



**MACHAKOS
UNIVERSITY**

Co-Creating Sustainable Futures

BIANNUAL RESEARCH AND INNOVATION BULLETIN



FUNDAMENTAL STATEMENTS

Vision

Excellence in transformative scholarship and community service.

Mission

To Provide scholarship through Teaching, Training, Research and Innovation; and community service for sustainable industrial and socioeconomic transformation.

Identity Statement

Machakos University is an Academic Institution Committed to Generating and Transmitting Knowledge, Skills and Attitude through Science, Technology, Research and Innovation for the Benefit of Humanity.

Philosophy Statement

The Philosophy of Machakos University is to provide transformative leadership in Teaching, Training, Research, Innovation, Industrial and Technology transfer for wealth creation.

Core Values

- Creativity:** We shall use imagination and original ideas to create value for our Customers
- Agility:** We shall embrace urgency and flexibility in responding to customer demands
- Meritocracy:** We shall promote merit-based service
- Professionalism:** We are committed to high standards of training, research and service delivery
- Integrity:** We shall uphold honesty and high moral standards
- Inclusivity:** We shall offer equitable access to opportunities and resources

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EDITORIAL MESSAGE



Machakos University is deeply committed to advancing research and innovation in line with our mission of providing scholarly education for the industrial and socio-economic transformation of communities. Through the Division of Research, Innovation, and Linkages (RIL), we aspire to establish ourselves as a Center of Excellence in research, innovation, outreach and Linkages.

Our approach to achieving this vision is guided by coordinated research and innovation work plans and activities. These efforts are geared towards building capacity for research and innovation, monitoring and evaluating research projects, and supporting innovative research aligned with the priorities of Kenya.

Collaborating closely with stakeholders, the RIL Division plays a pivotal role in disseminating research findings through various outreach activities, including workshops, agricultural shows, exhibitions, as well as academic forums such as conferences, workshops, public lectures, and publications. These initiatives serve to bridge the gap between academia and society, ensuring that our research contributes meaningfully to addressing real-world challenges.

Recognizing the importance of continuous learning and skill development, Machakos University organizes annual training sessions on research and innovation to support the growth and competency of our staff and students. As we present the 7th Biannual Research and Innovation Bulletin, we take pride in the impactful contributions made by our university community. Through the stories featured in this bulletin, you will witness firsthand the profound impact of our research on society, as well as the enriching experiences gained by our staff, students, and the wider community through their involvement in research activities. We remain committed to pushing the boundaries of knowledge, innovation and service and we are excited to share these achievements and milestones with you.

Prof. David Mulwa, Ph.D.
Ag. Registrar (Research Innovation and Linkages) & Chairman, Editorial Board

Editorial Team

- | | |
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FROM THE DEPUTY VICE-CHANCELLOR (RESEARCH, INNOVATION AND LINKAGES)



**Prof. Peter N. Mwita, PhD,
Deputy Vice Chancellor,
Research, Innovation and
Linkages**

At Machakos University, we take immense pride in our dedication to excellence, innovation, and collaboration. Our recent endeavors stand as testament to our unwavering commitment to capacity building, academic discourse, community engagement and global partnerships.

Our ongoing efforts to enhance the skills and expertise of our staff and students through targeted training sessions lie at the heart of our pursuit of academic excellence. By investing in capacity building, we empower individuals to make meaningful contributions to their respective fields and catalyze positive change within society. The vibrant exchange of ideas and scholarly dialogue at our postgraduate colloquium served as a shining example of our academic ethos. This platform not only provided emerging scholars with the opportunity to showcase their research but also fostered interdisciplinary collaboration, thus advancing knowledge in diverse fields.

As we celebrate these achievements and collaborative ventures, we reaffirm our dedication to excellence, innovation, and positive impact. Together with our partners and stakeholders, we will continue to push the boundaries of knowledge and create a better future for all

CAPACITY BUILDING THROUGH TRAININGS

We are pleased to announce the successful completion of two insightful training sessions conducted recently:

Training on Intellectual Property Rights held on August 30, 2023 with 35 attendees. The training session on Intellectual Property Rights provided participants with a comprehensive understanding of the principles and importance of intellectual property protection. Topics covered included patents, trademarks, copyrights, and trade secrets. Participants gained valuable insights into safeguarding their creative and innovative works, ensuring legal protection, and maximizing the value of intellectual assets.

Training on Innovation and Entrepreneurship held on September 15, 2023 with 58 attendees. The training session on Innovation and Entrepreneurship aimed to inspire and equip participants with the knowledge

and skills necessary to foster innovation and entrepreneurship. Through interactive discussions and practical exercises, participants explored strategies for generating innovative ideas, developing business models, and navigating the entrepreneurial landscape. The session emphasized the importance of creativity, adaptability and resilience in driving sustainable innovation and entrepreneurial success.

We extend our sincere appreciation to all participants for their active engagement and enthusiasm during these training sessions. We believe that the knowledge and insights gained will empower individuals to contribute effectively to their respective fields and drive positive change within our University and beyond.

MACHAKOS UNIVERSITY POSTGRADUATE COLLOQUIUM

Machakos University held its annual Postgraduate Colloquium on December 6, 2023, providing a platform for postgraduate students to present their research findings, engage in scholarly discussions, and showcase their academic contributions. The colloquium aimed to foster intellectual exchange, promote interdisciplinary collaboration, and celebrate the scholarly achievements of postgraduate students across various disciplines.

The colloquium featured a series of research presentations by postgraduate students from diverse academic fields, including sciences,

humanities, social sciences, and engineering. Students presented their research findings, methodologies, and conclusions, demonstrating the breadth and depth of research conducted at Machakos University.

The colloquium provided networking opportunities for postgraduate students to connect with peers, faculty members, industry professionals, and potential collaborators. These interactions facilitated knowledge exchange, networking, and collaboration, fostering a supportive and collaborative research environment.

The Machakos University Postgraduate Colloquium was a resounding success, bringing together postgraduate students, faculty, and stakeholders to celebrate academic excellence, innovation, and scholarly achievement. The event provided a platform for students to showcase their research endeavors, engage in interdisciplinary

dialogue, and forge meaningful connections within the academic community. As we reflect on the success of the colloquium, we reaffirm our commitment to nurturing a vibrant research culture, promoting academic excellence, and empowering the next generation of scholars and researchers at Machakos University.



THE MKSU HACKFEST, 1ST EDITION

The inaugural edition of the MksU Hackfest surpassed all expectations, emerging as a resounding success and a testament to the vibrant spirit of innovation at Machakos University. Held from the 29th to 1st of December 2023 at the Machakos University Amphitheatre and Luban Workshop, the event brought together a diverse and dynamic community of innovators, developers, and ICT enthusiasts.

The Machakos University Tech Community under the School of Engineering and Technology conceived the Hackfest with a clear vision to foster creativity, collaboration, and technological advancement within the field of engineering and technology. With a focus on addressing specific challenges faced in Machakos County and beyond, the event aimed to promote skill development and provide a platform for young minds to showcase their prowess.

Participants were provided with a unique platform to showcase their talents, exchange ideas, and tackle real-world problems through technology-driven solutions. The Hackfest attracted individuals from various clubs within the school, as well as support from selected faculty members, who worked tirelessly to curate an enriching experience for all involved. From meticulously planned agendas to thoughtfully selected themes and challenges, every aspect of the event was designed to inspire innovation and collaboration.

The success of the Hackfest was made possible by the passion and ingenuity of the participants, coupled with the support of sponsors and partners. This report celebrates the achievements of the participants, acknowledges the invaluable contributions of sponsors and partners, and provides insights to guide future endeavors. Through documentation of this nature, we aim to showcase the vibrancy of the hackathon community and inspire continued growth and innovation within our technological landscape.

The hackathon owes much of its success to the dedicated and passionate individuals comprising the organizing team. With backgrounds ranging from technology to event management and marketing, this diverse group worked cohesively to ensure every aspect of the event was meticulously planned and executed. From orchestrating logistics to coordinating workshops and liaising with sponsors, their efforts were instrumental in creating a seamless and rewarding experience for all participants.

The Hackfest attracted close to 200 individuals, forming 12 groups of three to five members each. Participants not only showcased their technical prowess but also forged connections, learned from peers, and contributed to the ever-evolving landscape of engineering and technology. We extend our appreciation to each participant for making the Hackfest an unforgettable celebration of innovation and collaboration. As we reflect on the success of the 3-day event, we remain committed to fostering a culture of innovation and collaboration at Machakos University.

Stay tuned for future editions of the MksU Hackfest as we continue to push the boundaries of technological innovation and empower the next generation of innovators.



Machakos University students participating in the Hackfest

6TH PUBLIC LECTURE: “LIFESTYLE DISEASES: CANCER HEALTH CRISIS”

The 5th Public Lecture, titled “Lifestyle Diseases and the Cancer Health Crisis,” was an enlightening and impactful event held on Wednesday, 27th September 2023. This lecture brought together experts, healthcare professionals, and concerned individuals to discuss the critical issue of lifestyle diseases, with a particular focus on cancer.

The lecture shed light on lifestyle diseases, with a particular emphasis on the growing health crisis posed by cancer. Attendees gained valuable insights into the causes, risk factors, prevention, and management of cancer, a disease that continues to impact individuals and communities worldwide.

The lecture featured an expert speaker who provided in-depth analysis and perspective on the topic, drawing upon the latest research, clinical findings, and public health insights. Attendees benefited from the expertise and experience shared by the speaker, gaining a deeper understanding of the complexities surrounding cancer and lifestyle-related health issues.

The event included an interactive session where attendees had the opportunity to engage with the speaker, ask questions, and participate in discussions. This interactive format facilitated knowledge exchange, encouraged dialogue, and empowered participants to take proactive steps towards improving their health and well-being.

Speaker Highlights:

The event featured prominent speakers, including:

•**Dr. Geoffrey Zambezi Mutuma** as the Main speaker. Dr. Mutuma is a renowned Pathologist and Microbiologist with a key interest in cancer treatment, cancer awareness, cancer control prevention and surveillance and work place health promotion. He was able to provide valuable insights into cancer prevention and treatment.

•**Dr. Benjamin Nzomo** a Healthcare leadership and governance specialist with keen interests in efficient and sustainable health financing models geared towards provision of quality healthcare services. Dr. Nzomo discussed the significance of governance structures in healthcare organizations and how regulations and policies can be harnessed to combat lifestyle diseases like cancer.

•**Dr. Tindih S. Heshborne** who holds a Ph.D. in Bioscience engineering of Bovine immunological systems for the control of protozoan parasites was a panelist in the public lecture. Dr. Heshborne is currently the Chairman Department of Biological Sciences at the School of Pure and Applied sciences, Machakos University. His current research interests cut across the immunological analysis of vaccine and drugs molecular candidates in Covid-19, Snake-venom, Malaria and Cancer. Dr. Heshborne discussed the role of immunology analysis in cancer treatment and prevention.

•**Ms. Dorothy N Mulei**, BTh. A Tutor at Ukamba Bible College and a cancer survivor also participated as a panelist. Ms. Mulei shared her insights on her cancer diagnosis journey including the emotional and physical challenges faced upon learning about diagnosis. She was able to also share the treatment and the recovery process. Her story and advocacy efforts shine a light on the critical importance of addressing lifestyle-related factors in the fight against cancer.

Key Takeaways:

- 1. Understanding Lifestyle Diseases:** The event began with an in-depth exploration of lifestyle diseases, emphasizing their growing prevalence in our modern society. Participants gained insights into how lifestyle choices, such as diet, exercise, and stress management, can significantly impact one's health.
- 2. The Cancer Health Crisis:** The spotlight of the lecture was on cancer, a disease that affects millions of lives worldwide. Renowned oncologists and researchers shared valuable information on the latest advancements in cancer prevention, detection, and treatment.
- 3. Healthy Living Strategies:** Attendees learned practical strategies to adopt a healthier lifestyle and reduce their risk of lifestyle-related diseases. Speakers discussed the importance of balanced nutrition, regular exercise, and stress reduction techniques.
- 4. Community Engagement:** The event encouraged community engagement in the fight against lifestyle diseases and cancer. Participants were inspired to take proactive steps in their own lives and share this knowledge with their families, friends, and communities.
- 5. Q&A and Panel Discussion:** The lecture concluded with an engaging Q&A session, allowing attendees to interact directly with the experts. A panel discussion offered diverse perspectives on the challenges and solutions related to lifestyle diseases and the cancer health crisis.

Machakos University extends our heartfelt gratitude to all attendees, speakers, and partners who made the 5th Public Lecture on "Lifestyle Diseases and the Cancer Health Crisis" a resounding success. Together, we are taking significant steps toward a healthier, happier future.



Panelist fielding questions from participants.



Prof. Joyce Agalo, Vice-Chancellor, Machakos University addressing the participants.

MACHAKOS UNIVERSITY'S REMARKABLE PARTICIPATION IN NATIONAL TREE GROWING DAY

We are delighted to share the success of our recent community tree planting initiative, which took place on November 13th, 2023, at Maruba Dam. As part of our commitment to environmental conservation and in response to the Presidential directive on the national tree growing restoration campaign, the University took proactive steps to contribute to this important cause.

Representing the Vice Chancellor, Professor James Muola together with the University Management led Machakos University fraternity in the National Tree Planting Day at Maruba Dam in Machakos County. The exercise which is in line with the National Government's agenda to plant fifteen billion trees by 2032 to restore and conserve 10.6 million hectares of degraded landscapes and ecosystems saw Machakos University fraternity plant over 20,000 tree seedlings.

Speaking during the exercise, Professor James Muola congratulated all participants noting that the exercise is a national government strategy to reverse effects of climate change in the country. He also added that planting trees will not only conserve the environment but also sustain life and enhance peace and hope towards the future.

The highlight of the event was the ceremonial tree planting, symbolizing Machakos University's collective dedication to sustainability. Distinguished guests, faculty members and student took turns planting seedlings, each tree representing a shared commitment to environmental responsibility. The ceremony was not just a physical act of planting; but a symbolic gesture, marking the growth of our collective efforts to nurture a healthier environment.

A total of 9,420 tree seedlings were planted at Maruba Dam, symbolizing our dedication to fostering a greener and more sustainable environment. This initiative not only aligns with the national agenda for tree restoration but also reflects our university's ethos of environmental stewardship and community engagement.

In addition to the trees planted at Maruba Dam, 580 tree seedlings were generously donated to the local community. This gesture aims to empower and involve community members in the tree planting campaign, fostering a sense of ownership and responsibility for environmental conservation.

The success of this tree planting exercise was made possible through collaborative efforts with various stakeholders. The University partnered with the County Government of Machakos, National Environment and Management Authority (NEMA), Kenya Forest Service (KFS), Maruba Water Resource and Users Association, National Bank of Kenya, Red Cross, Water Resources Authority, and Konza Technopolis Development Authority (KoTDA). Their invaluable support and collaboration were instrumental in ensuring the success and impact of the initiative.

We extend our sincere gratitude to Konza Technopolis Development Authority (KoTDA) for donating 500 tree seedlings and to the National Bank of Kenya for their contribution of 250 seedlings. Their generosity and commitment to environmental conservation have significantly enhanced the scope and reach of our tree planting efforts.

As stewards of the environment, we remain committed to sustainable practices and initiatives that promote biodiversity, combat climate change, and enhance the quality of life for current and future generations.

We encourage members of the university community and the broader public to continue supporting tree planting initiatives and to actively participate in efforts to preserve and protect our natural resources.

Together, let's nurture a greener and more resilient future for our planet and communities.



Members of staff planting a tree at Maruba Dam



ADVANCING AFRICAN SPACE EXPLORATION: MACHAKOS UNIVERSITY SIGNS A LETTER OF INTENT FOR COLLABORATION WITH FUTURES FORUM-USA.

Machakos University and the Futures Forum, led by Dr. Clair Nelson, have signed a Letter of Intent to collaborate on various activities, all aimed at advancing African space exploration and research. The collaboration seeks to promote the Omni Africa Space Exploration Analog Simulation (OASEAS) Initiative, with the ultimate goal of ensuring African participation in the analog space research ecosystem.

The key points of collaboration between Machakos University and the Futures Forum include:

1. Establishment of OASEAS and Extra-Curricular Activities: The joint pursuit of establishing OASEAS and implementing extra-curricular learning activities, such as a National Society of Black Engineers Student Chapter or the first Kenya Space Society Club Student Chapter.
2. Research and Development Grants: Both parties will collaborate on seeking research and development grants that align with the vision and mission of the OASEAS Initiative.
3. Development of Space Education Programs: Dr. Clair Nelson and Machakos University will jointly develop and deliver courses and programs that promote the vision, mission, and objectives of space education, including Strategic Foresight and Futures Studies.
4. Conferences, Seminars, and Publications: The collaboration will involve organizing conferences, seminars, and publications that contribute to the mission and objectives of the OASEAS initiative, focusing on Space for the UN Sustainable Development Goals (SDGs) and Space Settlement.
5. Faculty and Student Exchange: Machakos University and relevant institutions globally will facilitate faculty and student exchanges, fostering international cooperation and knowledge sharing.

6. Transdisciplinary Research Programs: Together, they will work on developing transdisciplinary research programs that address challenges through the application of Space Science, Engineering, and Technology for the UN SDGs, Ethical Exploration of Space, and Sustainable Futures for Humanity.

This collaboration marks a significant step in advancing space research, education, and training in Africa, and both parties are grateful for the pivotal roles played by Prof. Mugendi, Prof. Peter Mwita, and Ag. Vice Chancellor Prof. Joyce Agalo in making this collaboration a reality. Their efforts have demonstrated the commitment of Machakos University to bring this ambitious initiative to fruition and contribute to the progress of space exploration in Africa.

ENGINEERING PRACTICE, INNOVATION AND PROJECT (EPIP) RESEARCH CENTRE LAUNCHED AT MACHAKOS UNIVERSITY

Machakos University proudly announces its role as the host institution for the newly unveiled Kenya Engineering Practice, Innovation and Project (EPIP) Research Centre. The inauguration ceremony took place on Sunday, 3rd September, 2023, marking a significant milestone in the collaboration between Machakos University and Tianjin City Vocational College.

During the unveiling ceremony, Professor Joyce Agalo, the Vice-Chancellor of Machakos University, highlighted the remarkable achievements resulting from the partnership between Machakos University and Tianjin City Vocational College. These milestones include the establishment of the Luban Workshop, renowned for attracting visitors nationally and internationally for benchmarking and training purposes. Additionally, the introduction of the BSc in Cloud Computing and Information Security and the successful participation of Machakos University students in the Chinese Ambassador Scholarship program were emphasized.

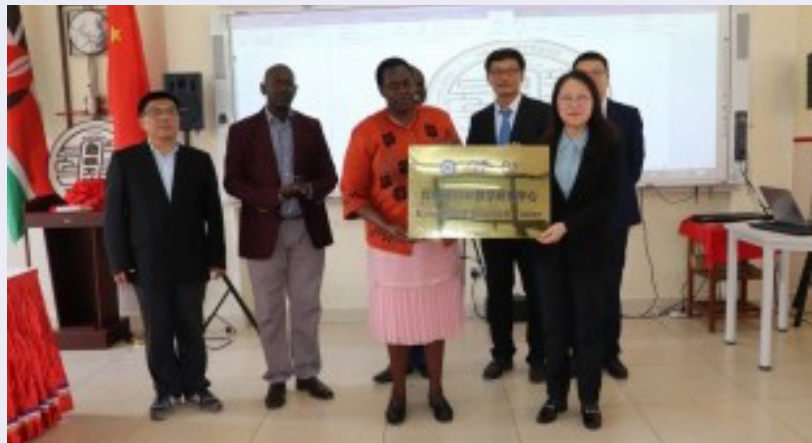
Professor Agalo further advocated for the establishment of a Confucius Institute within Machakos University to facilitate the teaching of the Chinese language. This initiative aims to bolster an effective Student and Staff mobility program.

In his opening speech, **Mr. Lv Jiahua**, Deputy Director of Hebei District Education, Bureau of Tianjin, commended the progress achieved through the Memorandum of Understanding (MoU) between the two institutions. He praised the establishment of the Kenya EPIP Research Centre and assured full support for its operations.

The event was graced by distinguished guests including Mr. Alex Zhou from Huawei Kenya, Professor Romanus Odhiambo, Vice-Chancellor of Meru University of Science and Technology, and Ms. Caroline Ikirinya from Konza Technopolis.

Subsequently, Liu Sheng, Deputy Vice-Chancellor of Tianjin City Vocational College, Dr. Geng Jie, Researcher at the Vocational Education Research Centre of Tianjin Academy of Educational Science, and Yu Zhenzhen, English teacher at Tianjin City Vocational College, engaged with Machakos University students.

The establishment of the Kenya EPIP Research Centre signifies a pivotal step towards advancing engineering practice, innovation, and project management in Kenya, further solidifying Machakos University's commitment to excellence in education and research.



Front: Prof. Joyce Agalo, VC MksU and Dr. Geng Jie Researcher at the Vocational Education Research Centre of Tianjin academy of Educational Science.

Back from right to left: Liu Sheng Deputy Vice-Chancellor Tianjin City Vocational College,

Prof. peter Mwita, Deputy Vice-Chancellor (Research, Innovation and Linkages) Machakos University,

Mr. Lv Jiahua: Deputy Director of Hebei District Education, Bureau of Tianjin and Mr. Alex Zhou from Huawei Kenya





Prof. Romanus Odhiambo, vice-Chancellor Meru University Of Science and Technology making his remarks



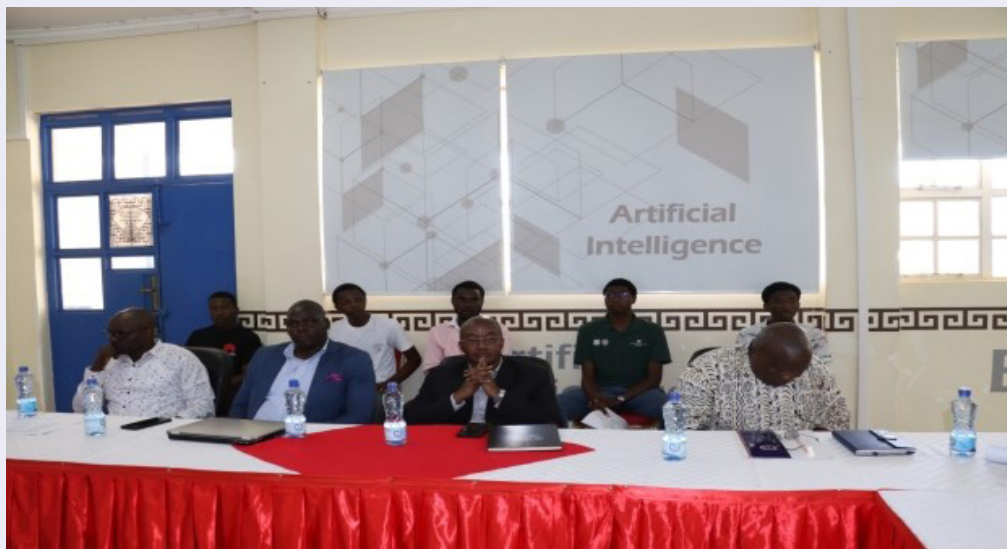
Members of staff and students following a presentation



Dr. Geng Jie Giving a presentation



Members of Machakos University, Tianjin City Vocational College and Konza Technopolis



Members of staff from Machakos University and students

