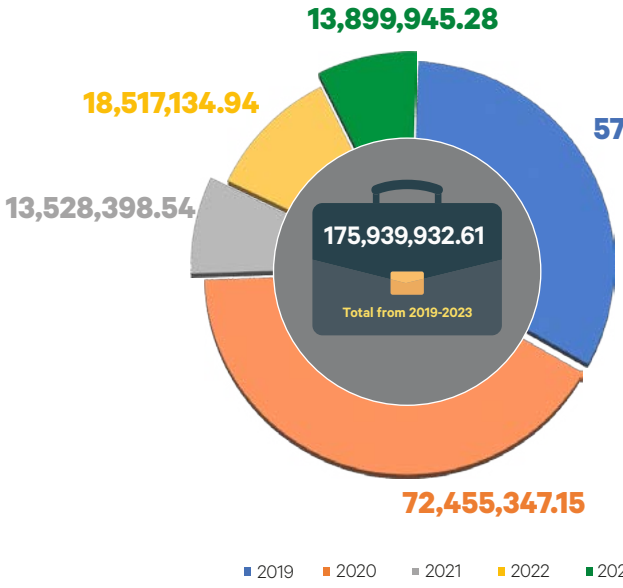
Metric	Scholarly Output	Citations	Citations per Publication	Field Weighted Citation Impact
Academic-corporate collaboration	137	24,736	180.6	16.01
No academic-corporate collaboration)	6,997	61,990	8.9	1.04



(Data Source: Scopus)

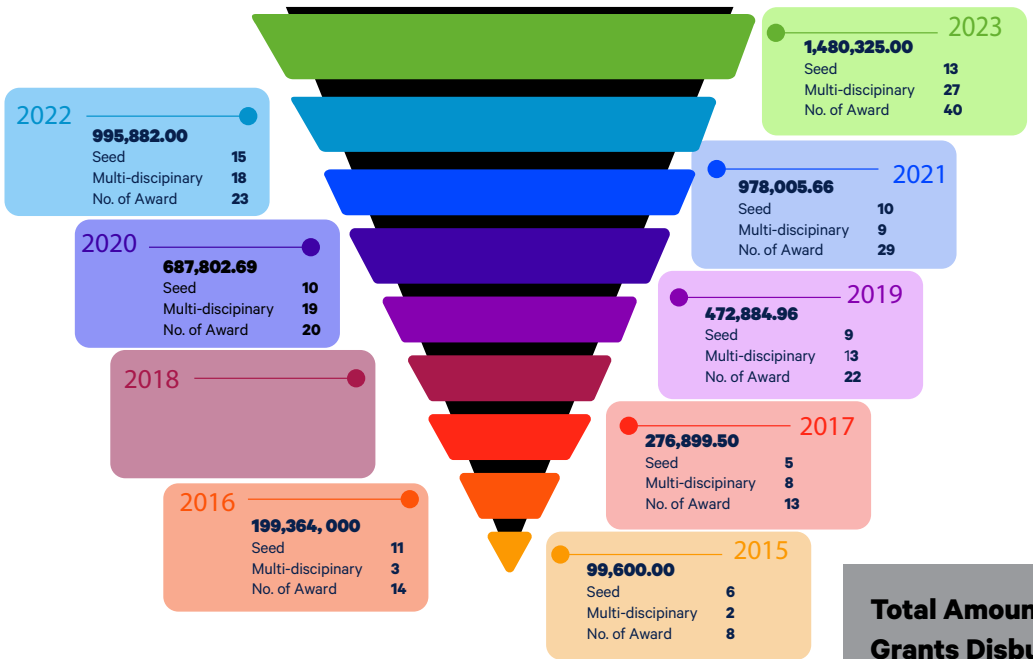

OGR @ 10
GARY COMSTOCK
RESEARCH ETHICS
GRANT WRITING 101
INNOVATION IN TRANSLATION

Externally Funded Grant Awards



Total Amount of Grants Received (USD)

Internally Funded Grant Awards
KNUST Research Fund (KReF)



Total Amount of Grants Disbursed (GH¢)

KNUST's Funding Partners

THE WORLD BANK

Danida Fellowship Centre
Sustaining development through research and learning

mastercard foundation

THE ROYAL SOCIETY

European Union

NIH
National Institutes of Health

GOVERNMENT OF GHANA

BILL & MELINDA GATES foundation

The African Academy of Sciences

GCRF
Global Challenges Research Fund

wellcome trust

IDRC · CRDI
International Development Research Centre
Centre de recherches pour le développement international

Canada

UKRI
UK Research and Innovation

World Health Organization

KNUST's Funding Partners

KNUST's Funding Partners

Research Overview

College of Agriculture and Natural Resources

The College of Agriculture and Natural Resources (CANR) continues to lead in research innovation and academic excellence. With a strategic focus on advancing food production, rural livelihoods, climate change adaptation, entrepreneurship, and natural resources governance, CANR has solidified its role as a premier research-intensive College.

In 2022-2023, CANR launched several ground breaking research projects. These projects are spearheaded by faculty members and supported by active student involvement, underscoring the College's commitment to integrating research with teaching and learning. Key initiatives include: research for development and innovation in agriculture and learning, fostering new agricultural techniques and learning methodologies; climate-smart cocoa agroforestry in ghana, developing sustainable cocoa farming practices that enhance resilience to climate change; soil conservation and regenerative practices, enhancing carbon sequestration and reducing greenhouse gas emissions through innovative soil management; machine learning for fertiliser recommendation in ghana, a collaborative research for site-specific fertiliser recommendation and yield prediction. Others include identifying pollinators to enhance cocoa productivity, conducting in-depth research on pollinators to improve cocoa yields; organic soil amendments in cocoa farming, investigating the production and economic use of organic soil amendments; comprehensive tier 2 livestock greenhouse gas inventory in Ghana, compiling a detailed greenhouse gas inventory for the livestock sector; exploring the use of fruit by-products to enhance small ruminant production sustainably; poultry husbandry practices reference guide, developing a comprehensive guide for poultry farming tailored to local contexts; and technical operational manual for tree crops development authority, creating a strategic operational manual to guide the implementation of a five-year plan for tree crops development in Ghana.

During this period, CANR secured over 25 major research grants from prominent organisations, including the EU, USAID, DANIDA, IITA, Norad, DFID, the New Zealand Agriculture Greenhouse Gas Research Council, FSNet-Africa, and the Royal Society. These grants enable faculty and students to conduct high-impact research addressing local and global challenges. New partnerships with the United Nations World Food Programme, the World Bank, the International Union for the Conservation

of Nature (IUCN) and UM6P, Morocco have further expanded the College's research reach and impact.

CANR's research has had a tangible impact on local communities. In collaboration with the Kumasi Recycling Plant of the Jospong Group of Companies, CANR developed a proposal for effective waste management, compost improvement, quality assurance, and certification for the agricultural industry. This project exemplifies how CANR's research translates into practical solutions for community challenges.

CANR has also achieved international recognition. In the 2022-2023 academic year, a team of students from the BSc Packaging Technology programme won the Safe Food Gold Award at the WorldStar Global Packaging Awards 2022, organised by the World Packaging Organisation. The winning team, comprising Ms. Humility Daniella Nyame, Mr. Christian Addo, and Ms. Samuella Obuoma Aggrey, was recognised for their research into safe and sustainable food packaging. Their project highlighted the development of packaging solutions that enhance food safety and extend shelf life, which is crucial for food security and reducing waste. Additionally, the gold winner for the WorldStar Global Packaging Award 2023 was from the same programme. The winning entry titled "Alpha Biopac – Packaging for Effective Storage and Transportation in the Supply Chain for Smoked Fish" by Ms. Akyaa Edna Amo-Duah, Mr. Bartholomew Nyarko, and Ms. Naa Adoley Maxine Allotey-Quist, originated from their extensive research into packaging innovations. This project focused on developing sustainable packaging materials that ensure the safe transportation and storage of smoked fish, a staple in many Ghanaian households.

The College has invested in a state-of-the-art agricultural research laboratory, enhancing capabilities in soil and plant analysis. These facilities support the College's robust research agenda and provide students with hands-on experience in cutting-edge research techniques. Looking ahead, CANR aims to explore the use of digital technologies in precision agriculture, leveraging data analytics and remote sensing to optimise agricultural practices. The College also plans to expand its research on climate resilience, focusing on developing adaptive strategies that mitigate the impacts of climate change on agriculture and natural resources.

Through these initiatives, CANR remains a cornerstone of innovation, significantly contributing to sustainable development and improved livelihoods in Ghana and beyond. The College's commitment to research excellence ensures that it continues to produce impactful research that addresses pressing global challenges while providing students with the skills and knowledge needed to become leaders in their fields.

College of Art and Built Environment

The College of Art and Built Environment (CABE) being the foremost institution in the training of professionals of the built environment, design and art industry in Ghana is made up of three faculties: Art, Built Environment and Educational Studies. These faculties offer an array of teaching, research and outreach programmes in the key disciplines of Architecture, Building Technology, Planning, Land Economy, Communication Design, Painting and Sculpture, Rural and Industrial Art and Publishing Studies.

The primary objective of the College is to advance knowledge geared towards addressing global interventions in line with the SDGs and AU agenda 2063. Through its research department, the Centre for Settlement Studies (CSS), the College is engaged in developing innovative and appropriate technologies for addressing rural and urban housing solutions.

The CSS, established in 1959 by the Government of Ghana, is an Educational, Advisory Research Centre under the Faculty of Built Environment. It focuses on housing and planning research, aligning with the Sustainable Development Goals (SDGs) and the new urban agenda. CSS aims to lead urban research in Africa, and address socio-economic needs of rural and urban poor communities. CSS research fellows are affiliated with professional bodies such as the Ghana Institute of Planners, and collaborate with local and international institutions like the World Bank and DFID. CSS is a founding member of the African Urban Research Initiative (AURI) and works with KNUST's Departments of Planning and Civil Engineering on Urban Management and Disaster Risk Assessment programmes.

Key projects include the Network of Excellence on Land Governance in Africa (NELGA), a DANIDA-funded collaboration with Aarhus University for sustainable natural resource management, a partnership with the Technical University of Munich on flood-induced malaria research in Accra and recently the Building Resilient Communities through Integrating Climate Adaptation with Sustainable Development Goals in the University Education and Research (BRIDGE) project funded by the German Academic Exchange Service (DAAD) and led by Prof. Divine Ahadzie.

College of Humanities and Social Sciences

The College of Humanities and Social Sciences (CoHSS) is the largest of the university's six Colleges, comprising two faculties and a school: the Faculty of Social Sciences, the Faculty of Law, and the KNUST School of Business. CoHSS is distinguished not only by its size but also by its commitment to cutting-edge research and interdisciplinary innovation. It hosts two pivotal research centres: the Centre for Applied Research and Innovation in Supply Chain Africa (CARISCA) and the Centre for Cultural and African Studies. These centres drive research initiatives that align with the United Nations' Sustainable Development Goals (SDGs), leveraging advanced methodologies such as artificial intelligence, machine learning, geographic information systems (GIS), and remote sensing to address critical Social Sciences and Humanities challenges.

Over the years, CoHSS has fostered an environment conducive to teaching, collaborative research, entrepreneurship, and outreach programmes across critical disciplines, including Law, Business Administration, Economics, Geography and Rural Development, Political Studies, History, Sociology, Social Work, Religious Studies and Human Development, English, Linguistics, French and Francophone Studies, Akan Language and Culture, and Media and Communication Studies. These efforts support KNUST's mission to deliver high-quality education, foster innovation, and contribute to the socioeconomic advancement of Ghana, Africa, and the world. Graduates from these programmes continue to enhance the university's vision of developing relevant knowledge and a skilled workforce for sustainable development.

The KNUST School of Business (KSB) excels in research, innovation, and global partnerships. Through the $15 million KNUST-Arizona State University (ASU) CARISCA Project, funded by USAID, it has become a leading hub for supply chain research and capacity building in Africa. KSB also hosts the O. R. Tambo Research Chair in Entrepreneurship and Youth Employment, awarding scholarships to promote entrepreneurial growth and youth empowerment in 2022–2023.

KSB's international collaborations include a partnership with the Technical University of Berlin, which established the Centre for Affordable and Sustainable Logistics Networks (ASONG) and created internships in Germany focusing on purchasing and E-mobility. Another key initiative is the exchange programme with Southern University in Louisiana, which brought a 22-member delegation to KNUST in 2024. This visit promoted international business education, export readiness, and digital entrepreneurship for minority- and women-owned small businesses while enhancing faculty and student experiences.

In academic innovation, KSB students joined the ASU-KNUST 3+1+1 International Accelerated Degree Program under the MasterCard Foundation Scholars Program, and the Department launched a Master's programme in Aviation Management in partnership with the Ghana Civil Aviation Authority to address industry needs. These achievements highlight KSB's commitment to excellence and societal impact.

Professor George Bob-Milliar from the Department of History and Political Science secured a $1.7 million DANIDA grant for the "Multiple Waterscapes in Urban Ghana" (MUWUG) project, which will train two PhD students. Dr. Eugenia Anderson and Miss Helena Egyir earned the prestigious Queen Elizabeth Advanced Scholars Award, advancing their research in Canada. Furthermore, Dr. Sebastian Paalo received the 2024/2025 Social Science Research Council (SSRC) African Peacebuilding Network fellowship for his project on *"Ambiguous Empowerment. A Feminist Critical Peace Reading of Women's Empowerment in Peacebuilding in Ghana and Sierra Leone."* The College of Humanities and Social Sciences continues to drive knowledge creation, societal progress, and sustainable development through dedicated efforts.

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College of Engineering

Formerly called the School of Engineering, the College of Engineering, KNUST has been the hub of innovation in the country for many years.

Professor Kwabena Biritwum Nyarko, a Professor in the Civil Engineering Department, is the current provost of the College.

The College of Engineering, KNUST has three faculties: the Faculty of Mechanical and Chemical Engineering, the Faculty of Civil and Geomatic Engineering, and the Faculty of Electrical and Computer Engineering.

The College offers a wide range of engineering programmes, including Agricultural Engineering, Aerospace Engineering, Automobile Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical and Electronics Engineering. Other programmes include Geological Engineering, Geomatic Engineering, Marine Engineering, Materials Engineering, Mechanical Engineering, Metallurgical Engineering, Petrochemical Engineering, Petroleum Engineering, and Telecommunications Engineering.

Several great alumni have been produced by this noble College. Some of these people include Patricia Obo-Nai, the current Chief Executive Officer of Telecel Ghana, Selorm Adadevoh, the Chief Commercial Officer of MTN Group, Ghana, and Engineer Thomas Mensah who was a contributor to the development of fibre optic manufacturing and nanotechnology.

Research work at the College is mostly spearheaded by research centres of the College. These include the Brew-Hammond Energy Centre, Regional Water and Environmental Sanitation, Kumasi, KNUST Engineering Education Project, Transport Research and Education Centre, Kumasi, and West African Science Service Centre on Climate Change and Land Use.

Some of the innovations from the College of Engineering, KNUST include the famous fufu pounding machine that has made the preparation of fufu very simple and less complicated.

Currently, several kinds of research are being conducted at the College in various fields to address both national and global needs.

There is research for the production of a low-cost Automated Continuous Ambulatory Peritoneal Dialysis Device to help in the removal of excess water, solutes, and toxins from the blood. The device has a robust interface that controls the entire continuous ambulatory peritoneal dialysis setup with minimal or no human intervention. The project combines mechanics, electronics, and programming to automate continuous ambulatory dialysis setup and monitor the dialysis process.

The College is also a host to a project titled, "The Agrivoltaic Technology in Drylands of West Africa: Strengthening National Innovation Systems for Diffusion and Market Development at the Water-Energy-Food Nexus". The project developed an agrivoltaic system to bolster the national resilience of renewable energy and food production security to a changing climate in Ghana. The project used a piece of land for crop cultivation in the partial shade of a solar PV installation that produces electricity. While the crop yield increases through this process, the solar PV installation efficiency increases due to the cooling effect from the transpiring effects of the crops.

The rise of galamsey activities in Ghana has greatly damaged various water bodies and lands in Ghana. As a way to ensure the safety of people in mining areas, a team from the College of Engineering has conducted research on the beneficiation and nanosynthesis of iron oxide from ferrous slags for heavy metal removal from polluted water. Heavy metals like arsenic, lead, and mercury pollute water bodies through the actions of galamsey. These ferrous slags are waste products from blast furnace works and they have proven to be very useful for the removal of some of these heavy metals from the galamsey polluted water bodies.

The SmartGreen is an innovative smart irrigation system designed specifically for small to medium-scale farmers in Ghana who do not have access to modern irrigation systems. SmartGreen is aimed at transforming farming in Ghana by optimising water usage, enhancing crop yields, and supporting sustainable agricultural practices. The project contributes to the SDGs 2, 13, and 15.

BIDIGREEN is a research project that has produced smokeless charcoal for household and business use. BIDIGREEN is a start-up that aims to solve the issues surrounding the felling of trees for charcoal production in rural and urban areas in Ghana by producing charcoal from crop waste like sawdust, coconut shells, palm kernels, and others. The charcoal produced from the research is smokeless and also burns longer than the traditional charcoal. This research project aims at empowering Ghana to fulfil SDG Goals 7, 8 and 13.

The College is witnessing an innovation in the upcycling of electronic waste into functional art. This project makes use of out-of-place resources that have not been found yet. Spray cans and pomade bottles are repurposed into electronic materials like bulbs, bluetooth devices, solar devices, and others.

A smart Internet of Things energy conservation innovative device called "DUO" has been produced at the College to efficiently conserve energy by automatically powering off electrical gadgets like light bulbs, fans, air conditioners, and other electronics when no human presence is detected in a room within a specified duration. The innovation receives functionality updates remotely, making it a dynamic and responsive system. This innovation addresses SDGs 7, 9, and 12.

Kente cloth, an indigenous Ghanaian fabric, is currently produced manually in a wooden loom. This traditional process is not only toilsome and time-consuming, taking 14 to 40 days to produce, but also limits the scale of production and the affordability of the fabric. The Mechanised Kente Weaver rolled out by a team of researchers at the College addresses this issue by introducing an innovative small-scale, compact, portable, and energy-independent mechanised kente weaving loom. This technology has improved and increased the productivity of the kente fabric by about ten folds, leading to a lower market price of the kente cloth and making the kente weaving industry more sustainable and attractive.

The design, fabrication, and testing of a hand exoskeleton device for aiding stroke patients in their recovery has also been sucessful. This project explored various ways of establishing muscle-brain coordination for stroke rehabilitation by developing an assistive device known as pneumoglove. It is a soft exoskeleton device to assist stroke patients in the movement of their impaired arm and designed purposely for low resource settings (developing nations). It can also be used as an assistive device to enable stroke patients to execute activities of daily living (ADL).

A convertible wheelchair bed has been designed and tested at the College. The convertible wheelchair bed project represents a transformative innovation aimed at addressing the multifaceted challenges encountered by individuals with mobility impairments, particularly in regions where accessibility to traditional healthcare infrastructure is limited.

A vein finding device for a low-resourced health environment is another groundbreaking project conducted by researchers at the College. This project endeavours to revolutionise medical procedures involving vein puncture by developing a vein finding device tailored to enhance efficiency and patient comfort, particularly for individuals with darker skin tones and those who are obese.

A poultry de-feathering machine has been developed by researchers at the College to optimise the poultry industry while ensuring humane conditions for chickens undergoing processing. The de-feathering machine automates the de-feathering stage during poultry processing thereby boosting overall productivity, while at the same time ensuring ethical conditions for chickens, which is a growing consumer preference.

College of Health Sciences

The College of Health Sciences has in total, seven Schools and Faculties namely: Faculty of Pharmacy and Pharmaceutical Sciences (FPPS), Faculty of Allied Health Sciences (FAHS), School of Medical Sciences (SMS), School of Dentistry (SoD), School of Veterinary Medicine (SVM), School of Public Health (SPH) and the School of Nursing and Midwifery (SoNM).

The College currently holds the enviable record in KNUST of the highest research outputs that support healthcare in Ghana and also in terms of attracting funding and grants to the University. The College was adjudged the best research College at the 2023 KNUST Research Excellence Awards and topped in research outputs for the University; with a total of **715 publications,** 30.6% of the total publications in the University as reported in 18th Edition (*latest)* of KNUST Quality Assurance Bulletin.

The College currently boasts of two (2) research centres: Kumasi Centre for Collaborative Research in Tropical Medicine (KCCR) and the German-West African Centre for Global Health and Pandemic Prevention (GWAC).

Kumasi Centre for Collaborative Research in Tropical Medicine (KCCR) is an international platform for biomedical research, which operates in collaboration with the School of Medical Sciences (SMS), Kumasi Ghana, and the Bernhard-Nocht Institute for Tropical Medicine (BNITM), Hamburg, Germany. The core objective of the centre is to develop a series of world standard research programmes through the acquisition of research grants; and bring scientists and their ideas in this network to conduct research into tropical diseases. KCCR's priority is to develop training facilities and educational programmes for Ghanaian postgraduates and technical staff. KCCR is recognised as a WHO reference laboratory for Buruli Ulcer diagnosis and is designated as an African Network for Diagnosis and Drug Discovery Innovation (ANDi) centre of excellence for applied Biomedical research.

Currently, there are several research groups at KCCR. They include the Skin NTD Research group, Global Health and Infectious Diseases Research group, the Filariasis Research Group, the Malaria Research Group and the One Health Virology Research Group. Presently on-going research are in the areas of Buruli ulcer, Tuberculosis, COVID-19, Filariasis and Malaria.

G-WAC collaborates with the Technical University Berlin, Charité-University of Medicine Berlin and University of Bonn, Germany.

GWAC focuses on research and teaching, employing the One-Health approaches that can contribute to mitigating the drivers of pandemics and strengthen health systems' responses to pandemics as well as cross-cutting issues, such as gender, community engagement, ethics and equity; leadership and knowledge integration; and big data for evidence and prediction. Currently, GWAC is actively undertaking various joint collaborative research projects in global health and pandemic prevention/ preparedness using the One-Health Approaches and training of Ghanaian postgraduates. G-WAC has enabled more than 100 West-African policy-makers/ practitioners/ researchers to participate in short-courses, and provided scholarships for more than 140 PhD, MSc, and post-doctoral students to study and research at G-WAC partner institutions in Ghana or Germany.

College of Science

The College of Science is renowned for its commitment to research, innovation, and comprehensive scientific education. It is organised into two main Faculties, Biosciences and Physical and Computational Sciences and has two Research Centres: the KNUST Laboratory for Interdisciplinary Statistical Analysis (LISA) and the KNUST Periodic Table of Food Initiative (PTFI) Centre. With a vibrant academic staff of approximately 200 and a diverse student body of over 10,000, the College thrives as a hub of scientific inquiry and interdisciplinary collaboration.

A key strength of the College lies in its diversity which is evident both in its student population and in the research areas it supports. Through actively increasing its intake of international students and forming partnerships with collaborators worldwide, the College has cultivated a dynamic research community that is formidable and transcends borders.

The College hosts over 60 research grants, fueling impactful studies in areas crucial to both Ghana and global science. These research initiatives span a vast array of disciplines, including Climate Science, Soil and Environmental Science, Food and Nutrition, Human Health, Immunology, Microbiology, Molecular Biology, Genomics, Forensic Science, Artificial Intelligence, Geophysics, and Photonics. The College's work in fields such as Soil and Environmental Science addresses pressing challenges related to sustainable agriculture, land management, and environmental resilience, while its research in Food and Nutrition delves into the nutritional quality and safety of food systems, especially in relation to Africa's unique agricultural contexts. Advanced studies in Human Health, Immunology, and Molecular Biology explore disease prevention and treatment, with a specific focus on understanding regional health challenges and improving public health outcomes.

Through the PTFI Centre, the College is pioneering research on food composition and quality using state-of-the-art omics platform. This work aims to improve food security and public health by creating a detailed understanding of food's nutritional content, which could support policy-making for healthier, and more resilient food systems. The work of the Centre is supported by the Rockefeller Foundation, Seerave Foundation, Bill and Melinda Gates Foundation and the American Heart Association.

There is cutting-edge research being conducted in Artificial Intelligence and Photonics which is opening new boundaries in technology and engineering, with applications ranging from healthcare diagnostics to energy solutions.

The College has built a solid reputation as a premier institution for training skilled scientists who are integral to economic and industrial advancement. Guided by its mission, the College strives to provide exceptional education, foster a spirit of entrepreneurship, and drive research that contributes to sustainable industrial and socio-economic development in Ghana and the world.

Featured Research

01. Addressing healthcare associated infections using novel mechano-bactericidal surfaces for biomedical devices

Microbial contamination of medical devices and infection-prone areas is one of the main causes of healthcare-associated infections. Healthcare associated infection is the fourth leading cause of death after cancer, heart disease and stroke. Besides the use of antibiotics (antibacterial, antifungal, and antiviral therapies) which have been found to be costly and sometimes ineffective, one potential strategy for breaking the chain of transmission of infections is engineering novel antimicrobial surfaces. This technology has been developed by Dr. Henry Agbe and his team from the Department of Materials Engineering. The novel mechanobactericidal technology is a one-time investment, which imparts antimicrobial property on surfaces of both hygiene critical environment and biomedical implant devices. Coupled with hand washing, the technology provides a one-time bottom-up surface engineering approach to solving the problem of healthcare associated infections and antimicrobial resistance. This technology provides a high-end, custom antimicrobial surface technology for metallic, ceramic, plastic and textile touch surfaces in hospitals, hygiene critical environments, food, transportation, educational and residential facilities. This novel mechanobactericidal technology has the potential to contribute to Sustainable Development Goals 1 (Job creation) and 3 (Good health and wellbeing).

http://dx.doi.org/10.5772/intechopen.1007269

02. A Sustainable Cooling Solution for Ghana's Refrigeration Challenges

Ghana relies heavily on old, inefficient refrigerators which increase energy demand and release harmful emissions due to outdated refrigerants. This research, led by Dr. Akyana Britwum, aimed to create a sustainable and efficient cooling solution using a thermoelectric module based on the Peltier effect. The findings have shown that retrofitting refrigerators with thermoelectric modules is a practical, energy-saving alternative for Ghana, eliminating the need for harmful refrigerants and supporting global environmental goals. The new refrigeration system consists of a thermoelectric cooling unit and an electronic control unit. The cooling unit uses a Peltier module placed between two heat sinks, with the cold side inside a recycled refrigerator and the hot side exposed. The control unit manages power and records data. Two cooling methods were tested: one using natural airflow and another combining natural and forced airflow. The thermoelectric module managed to cool the refrigerator significantly, achieving a difference of -2.1°C on the cold side and 39°C on the hot side. Natural airflow resulted in a 7.2°C cooling effect with 70W of power, while the combined airflow method achieved 6.7°C with 72.4W. This is much more efficient compared to traditional secondhand refrigerators, which use 148 W. An automated control unit was also developed to enhance efficiency and provide useful data for future improvements. These findings support international environmental agreements by eliminating dangerous refrigerants and promoting sustainable cooling technologies. The research offers valuable insights for better air circulation and energy efficiency in refrigerators, contributing directly to Sustainable Development Goals 7 (Affordable and Clean Energy), 13 (Climate Action), and 9 (Industry, Innovation, and Infrastructure). It paves the way for future advancements in cooling technologies to support global sustainability efforts.

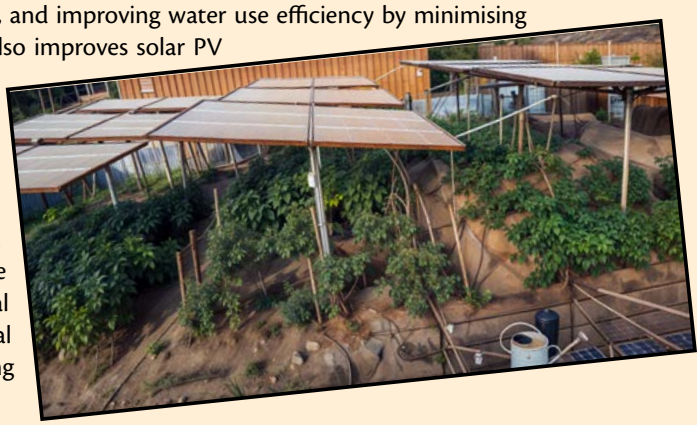
http://dx.doi.org/10.13140/RG.2.2.20725.45281

03. Customised Prèt-a-Porter: West Africa's Answer to the Quest for Sustainable Fashion

This study showcases how the West African prèt-a-porter fashion production model which is undergirded by the sociocultural milieu of exclusivity, uniqueness, and individuality, inherently possesses features that promote sustainability. Customised prèt-a-porter is a limited-edition ready-to-wear model by Ghanaian and Nigerian fashion designers that ensures a measured production volume, demands a high level of creativity, and prescribe sustainable laundry measures to ensure long-life clothes. The discourse on sustainable fashion has so far ignored two important perspectives: the contribution of fashion production from Africa and how socio-cultural factors contribute to sustainability. This study, led by Dr Adwoa Owusuaa Bobie to bridge these gaps, was conducted in Lagos, Nigeria, and Accra Ghana, between 2018 and 2021. Using a qualitative research approach, researchers interviewed 48 fashion designers in the two cosmopolitan cities on their experiences as fashion producers from Africa. The study shows that sustainability is built into the West African fashion milieu, which guides contemporary designers' work as they seek to scale up production. Though they produce ready-to-wear retail, fashion designers produce a limited number of clothes to avoid surplus that creates disposable problems in the environment. These limited quantities are uniquely created, with an emphasis on innovation and creativity, to suit the fashion taste of specific groups of fashion lovers (which transcends class) and speaks to the individuality of consumers. The designers further advise consumers on how to keep clothes for longer periods by avoiding environmentally hazardous laundry products. This also protects the environment from chemical pollution. In all, this research introduces to the conversation on sustainable fashion, a proactive, indigenous method of production that ensures environmental sustainability, other than the reactive methods being propagated by Western fashion brands.
https://doi.org/10.1080/17569370.2024.2310295

04. Agrivoltaic Technology in Drylands of West Africa: The Water-Energy-Food Nexus Process

At COP28, 118 governments, including Ghana, committed to tripling global renewable energy capacity by 2030 to reduce fossil fuel dependency. Ghana's ambitious energy plan foresees solar PV contributing over 100 GW by 2060, necessitating vast land use which could conflict with agricultural needs. Addressing this, industrialised nations like Japan are pioneering space-efficient solar PV solutions. In response, Ghana launched the "Agrivoltaic Technology in Drylands of West Africa" project led by Prof. Francis Kemausuor and his team and funded by USAID and NAS through the PEER programme, in collaboration with KNUST and CSIR. Agrivoltaic systems integrate solar PV panels with agriculture on the same land, optimising space. Panels are installed higher to allow crop cultivation underneath, creating a beneficial micro-climate. This setup aims to boost crop yield by reducing heat and light stress, enhancing photosynthesis, and improving water use efficiency by minimising evapotranspiration. The cooler micro-climate under the panels also improves solar PV efficiency. The research, which assesses agrivoltaic impacts on the water-energy-food nexus, was conducted in two Tropical Agrivoltaic Research Fields (TARF): one in Kumasi's forest zone and another in Tamale's savanna zone. Researchers compared three setups: traditional open-field agriculture, ground-mounted solar PV, and agrivoltaic systems, using pepper, tomatoes, and eggplants. Sensors monitored radiation, temperature, and moisture, alongside weather stations for climatic data. This initiative promises the dual benefits of reliable renewable energy and enhanced agricultural productivity, offering a sustainable model for land use in developing regions facing similar challenges.
https://www.researchgate.net/publication/356592280



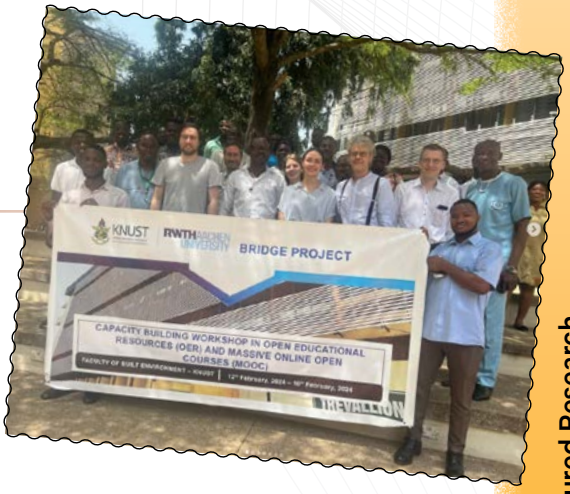
05. Using Ghanaian Shallots as a Natural Anti-Infective Product to Mitigate Multidrug-Resistance in Tuberculosis

The WHO has named antimicrobial resistance as one of the significant public health threats of the 21st century causing persistent infections that claim millions of lives every year with enormous demands on medical and social resources. Prof Cynthia Amaning Danquah and her team investigated the bulb extracts of selected Ghanaian shallots for their anti-infective, efflux pump and biofilm inhibitory activities as potentially useful leads in efforts towards the discovery and development of new anti-tuberculosis agents. The team used the high-throughput spot culture growth inhibition (HT-SPOTi) assay designed by Prof Amaning Danquah for screening extracts and compounds in resource-limited settings. The surge in multidrug resistance has been linked to the increasing failure of antimicrobial therapy coupled with the diminishing numbers of new antibiotics in the drug development pipeline. This has intensified the urgency to develop new antimicrobials with novel modes of action for the treatment of infections to save the human race. This is in line with addressing SDG Goal 3 which is to ensure healthy lives and promote well-being for all. The findings from this study shown that the bulbs of Ghanaian *Allium cepa var aggregatum* (shallots) are a source of phytochemical hits or bioactive leads that can be further developed as anti-infective drugs against Tuberculosis.
https://doi.org/10.3390/antibiotics10080902.

06. Turning Cashew Apples into a Sustainable Feed Resource for Sheep and Goat Farmers

In Ghana, sheep and goat farmers face significant challenges during the prolonged dry seasons when feed is scarce, jeopardizing the nutrition of these animals. Research led by Dr. Antoinette Simpah Anim-Jnr under the Food Systems Research Network for Africa (FSNet-Africa) has uncovered a transformative solution: using cashew apple silage as a sustainable feed resource. Cashew apples, typically discarded as waste during the harvesting of the nuts, have been found to be highly nutritious and ideal for ensiling, which preserves their quality and enhances their value as animal feed. By adopting this innovative approach, farmers can ensure their livestock are well-nourished even during periods of feed scarcity by converting a waste product into a vital resource. This does not only support the livelihoods of farmers by improving animal health and productivity but also promotes sustainable agricultural practices and community resilience. Through community engagement and practical demonstrations, the researchers aim to drive widespread adoption of cashew apple silage, fostering a positive impact on sheep and goat farming in Ghana and beyond.

07. Building Resilient Communities through Climate Adaptation



The DAAD-funded BRIDGE Project, a collaboration between KNUST and RWTH Aachen University in Germany, aims to integrate climate adaptation with the Sustainable Development Goals (SDGs) in university education and research. The project, which from April 2023 to March 2026, is being implemented by KNUST's Centre for Settlements Studies and the Department of Religion and Human Development. This project is led by Prof. Divine Kwaku Ahadzie and seeks to identify climate-related risks in Ghanaian communities and develop adaptation measures towards achieving the SDGs. Initial findings are being used to engage communities affected by the Akosombo dam spillage, enhancing climate action and adaptation measures. The initiative aligns with multiple SDGs, particularly those focusing on agriculture, biodiversity, health, infrastructure, and water management, aiming to build resilient communities and reduce vulnerability to climate change. The research findings are also being used to update the MPhil in Urban Management Studies content at KNUST and prioritise co-teaching with industry professionals to apply evidence-based climate actions in urban management. The project emphasises capacity building, with ten junior researchers already trained in Germany, and seven PhD researchers planning to conduct part of their research at RWTH Aachen University. To promote teaching and learning, AI facility will be installed at KNUST to facilitate the use of AI in Open Educational Resources (OER) and Massive Online Open Courses (MOOC).
https://lfi.rwth-aachen.de/en/projekt/bridge/

08. Using WhatsApp to Address Community and Hospital-based Obstetrics Emergencies

A team of researchers at KNUST led by Prof Veronica Millicent Dzomeku has designed and implemented a WhatsApp Triage, Referral, and Transfer (WAT-RT) System as an intervention for managing obstetric emergencies. The project was aimed at enhancing timely care-seeking along the referral pathway for pregnant women through the implementation of the WAT-RT System between first-line community health workers, rural health facility midwives and district hospital staff. Timely intervention in obstetric (OB) emergencies has been a concern for many countries, including Ghana, as inadequate equipment and personnel at some facilities to handle some of these emergencies have resulted in deaths in some instances. Referring patients to better-equipped facilities is often the only option for many low-resourced health facilities. This system will increase continuity and access to quality maternal care, and contribute to reducing preventable, obstetric-related deaths through information sharing and the ability to track referred clients, thus addressing SDG 3. Sixteen rural health facilities in Bono West and Bono East in the Bono regions of Ghana have benefited from the project, where 306 referrals were made using the system. Midwives and patients attested that the system was effective and had contributed to improved health outcomes. Other members of the research team included Prof. Emmanuel Nakua and Dr. Adwoa Bemah Boamah Mensah.
https://bmcdigitalhealth.biomedcentral.com/articles/10.1186/s44247-023-00012-5

09. Developing a Materials Passport System for the Ghanaian Construction Industry

The circular economy research focuses on redesigning economic systems to reduce waste while increasing resource reuse, recycling, and regeneration. It seeks to decouple economic growth from resource consumption and environmental degradation by promoting a system in which materials and products are reused for as long as possible, with their value preserved throughout their lifecycle. Dr. Kofi Agyekum from the Department of Construction Technology and Management, leads a multidisciplinary research team (building science, engineering and materials research) that has investigated various aspects of the circular economy and how it can be applied in construction. The team explored its application in resource management, waste reduction, recycling technologies, design for circularity, deconstruction, adaptability, and maintainability, among others. The research has created a basis for the ongoing development of a materials passport system for the Ghanaian construction industry. A materials passport system is a document that contains sets of data describing the characteristics, manufacturing history, suggested predictive maintenance schedules, and remaining useful life (RUL) of products and materials that give them value for recovery and reuse. This innovation fits well with the concept of industrial symbiosis, which involves the use of underutilised resources including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials aimed at keeping resources in productive use for a longer period. This research area has significant relevance to the Sustainable Development Goals (SDGs), as it intersects with several goals including Goal 8: Decent Work and Economic Growth; Goal 9: Industry, Innovation, and Infrastructure; Goal 11: Sustainable Cities and Communities, and Goal 12: Responsible Consumption and Production.
https://www.emerald.com/insight/content/doi/10.1108/IJBPA-01-2024-0007/full/pdf?title=implementing-materials-passports-in-the-construction-industry-empirical-evidence-from-ghana

10. Old Parks, New Futures: Documenting the Uses of Open Space in an African City

An interdisciplinary study led by Prof. George M. Bob-Milliar of the History and Political Studies Department has combined archival and anthropological methodologies to shift the ideas around which public spaces are valued. The study has investigated the history and present-day uses of the Sir Francis Jackson Park (Golden Jubilee Park since 2007) created in 1935 in downtown Kumasi, Ghana's second largest city. The Park, like many other public parks, suffers from poor maintenance and poor services and does not fit with the ambitions of urban planners. "Old Parks, New Futures", which challenges urban planning visions, was implemented by a team of researchers from KNUST, University of East Anglia, and University of Copenhagen. The team has elucidated the rich history of the park and its current importance as a place for residents to meet, do business and spend time. The project explored three different ways in which the Jackson Park makes a difference in city life: the political history of the park, its function as a meeting place for civil organisations, and its use by less advantaged residents of the city to make a living.
https://www.oldparksnewfutures.org

11. Discovery of Useful Indigenous Oilseeds: African Locust Bean (*Parkia biglobosa*)

To help address increasing hunger and malnutrition resulting from changes in weather patterns, high population growth and the advent of COVID-19, it has become essential to explore additional sources of nutritious diets. Monotonous, staple-based diets deficient in essential micronutrients continue to characterise the diets of many low-income households in low- and middle-income countries. Diversifying household diets can contribute to overall macro and micronutrient adequacy and improve the nutritional status of individuals. Dr. Mercy Badu of the Department of Chemistry, KNUST, and her team have sought to identify medicinal and nutritional compounds from oilseeds to improve nutrition and health. The Savannah Regions of Ghana are endowed with different species of oilseed-bearing fruit plants, with different parts of the plants utilised for different purposes. However, the seeds are usually left as waste. Studies have confirmed that a large number of these seeds have oil yields in the range of 19–52% and crude protein contents of 14–29 %. Some of the seeds also contain significant levels of mineral elements including zinc, iron, magnesium, potassium, iron, calcium, and sodium. The study has therefore extracted, isolated and characterised the structural composition of the bioactive compounds found in the oilseeds and evaluated the bioavailability of the nutritional compounds when ingested. The identified benefits of these oilseeds increase interest in consumption and generate market value for the seeds. The findings of this research, which is contributing to SDGs 1, 2 and 3, have been shared with the Ministry of Food and Agriculture, Ministry of Environment, Science, Technology and Innovation, Ministry of Local Government, the Ministry of Health, and other stakeholders to consider the seeds especially in planning the National School Feeding Programmes.
https://doi.org/10.1016/j.foohum.2023.07.012

12. The Relationship Between Flood Exposure and Psychological Distress Among Ghanaian Adults

A study led by Prof. Kabila Abass of the Geography and Rural Development has examined associations of flood exposure to psychological distress among flood survivors in Ghana. Floods have been identified as a major burden internationally, and one of the major destructive hydro-meteorological hazards with significant socio-economic and emotional impacts on vulnerable populations. Floods are associated with loss of life and property, unhygienic conditions, increased levels of destitution, and reduced rates of mastery, self-esteem, and self-efficacy which may lead to mental health problems among flood victims and at-risk populations. The increased risk of mental distress may potentially result from disaster-induced life stressors, isolation, stigmatisation, death of loved ones, social and economic disruptions, and financial strain. The study shows that flood-related risks are associated with psychological distress among flood-prone households. It further revealed that female and younger age cohorts reported higher risks of psychological distress compared to their respective counterparts. Early identification of risk factors that predispose individuals to long-term psychological distress is crucial to ensure targeted interventions by the Public Health Unit of the Ministry of Health in collaboration with the Metropolitan, Municipal, and District Assemblies. This finding is therefore important as it will inform policy on interventions for reducing flood risks and improving the mental health of the population. https://doi.org/10.1016/j.scitotenv.2022.155481

13. Using Cucurbit Seeds (Egusi) for Nutrition and Food Security in Northern Ghana

Dr. Abena Boakye and her team from the KNUST, UoY, UoL, LUANAR, and UP have explored the use of cucurbit seeds (Egusi) for enhancing nutrition and food security in Northern Ghana. The project, funded by The Food Systems Research Network for Africa, aimed to address hunger and nutritional needs in climate-change-impacted communities by leveraging the potential of egusi, an undervalued crop. The first phase of the project was used to identify culturally appropriate, climate-smart agronomic practices through systematic reviews and stakeholder engagements. A comprehensive nutrient database and value-added products were developed through lab tests and recipe standardisation in the second phase. The findings of the study were disseminated via the media, conferences, and publications during the final phase. This project is novel in its holistic approach as it integrates sociocultural aspects with scientific interventions, creating nutrient-dense products for both local and commercial markets, thus supporting community nutrition and economic empowerment. It aligns with multiple UN SDGs and has the potential to inform policy, foster new markets, and create jobs, thereby contributing to national and regional food security. The research also facilitated mentorship and collaboration among scientists, enhanced the visibility of KNUST and supported the educational goals of the female students who participated in the project.

https://fsnetafrica.com/video/photos-from-the-field-exploring-the-food-use-of-cucurbit-seeds-egusi-for-community-nutrition-and-food-security-in-northern-ghana/

14. Exploring New Diagnostic Biomarkers of Gestational Diabetes Mellitus

Gestational diabetes mellitus (GDM) poses risks to both mother and fetus, and yet lacks a definitive diagnostic biomarker. This study led by Christopher Larbie, working with co-investigators from various Ghanaian institutions, explored the diagnostic potential of the maternal serum adiponectin, leptin, and the adiponectin-leptin ratio in detecting GDM. The study included 180 pregnant women (130 with GDM and 50 without) from Komfo Anokye Teaching Hospital and Tamale Teaching Hospital. The results revealed that pregnant women with GDM had significantly lower levels of adiponectin and the adiponectin-leptin ratio, but higher leptin levels compared to non-GDM participants. Adiponectin demonstrated strong predictive ability for GDM. These findings suggest that adiponectin, along with related biomarkers, could enhance GDM diagnosis, leading to better management strategies. Further longitudinal studies are recommended to bolster these results.

https://doi.org/10.1002/edm2.478

15. The Role o Genetic Factors in the Development of Preeclampsia in Pregnant Women

Hypertensive disorders of pregnancy particularly preeclampsia remains a major contributor to maternal and neonatal mortality in Ghana. Although, the exact cause of preeclampsia is not completely understood, several genetic and environmental factors have been implicated in the development of preeclampsia including the dysfunction of the endothelium, emanating from the reduced bioavailability of nitric oxide, a smooth muscle relaxant. This research led by Prof. (Mrs.) Linda Ahenkorah Fondjo from the Department of Molecular Medicine highlights one of the few gene variation studies that determined the genetic predisposition of Ghanaian women to the development of preeclampsia. The study examined the association between eNOS gene variants and nitric oxide production among preeclamptic women in the Ghanaian population in 75 preeclamptic women and 75 normotensive pregnant women receiving antenatal care at a government hospital in the Ashanti Region of Ghana. The findings revealed that preeclamptic women had lower nitric oxide concentration, and VNTR intron 4 4c4c" and "4a4c" genotypes. They also had a significantly higher distribution of "TC" genotype compared to normotensives. According to the study, possessing "4a4b" and "4b4b" decreased the likelihood of experiencing preeclampsia by 83% and 91% respectively. This finding highlighting the association between reduced nitric oxide production in preeclamptic women with specific gene variants, such as the VNTR intron 4 allele, provides a significant advancement in understanding the pathogenesis of preeclampsia. It sets the tone for genetic screening for early identification of high-risk women and improved management for high-risk pregnant women. The study points to the need to incorporate genetic screening into routine antenatal care to improve early prediction of women at risk of preeclampsia. The findings also underscore the importance of integrating genetic insights and counselling into clinical decision-making to enhance patient care and improve overall maternal and foetal health outcomes and ensure the overall wellbeing of mothers and babies. https://rdcu.be/dCpxN

16. Natural Mosquito Control: An Eco-Friendly Solution for Ghana

Ghana faces significant challenges in controlling malaria due to mosquitoes becoming resistant to chemical insecticides. This study explored the use of local plants as natural mosquito repellents and larvicides, offering an environmentally friendly alternative to synthetic insecticides. The research, led by Dr. Sandra Abankwa Kwarteng from the Department of Theoretical and Applied Biology, evaluated the ability of *Morinda citrifolia* (Noni) to kill mosquito larvae and assessed the repellent properties of Noni, Moringa oleifera (Moringa), and Ocimum basilicum (Basil). Oils from these plants were extracted using various techniques. Their effectiveness was then tested according to World Health Organization standards, using advanced analytical methods to identify the active ingredients in the oils. Noni oil proved to be highly effective in killing mosquito larvae. Additionally, Noni, Moringa, and Basil oils all demonstrated mosquito repellent properties to varying degrees. Noni oil provided the longest protection time of 120 minutes, followed by Basil at 84 minutes and Moringa at 72 minutes. Among these, Noni oil showed the highest efficacy, indicating its potential as a reliable mosquito control agent. Plant-based mosquito repellents and larvicides offer several advantages over chemical insecticides as they are environmentally safe, biodegradable and reduce pollution. These natural solutions are also accessible and affordable, as indigenous plants like Noni, Moringa, and Basil are easy to grow locally. This promotes self-reliance and active community involvement in health initiatives. By integrating plant-based solutions into existing vector management programmes, policymakers can enhance malaria prevention efforts, especially in areas where mosquitoes resist chemical insecticides. This study directly contributes to the Sustainable Development Goals of Good Health and Well-being (SDG 3) by providing new tools to prevent malaria and Life on Land (SDG 15) by promoting environmentally safe insect control methods.
https://journals.lww.com/jvbd/abstract/9900/repellent_and_larvicidal_properties_of_selected.9.aspx

17. Sleeping Sickness Among Livestock: A Huge Public Health Economic Threat

Trypanosomiasis, or sleeping sickness, is a significant public health and economic threat in sub-Saharan Africa, transmitted by Tsetse flies and caused by Trypanosoma parasites. This disease impacts both humans and livestock, with 65 million people at risk. In animals, it causes African Animal Trypanosomiasis (AAT), leading to severe agricultural losses. In the Suhum area of Ghana, a study identified high trypanosome prevalence in tsetse flies (58.9%) and pigs (46.2%), with no cases in cattle. The predominant parasite was *Trypanosoma Congolese*, with multiple infections detected in tsetse flies and pigs. Tsetse flies primarily feed on domestic pigs and warthogs, posing a risk of parasite transmission to livestock and potentially humans. The study highlighted the absence of effective tsetse control measures in the area, raising concerns about the re-emergence of trypanosomiasis in humans. The research recommends further studies across various domestic animals to understand seasonal variations in AAT transmission and emphasises the need for active surveillance to monitor and control the disease. Effective animal-tsetse control measures are crucial to prevent the spread of trypanosomiasis, which remains a neglected issue in Ghana despite its significant impact. This research, supported with funds from DFG, German African Research Cooperation in Infectious Diseases is led by Dr. Kingsley Badu and his team from the Department of Theoretical and Applied Biology of the College of Science.

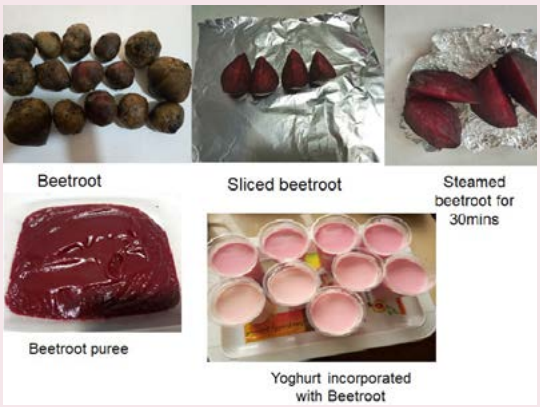
https://europepmc.org/article/med/38697074

18. Using Ferrous Slag to Remove Heavy Metal from Polluted Water

Water, as they say, is life. However, such benefits can only be achieved if from safe and portable water. The galamsey activities in Ghana have become a threat to water bodies, greatly affecting the benefits derived from water. Pollution caused by dissolved heavy metals in various water bodies is significantly dangerous due to the means of exposure of these metals and the kind of impact heavy metals have on humans. This research considered the effect of arsenic and lead on humans. Humans are prone to heavy metals through skin contact, ingestion and inhalation, and exposure can lead to brain damage, anaemia, kidney damage and cancer. However, even with harm caused by galamsey on waterbodies, there is still a gleam of hope in tackling heavy metal pollution: slag. The by-product of steel and iron production, slag, contains iron oxide and is effective in the removal of heavy metals from polluted water. Iron oxide is highly adsorbent, and it has been proven that, for the same quantities of adsorbents, smaller particles are even more adsorbent than their bulk counterparts. In this work, led by Dr. Bennetta Koomson from the Department of Materials Engineering, slag was successfully used to remove large amounts of heavy metals from water sampled from two river bodies affected by galamsey activities, namely the Jimi and Kwabrafo rivers in Obuasi. While tackling the problem of heavy metal contamination of water bodies, ferrous slag which is under-utilised in Ghana has also been made a beneficial resource. The research thus used, using one stone (one research) to kill two birds (slag utilisation and heavy metal detoxification).

https://doi.org/10.1016/j.matchemphys.2023.128301

19. Replacing Synthetic Additives in Yoghurt with Beetroot Puree



A study led by Mercia Lionel Adjei and other researchers from the Departments of Food Science and Technology and Animal Sciences, aimed to replace synthetic additives in yoghurt with natural beetroot puree as flavouring and colourant. This research evaluated the impact of beetroot puree on the pH, titratable acidity, viscosity, colour, proximate composition, probiotic viability, antioxidant activity, and total phenolic content of yoghurt. Using a response surface design, various formulations were tested, leading to the optimisation of three beetroot yoghurt formulations. These were compared with a control sample in terms of consumer acceptance and technical properties. Key findings demonstrated that incorporating beetroot puree improved the nutritional composition, probiotic viability, antioxidant activity, and sensory preferences of yoghurt. This novel approach offers a healthier alternative to synthetic additives and supports sustainable food production practices. The study aligns with several UN Sustainable Development Goals (SDGs), including promoting good health and well-being (SDG 3), responsible consumption and production (SDG 12), and climate action (SDG 13). It underscores the importance of natural ingredients in food innovation, providing insights for further research and potential commercial applications.
https://doi.org/10.1016/j.heliyon.2024.e25492

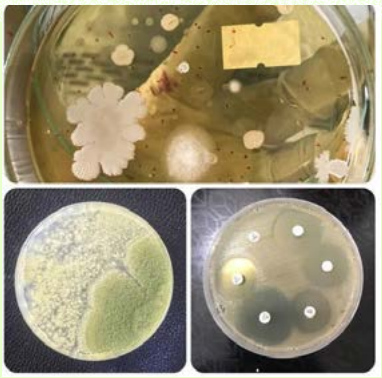
20. The Ada Beater: A Locally Fabricated Machine for Improving the Quality of Handmade Paper in Ghana

The Ada Beater project, led by Michael Adashie from the Department of Painting and Sculpture, aimed to improve the quality of handmade paper in Ghana. Conducted from May 1, 2022, to January 4, 2023, the project addressed challenges in the Printmaking Section of the Department. The project focused on utilising the local plant "York" (Devils Rope), known for its tough bast fiber traditionally used for making ropes, to produce high-quality paper. Project activities involved building and fabricating the Ada Beater machine from locally-sourced materials in Kumasi. This machine has been successfully tested and is now used by undergraduate and Master's students to enhance their educational experience and production efficiency in handmade paper creation. The Ada Beater is the first of its kind to be wholly fabricated in Ghana, with existing machines being imports. Its success does not only demonstrate innovation but also provides an economic opportunity, as more machines can be built to order, generating revenue. The project supports several UN Sustainable Development Goals including promoting environmental sustainability and adding value to invasive plants for papermaking.
Source: https://noyam.org/journal/ehass/DOI: https://doi.org/10.38159/ehass.202341013

21. Assessing the Nutritional Medicinal Properties of *Solanum torvum* and *Solanum nigrum* Berries and Leaves

A Research led by Jemima Owusuah Asante from the Department of Food Science and Technology, under the supervision of Professors Ibok Oduro, Faustina Wireko-Manu, Christopher Larbie, and Paul Poku Sampene Ossei has explored the functional phytonutrients in *solanum torvum* (Ekwanho nsusua) and *solanum nigrum*(nsusua) berries and leaves. These plants, native to tropical regions including Ghana, are known for their nutritional and medicinal properties. The study aimed to characterise the proximate composition, minerals, heavy metals, total phenols, and antioxidant activity of these species. It also assessed the bioavailability and safety of their aqueous extracts, revealing their potential as functional foods. The findings highlighted the presence of crude fiber, protein, and crude fat, along with minerals such as sodium, manganese, potassium, zinc, and iron in these species, with iron being more abundant in their leaves. The extracts demonstrated significant antioxidant activity and contained various bioactive compounds like squalene, palmitic acid, and several fatty acid esters which help reduce low density lipoproteins (bad cholesterol). Safety tests confirmed no adverse effects on major organs, and the anti-diabetic properties of *solanum nigrum* extract were comparable to standard drugs. The study also developed herbal tea and spice products, with fermented *solanum nigrum* herbal tea showing superior antioxidant properties and high consumer acceptability. These findings suggest that both plants have potential as therapeutic and novel food resources. https://doi.org/10.1016/j.afres.2024.100438

22. Assessing the Microbial and Heavy Metal Content of Commonly used Herbal Preparations in the Kumasi Metropolis, Ghana



The use of herbal medicinal preparations continues to serve as an essential component of healthcare systems in the prevention, treatment and cure of diseases. Its use is generally on the ascendency worldwide. This study, led by Prof. (Mrs.) Vivian Boamah and her team from the Department of Pharmaceutics, assessed the microbial and heavy metal quality of some herbal medicines in the Kumasi Metropolis. Twenty (20) herbal medicinal products were sampled randomly, serially diluted, and inoculated on various culture media for microbial growth using the pour plate technique. Concentrations of the heavy metals-Arsenic and Lead were assessed using MP-AES available at the KNUST Central Laboratory. Microbial loads ranged from 5x102 to 1.71x106 CFUmL-1, with 45% and 80% exceeding European Pharmacopeia thresholds for aerobic and yeast/mould counts, respectively, while 5% and 40% exceeded the WHO limits for Arsenic (5mg/kg) and Lead (10mg/kg), respectively. Eighty-seven (87) bacterial isolates comprising 27 species were identified with the most dominant being *Bacillus pumilus* (26.13%) and *Bacillus cereus* (9.09%) and the least dominant being *Pantoea septica*, *Mixta calida* and *Klebsiella oxycota* (1.14%). Twenty-six fungi comprising five genera were identified with *Aspergillus spp.* dominating (46.15%) and *Phialophora spp.* and *Fusarium spp.* among the least (1.78%). All bacteria were resistant to at least one class of antibiotics with five (5) being multidrug resistant. The novelty of assessing the resistant patterns of microorganisms in addition to the microbial loads and heavy metal concentrations using state-of-the-art laboratory equipment presents a different focus on research that seeks to understand how all the various sections of interest contribute to possible microbial infections, hazardous effects, and antibiotic resistance in consumers. The results of this study point to the potential health threats associated with the consumption of herbal medicinal preparations due to contamination. This heightens the need for good manufacturing practices and implementation of policies to ensure safety in herbal medicinal products. There should also be intensified surveillance and post-market assessment of herbal products.

23. Exploring the Challenges Facing Women with Disabilities in Exclusive Breastfeeding in the Kumasi Metropolis in Ghana

Although literature abounds with research on breastfeeding and its effects on child health, there is a dearth of research on the challenges faced by women with disabilities in exclusively breastfeeding their babies. A team of researchers led by Professor Dr. Dr. Daniel Buor, has explored the challenges facing women with disabilities in exclusive breastfeeding in the Kumasi Metropolis in Ghana. Fifty-five (55) women with disabilities from diverse communities in the Kumasi Metropolis participated in the study. The study observed that most women with disabilities had Caesarean deliveries which was a challenge to exclusive breastfeeding. Most of the mothers generally had low levels of education, were mostly unmarried and not gainfully employed. Apart from disabilities such as physical impairment, deafness and blindness which could negatively affect exclusive breastfeeding, some health professionals and relatives of the disabled women discouraged them from the practice. The team therefore recommends that the Disability Act (of the Republic of Ghana), 2006, Act 715 be implemented. Besides, creating special wards for women with disabilities in health institutions, medical staff must be oriented on their professional responsibilities and ethics.
https://doi.org/10.1007/s10995-022-03478-3.

24. Combating Social Isolation Among Filarial Lymphatic Patients

Dr. Alexander Kwarteng, a Senior Lecturer at the Department of Biochemistry and Biotechnology and his team seeks to tackle social isolation in filarial lymphatic patients. Social isolation exacerbates patients' suffering, reducing their quality of life. Funded by Canadian Institutes of Health Research (CIHR), this innovative project leverages science and biotechnology to develop effective solutions. The objectives of the project include investigating social isolation's impact, creating interventions, and evaluating their effectiveness. By addressing this critical issue, the project aims to improve treatment outcomes, enhance patients' wellbeing, and reduce suffering. Dr. Kwarteng's work has far-reaching implications, potentially transforming the lives of millions. By combating social isolation, this project seeks to improve mental and physical health, enhance patient resilience, foster inclusive communities, and inform evidence-based policies. This groundbreaking research offers hope for filarial lymphatic patients, showcasing the power of science and compassion in addressing complex health challenges
https://theconversation.com/patients-beliefs-about-illness-matter-the-case-of-elephantiasis-in-rural-ghana-216838.

25. French Prosodic Stress Produced by Ghanaian Speakers Compared to French Speakers: An Acoustic Investigation

A team led by Dr. Kofi Adu Manyah, of the French Section of the Department of Language and Communication Sciences, has shown the differences in how French native speakers and Ghanaian Twi speakers produce prosodic stress when speaking the French language. This was done by comparing three acoustic parameters (intensity, fundamental frequency, and duration). Prosodic stress refers to the prominence that one or more syllables receive relative to others in a given word. French natives and Ghanaian students with no speech or hearing impairment, and pursuing an undergraduate programme in French, were recruited to accomplish the task. The data, consisting of acoustic recordings at a self-selected conversational rate, were recorded in an anechoic room. Speakers had previous exposure to the Oral French Language and its prosodic structure but were given no indication of the position of stress on the syllables. This investigation has shown that the most important acoustic parameter in producing French prosodic final stress, by both native speakers and Twi- speaking learners of French, is duration. However, native speakers combined the three acoustic cues in varying degrees with duration, fundamental frequency and intensity whereas Ghanaian learners of the French language relied on duration but less on fundamental frequency and intensity, like the native speakers. Ghanaian learners of French produced French prosodic stress by using one of the three cues (duration). This study seeks to further understand language prosody, the study of the tune and rhythm of speech and how these features contribute to meaning, precisely in the domain of the Phonetics of Second and Foreign Language Acquisition, viz. the teaching and learning of French in a Ghanaian institution of higher learning.
https://www.internationalphoneticassociation.org/icphs-proceedings/ICPhS2023/full_papers/1105.pdf

26. An Elementary School-Based Indigenous Knowledge Pedagogical (ESBIK) Model for Educating Ghanaian Students on Native Tree Species

To promote environmental sustainability, this project has developed an elementary school-based pedagogical model grounded in indigenous knowledge for educating Ghanaian students about native tree species. With funding from Botanical Gardens Conservation International (BGCI), the project's goal is to address the critical endangerment of over 120 native tree species in Ghana by integrating traditional ecological knowledge into the education system. The research was led by Dr. Dickson Adom from the Department of Educational Innovations in Science and Technology of the College of Art and Built Environment. The team has created a pedagogical model with content, teaching methods, activities, and resources that incorporate indigenous knowledge for elementary schools. This novel approach integrates traditional knowledge such as singing traditional Ghanian folk songs which include native trees and inviting elders as co-instructors in classroom and field activities. An evaluation of the model's impact on students' sustainability consciousness and competence revealed a significant improvement on students' awareness and understanding of native tree species and their roles in the ecosystem. Students engaged in activities like tree planting and conservation campaigns, demonstrating increased sustainability consciousness. The project underscores the importance of using indigenous knowledge to connect students' learning with their cultural realities, enhancing appreciation for environmental stewardship. The model supports SDG 4 by promoting inclusive, quality education and SDG 15 by raising awareness of biodiversity conservation. The success of this project highlights the potential for scaling up and integrating such educational innovations into Ghana's national curriculum to foster a generation committed to environmental sustainability. The research has been recognised as one of the impactful projects of BGCI in the 2023 Year of Review (Page 8).

https://www.bgci.org/wp/wp-content/uploads/2024/03/PLMR-BGCI1816-BGCI-Year-in-Review-document-14-Mar.pdf

27. Extraction and Application of Okra Pectin for Food and Pharmaceutical Industries

The mucilage or polysaccharide content (known as pectin) of okra is of major technological interest for food, non-food and medicinal applications. Research led by Prof. Jacob K. Agbenorhevi sought to isolate and characterise different okra genotypes for their yield, physicochemical, structural, rheological properties, emulsifying properties and potential applications. Okra genotypes provide pectin (11-20%) with different structural and functional properties that can be used as new functional ingredients in the food or pharmaceutical industries. The findings show that okra pectin is a suitable emulsifier for chocolate making. It can also be exploited as disintegrants in immediate release tablet formulations. Publications from the studies can be found in Food Hydrocolloids, Food Biophysics, Scientific African, Cogent Food & Agriculture, Scientifica, Scientific World Journal, International Journal of Food Properties, Food Science & Nutrition, CYTA-Journal of Food, Journal of Ghana Science Association, Journal of Science and Technology, Food Chemistry Advances and other journals. The work presents opportunities for investment into the okra value chain as a means to improve economic benefits (job creation and income), livelihood, health, and food security, contributing to Sustainable Development Goals 1, 2, 3, 4, 5, 8, 10, 12 and 17.
https://www.scirp.org/journal/paperinformation?paperid=100695

28. Bird-Habitat Association in Owabi Wildlife Sanctuary in Ashanti Region, Ghana

Owing to recent widespread human-led activities within the surroundings of the Owabi Wildlife Sanctuary, a team of researchers from the Department of Forest Resources Technology, led by Dr. Collins Ayine Nsor, investigated how these disturbances potentially influenced birds' habitat preferences in the Owabi Wildlife Sanctuary. The study was conducted in four habitat types (agricultural land, built-up, forest reserve, and open-water area), using standardized ecological methods and multivariate statistical techniques. The findings revealed that besides disturbances like logging, farming and sand-winning, bird feeding habits or dietary structure have also contributed to their choice of habitat preference. For instance, about 56.8% of the birds such as the African Pied Hornbill and the Western Grey Plantain Eater preferred the forest habitat because they mainly feed on fruits. Even though the bird population in the surrounding agricultural and built-up land were severely impacted by disturbances, their presence was attributed to the availability of diverse food types. Five species, including the bronze-mannikins, have broad habitat preferences due to their ability to adapt to varied scales of disturbances. However, the increasing level of disturbances could potentially affect the population of forest-dependent and open-water-dependent birds, leading to a loss or modification of their behaviour similar to habitat generalist birds if managers of the Owabi Wildlife Sanctuary fail to implement the conservation measures highlighted in this study.
https://doi.org/10.1071/WR21148



29. Affirmative Action from Below? Grassroots Economic Empowerment and Women's Agency in Public Policy in Northern Ghana

A study led by Dr John-Paul S. Banchani and Dr Sebastian A. Paalo, of the Department of History and Political Studies has demonstrated that while affirmative action policies target broader societal impact, they are often trapped at high-levels, and led by elite actors with little reflection on the grassroots, especially in Global South contexts. Women's economic empowerment is implied in various affirmative action plans, however, there is little research on the nexus between the mostly disparate community-based women's economic empowerment programmes, often led by civil society organisations, and the broader concerns of inclusive governance and politics. On this backdrop, the study examined the link between grassroots economic empowerment as part of the broader spectrum of affirmative action and women's participation and influence in local governance and national politics in Ghana. The findings revealed important connections between women's economic empowerment and political empowerment, manifesting in the growing influence of women in decision-making in critical spaces such as homes, community and local governance, and national politics. Thus, increasing women's inclusion in local and national governance will require meaningful structural transformation and conscious efforts to link less-coordinated women's grassroots economic empowerment programmes to the broader national and global affirmative action policy discourses and practices.

30. Energy System Modeling for the Real World: Transforming Modeling Approaches for Sustainable Urban Development

Dr. John Bosco Dramani leads the MEASURES project, which seeks to revolutionise energy system modeling for sustainable urban development in low- and middle-income countries. Dr. Dramani is a Senior Lecturer at the Department of Economics of the College of Humanities and Social Sciences. The project addresses socio-techno-economic challenges, climate change impacts, and power sector inefficiencies, often overlooked in conventional models. By developing innovative approaches and leveraging interdisciplinary expertise, MEASURES enhances energy and climate resilience in urban areas. Focusing on Accra, Ghana, the project investigates economic imperfections, suppressed energy demand, climate change impacts, and power sector challenges. By advancing energy system modeling techniques, MEASURES provides recommendations for sustainable energy strategies, benefitting not only Accra but also other cities globally. This groundbreaking research contributes to SDGs 7, 9, 11, and 13, ensuring affordable energy, resilient infrastructure, and combating climate change. By promoting knowledge transfer through open access platforms, MEASURES sets a new standard for interdisciplinary collaboration and energy system modeling, empowering cities to build a sustainable future.
https://measuresproject.com/

31. Advancing Environmental Analytical Chemistry: From Contaminant Assessment to Sustainable Solutions

Professor Godfred Darko, an environmental analytical chemist at the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi, Ghana, has made significant contributions to the field. By understanding metal bioaccessibility and contamination levels, he contributes to informed decision-making and policy formulation. His research has practical implications for environmental management, public health, and sustainable development. Professor Darko's work aligns with several Sustainable Development Goals (SDGs). His research assesses health risks associated with environmental contaminants, aligning with SDG 3 (Good Health and Well-Being). Monitoring water quality and contamination levels contributes to achieving SDG 6 (Clean Water and Sanitation). His work also informs urban planning and pollution control, contributing to SDG 11 (Sustainable Cities and Communities). By studying environmental impacts, he contributes to climate resilience, aligning with SDG 13 (Climate Action). In addition, contamination assessment and remediation benefit ecosystems and biodiversity, aligning with SDG 15 (Life on Land).

Professor Godfred Darko's dedication emphasises the value of scientific inquiry in addressing global issues. His contributions advance a better understanding of environmental processes, paving the way for a more sustainable future.
https://www.sheathe.org/

32. Promoting Cultural Diversity and Economic Resilience with Leather Technology

Dr. Kwabena Asubonteng, from the Department of Indigenous Art and Technology, focuses his research on indigenous leather art, indigenous leather technology, and capacity building in leathercraft. His extensive research on indigenous leatherwork, involves using animal hides and skins to create a variety of products such as clothing, footwear, accessories, and decorative items. This age-old practice is deeply ingrained in the cultural heritage of indigenous communities all over the world, passed down through generations and frequently incorporating unique techniques, designs, and symbols. Dr. Asubonteng's research has several implications for the Sustainable Development Goals (SDGs), including

- Goal 1: Providing artisans in indigenous communities with sustainable livelihoods, including opportunities for income generation and poverty alleviation.
- Goal 8: Creating job opportunities, particularly in rural areas where traditional crafting skills are prevalent, to help drive inclusive economic growth.
- Goal 10: Recognising and valuing indigenous knowledge and skills in leatherwork, thereby promoting social inclusion and reducing inequalities, and
- Goal 12: Focusing on the use of natural materials and traditional techniques to promote sustainable production and consumption patterns.

Dr. Asubonteng's research helps to support and preserve indigenous leatherwork traditions, thereby promoting cultural diversity, economic resilience, and environmental sustainability, all of which are necessary for achieving the Sustainable Development Goals.

CARISCA

The Centre for Applied Research and Innovation in Supply Chain-Africa (CARISCA) was established in July 15, 2020 with the aim to becoming a globally recognised, locally owned hub for generating and translating innovative research into positive development outcomes for Ghanaian and pan-African supply chains. Its goal is to establish KNUST as Africa's leading supply chain management (SCM) Centre and a resource for researchers across Africa. The Objectives of the Centre are to Establish KNUST as Africa's top SCM expertise hub, drive innovative research, translation, and training to improve African supply chains, improve the efficiency and effectiveness of health care and agricultural value chains and increase inclusion and impact for women and disadvantaged supply chain actors.

Key Research Activities/Projects (2022-2023)

Research Activity/Project	Description
Faculty Research Capacity Building Workshops	The Workshops focused on topics like thesis publication, supply chain theory, survey trends, writing for various audiences, and experimental research designs.
Distinguished Lecture Series	The series covered topics such as supply chain startups, sustainability fraud, AI in operations management, diversity in logistics, and best practices for publishing.
CARISCA Training Series	The training provided writing for different audiences, building consistent writing practices, productivity, research design, and thesis defense.
Supply Chain Visibility in Ghana's Healthcare System	Assessing the impact of supply chain visibility on Ghana's healthcare system, with a focus on the Ghana Health Logistics Management Information System (GhiLMIS).
Combating Drug Counterfeiting	Research focused on improving healthcare by addressing drug counterfeiting issues.
Impact of Taxation on Port Activities in Ghana	A historical trend analysis of the effects of taxation on port and harbour activities in Ghana.
Evaluation of SCM Graduate Student Learning	Assessing the effectiveness of SCM education for graduate students.
Gender Diversity and SCM Sustainability	Exploring the relationship between gender diversity and sustainability in supply chain management.

Research Activity/Project	Description
Pharmacists' Role in SCM in Ghana's Public Health System	Investigating the role of pharmacists in supply chain management within Ghana's public health system.
Food Waste Reduction in the Hospitality Industry	Addressing food waste issues within the hospitality industry.
Bridging the Gap in Healthcare Supply Chain	Examining the role of traditional health providers in healthcare supply chains and their impact on low-income disadvantaged groups in Ghana.
Logistics Managers' Index (LMI)	Development of Ghana's first LMI to improve supply chain efficiency and transparency, facilitating better policy and decision-making.
AREPO Atomic DigiReceipt	A project to enhance supply chain financing by eliminating paper receipts, promoting environmentally friendly practices with or without the internet.
Team CLEEVE	A project using AI and machine learning to automate lab testing at the point-of-care, reducing turnaround time and improving diagnosis accuracy.
Signal/Kerve	Developing a mobile platform for real-time information flow in waste management supply chains to address waste disposal challenges in Ghana and Africa.

The Bureau of Integrated Rural Development (BIRD)

The Bureau of Integrated Rural Development (BIRD) is one of the premier research departments under the College of Agriculture and Natural Resources (CANR) at the Kwame Nkrumah University of Science and Technology (KNUST). As a leader in rural development research, BIRD serves as the vital bridge between the university and rural communities, promoting the transfer of innovations and services that enhance rural livelihoods. BIRD's core activities include conducting research, offering training and capacity building, facilitating development and evaluating projects. Through these efforts, BIRD generates valuable knowledge to inform both policy and practice, driving sustainable rural development.

BIRD facilitates the transfer of academic innovations and practical solutions to promote rural development. This mission is aimed at improving the quality of life in rural areas through impactful projects and initiatives. BIRD envisions becoming a centre of excellence in Africa for research and socio-economic development. This vision is driven by providing top-tier extension services, research, and consultancy to governments, donors, NGOs, and rural communities in Ghana and the broader West African sub-region. The Bureau is known for its high-quality projects, seminars, and publications in areas such as rural enterprise development, natural resource management, project planning, and capacity building. It boasts of a solid track record in fostering rural institutional development.

In the year 2022-23, BIRD made significant strides in rural development research and project implementation, focusing on key areas such as agriculture, governance, health, and climate change. key achievements include securing 5 grant-funded research projects, completion of eight commissioned research projects, and piloting the Agromovil Inc. "Match-Batch-Pay" app to streamline the sorghum supply chain. The Bureau generated 60 scholarly outputs, including: peer-reviewed journal articles, book chapters, conference papers, policy briefs and technical reports. Additionally, BIRD teaches across 14 KNUST departments and supervises undergraduate, MSc, and PhD students. BIRD is also deeply involved in capacity-building efforts including providing training for 25 local government staff in grant proposal writing and hands-on training for 150 graduates and interns in contract research and consultancy practice.

Key Research Projects

Research Title	Lead Researcher	Objective	Outcome
Post-Production Infrastructure and Women's Empowerment	Dr. Ebenezer Owusu-Addo	Explore the impact of post-production infrastructure on women's economic empowerment and access to nutritious diets among legume growers in Northern Ghana.	Highlighted opportunities to enhance gender equality and nutrition in a region marked by poverty and malnutrition.
Marine Plastic Pollution in Ghana	Dr. Ebenezer Owusu-Addo	Assess the scale of marine plastic pollution and its impact, informing policies on plastic waste management.	Emphasised the need for government action; 93% of respondents supported stricter plastic waste policies.
User Satisfaction with Agromovil Platform	Prof. Paul Sarfo-Mensah	Evaluate the satisfaction of smallholder farmers with the Agromovil platform in Northern Ghana.	Provided insights into the platform's effectiveness in improving market access for smallholders.
Landscape Planning and Governance in Greater Kumasi	Prof. Paul Sarfo-Mensah	Map stakeholders and develop sustainable development scenarios for the Greater Kumasi area.	Highlighted the need for intersectoral collaboration to address environmental degradation and unemployment.
Digitalisation and Rural Livelihoods	Dr. Albert Arhin	Assess the impact of digitalisation on rural livelihoods, focusing on barriers and challenges.	Revealed significant digital divides, with many rural residents lacking access to beneficial digital services.
Impact of Guinness Ghana Breweries' Local Sourcing	Dr. Ebenezer Owusu-Addo	Evaluate the economic impact of Guinness Ghana Breweries' local raw material sourcing.	Provided policy recommendations to enhance the benefits of local sourcing to the Ghanaian economy.
Baseline Evaluation of Ghana Agriculture Sector Improvement Programme (GASIP)	Dr. Ebenezer Owusu-Addo	Assess the effectiveness of the GASIP programme in supporting smallholder farmers.	Confirmed the potential for increasing commercialization and profitability in agriculture markets.
Child Labour and Forced Labour in Cocoa Production	Dr. Albert Arhin	Establish baseline data on child and forced labour in cocoa-growing areas for remediation efforts.	Provided crucial data to improve child labour prevention initiatives.

RWESCK

The Regional Water and Environmental Sanitation Centre, Kumasi (RWESCK), established in 1998 is dedicated to addressing water resources and environmental sanitation challenges in Ghana and Sub-Saharan Africa. The Centre focuses on five thematic areas: Innovative Water Treatment Technology, Water Distribution and Digital Technology, Environmental Sanitation and Waste Management Technology, Climate Resilience and Water Resources Management, and Water and Sanitation Governance. RWESCK aims to develop innovative products and technologies in Water, Sanitation, and Hygiene (WASH) and strengthen human resource capacity in these areas.

RWESCK has demonstrated strong research output, with 162 publications produced between 2019 and 2023. The Centre continues to advance research in water and environmental sanitation, contributing to the development of innovative solutions and technologies to address regional challenges.

Key Research Activities/Projects (2022-2023)

Research Activity/Project	Partners	Focus
NYANSAPO: Embedding Digitalisation Innovations in WASH	French Embassy, CWSA Ghana, HYDRO Ghana, GSSTI Ghana, AgroParisTech France, Altereo France, Suez France, Bluspark France	River water quality monitoring, digitisation of CWSA water systems, and pilot billing software for water systems.
NORPART: Exchange Student Research	Kumasi Waste Water Treatment Plant	Towards net-zero emissions in wastewater treatment.
CWSA: Robotics and Acoustic Sensing for Water Leakage Detection	CWSA	Developing robotics and non-intrusive acoustic sensing for detecting water leakage.
Zoomlion: Solid Waste Management	Zoomlion, AfESC	Development of econometric cost functions, financial models, and a digital twin simulation tool for waste management.

Highlights of Recent Innovations:

- Non-Intrusive Acoustic Sensing for Water Leakage Detection: This project led by Dr. Kwame Sarkodie aims to enhance water resource management by developing an advanced passive acoustic sensor for detecting water leaks.
- Robotics and AI for Water Leakage Detection: A robotic system equipped with AI is being developed for efficient, non-intrusive water leakage detection in pipelines.
- Unmanned Aerial Vehicles for Illegal Mining Surveillance: UAVs are being developed to monitor illegal mining activities in Ghana, providing real-time data to combat "galamsey" operations.
- Rotary Dryer Technology for Food Waste Processing: This innovation, developed by RWESCK alumnus Mr. Joseph Kwarko-Kyei, processes food waste into animal feed and organic fertilisers, offering sustainable alternatives to chemical products.

Research Support Units

Office of Grants and Research

The Office of Grants and Research (OGR) is responsible for facilitating the implementation and growth of the University's research agenda. The Office provides the framework and support services to ensure that the University's strategic research goals are achieved and the University's interests are protected. The OGR provides services through its Central and College Offices. Staff who are specialised in grants and research management support researchers throughout the research and grant cycle.

Pre-award Services

Post-award Services

Grant Financial Management

Research Capacity Development

Research Data Management

Research Ethics

Research Dissemination and Visibility

Intellectual Property (IP) and Knowledge Transfer

Research Compliance

LABORATORY FOR INTERDISCIPLINARY RESERACH **(LISA)**

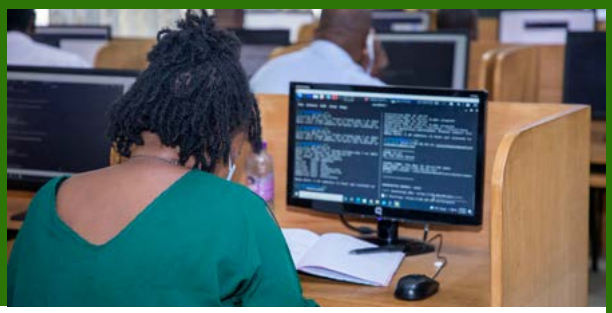
The Laboratory for Interdisciplinary Reserach (LISA) is a statistical collaboration laboratory with a goal to increase the quantity and quality of statistics and data science applied to advance high-impact research at KNUST.

LISA enhances research activities in the University through:

- Designing Experiments or Surveys
- Analysing and Plotting Data
- Interpreting Results
- Communicating Statistical Concepts
- Installing Statistical Software for staff and students

UNIVERSITY INFORMATION TECHNOLOGY SERVICES (UITS)

The UITS is the main provider of Information and Communications Technology (ICT) services across the University. It provides a connected environment and innovative sustainable technology solutions to enhance research activities through:



- Software Development

- User Support Services

- Network Operations and Infrastructure

- Systems and Data Management

UNIVERSITY LIBRARY

The University Library provides adequate scholarly resources to support research and dissemination of knowledge through:

- Journal and Database Subscription
- Electronic Resources
- The Research Commons for Faculty and Postgraduate Students
- Turnitin plagiarism software
- Institutional Repository (KNUSTSpace) for publication visibility
- Institutional Visibility through generation of research performance data
- Academic Skill and Research Training
- Verification of Research Publication Sources
- Promotion of Open Access

CENTRAL LABORATORY

The Central Laboratory is a shared research facility with state-of-the-art equipment providing research assistance and training to scientist in varied background in equipment-specific application and methodologies. Notable among the available facilities are:

Chromatography Facility

- Gas Chromatograph – Electron Ionization -Mass Spectrometer (GC-EI-MS)
- Gas Chromatograph – Flame Ionization Detector (GC-FID)
- Analytical High Performance Liquid Chromatograph (HPLC)
- Ultra-High-Performance Liquid Chromatograph – Electrospray Ionization – Time of Flight Mass Spectrometer (UHPLC-ESI-ToF-MS)

Spectroscopy Facility

- 500 MHz AVANCE III HD Nuclear Magnetic Resonance
- Atomic Absorption Spectroscopy - Flame and Graphite Furnace
- Attenuated Total Reflectance – Fourier Transform Infrared Spectroscopy
- Double Beam UV/VIS Absorption Spectrophotometry
- Multi-Mode Microplate Reader (Fluorescence, Absorbance and Luminescence.)

The KNUST Research Week which coincided with the Office of Grants and Research (OGR) 10th anniversary celebration was held from May 29th to June 2nd, 2023 under the theme "Innovation and Entrepreneurship in Science and Technology for Sustainable Future."


HEALTH WALK




OPENING CEREMONY








KNUST SCIENTIFIC RESEARCH CONFERENCE



Activities organised during the week included the Opening Ceremony, KNUST Scientific Research Conference (TEKCONFAB23), Office of Grants and Research @ 10 Symposium, a Health Walk and Research Excellence Award Ceremony.

OGR @ 10 SYMPOSIUM

ENGAGEMENT WITH BASIC SCHOOLS

RESEARCH EXCELLENCE AWARDS

Research Capacity Building in Pictures


KNUST
Kwame Nkrumah
University of Science
and Technology, Kumasi
OGR
Office of Grants
and Research
GRANT PROPOSAL
RITING WORKSHOP
OR RESEARCHERS


Welcome to the
No1 Destination


ETHICS IN
RESEARCH

RESEARCH REPORT COMMITTEE

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Director, Office of Grants and Research, KNUST

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University Relations Office

Design Team

Dr. Francis Kofi Nunoo (Lead)
College of Art & Built Environment

Mr. David Adu
Office of Grants and Research

COVER DESIGN

The cover design represents sustainability, green solutions, and partnerships, reflecting the University's commitment to environmental stewardship.