



# 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

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

## Inside this Issue

|  |    |
|--|----|
| From the deputy vice-chancellor (research, innovation and linkages).....                                   | 2  |
| Machakos university exhibits in the commission for university education (cue) 4th biennial conference..... | 3  |
| Participation in the south eastern agricultural society of kenya machakos national show.....               | 4  |
| Building sustainable futures at machakos university's 6th international conference.....                    | 5  |
| Visit by national association of vocational education of china.....  | 7  |
| Participation and exhibition of innovations in the dekut/ebk conference.....                               | 8  |
| Award of scholarships to students by chinese ambassador to kenya.....                                      | 9  |
| Tree growing exercise on 9th april, 2024.....  | 9  |
| Celebrating african culture through dance, art and cuisine.....  | 11 |
| Activation of ajira digital club at machakos university.....   | 12 |
| Machakos university 6th innovation and exhibition week.....  | 13 |
| University medical camp.....   | 15 |
| Virtual training on engineering, practice, innovation and project (epip).....                              | 16 |
| The launch of stem centre at machakos university.....  | 16 |
| Public lecture on environment and carbon credit.....   | 18 |
| Machakos university researchers feature in the cue researchers bulletin.....                               | 19 |

## EDITORIAL MESSAGE



We are pleased to unveil the ninth issue of the Machakos University Biannual Research and Innovation Bulletin. The Editorial Board, driven by their relentless spirit, has handpicked a range of articles that offer something for everyone in our audience.

The Division of Research, Innovation and Linkages is dedicated to delivering quality education through comprehensive training, cutting-edge research, and innovative practices that drive industrial growth and socio-economic progress in our communities. We deeply appreciate the continued support from the University Management, the Machakos University family, and our strategic partners in fostering research, innovation, and technology transfer.

In this issue, we continue to advance our knowledge on technological innovation and improve on these practices through the highlighted activities. We hope you will find it a classical read!

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

### Editorial Team

|                     |   |
|---------------------|---|
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| Ms. Eliabeth Mbatha | ~ Administrative Assistant, Office of<br>Registrar-RIL  |
| Mr. Moses Marwa     | ~ ICT   |

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



Machakos University serves as a center for researchers, innovators, and academics to develop solutions to emerging global challenges. We achieve this through technological innovations focused on creating a sustainable future.

Our commitment to contributing to Kenya Vision 2030 and the Bottom-up Economic Transformation Agenda (BETA) remains a core guiding principle, aligned with the University's strategic plan. In line with our research and innovation agenda, we aim to expand knowledge and technology through comprehensive training programs and the establishment of research infrastructure to advance Science, Technology, Engineering, and Mathematics (STEM).

The University's dedication to community development fosters a collaborative environment where our innovative skills and inventions are tested, commercialized, and facilitate technology transfer.

In our pursuit of co-creating sustainable futures, we actively participate in various community development and environmental conservation initiatives. These efforts include projects such as public lectures to educate staff on carbon credits, the preservation of African cultural heritage, and ICT-driven programs, all featured in this bulletin.

*Prof. Stanley M. Makindi, PhD,  
Ag. Deputy Vice Chancellor,  
Research, Innovation and Linkages*



## MACHAKOS UNIVERSITY EXHIBITS IN THE COMMISSION FOR UNIVERSITY EDUCATION (CUE) 4TH BIENNIAL CONFERENCE

Machakos University participated in the 4<sup>th</sup> Biennial Conference of Commission for University Education (CUE) that was held from 12<sup>th</sup> to 14<sup>th</sup> June, 2024 at the Kenya International Conference Centre. The Conference brings together Universities, research organizations and higher education agencies to showcase their research findings and innovations. The theme was on **Catalyzing Systemic Social Transformation Through Research and Innovation**.

It was attended by 39 universities among them Machakos University, which was represented by Dr. Erick Omuya, Mr. Peter Weremwanja and two students. The team showcased two innovations on *the use of fibrous ceramic filters in the reduction of turbidity and pathogen in drinking water*; and *Blind Eye: Bridging accessibility and awareness for the visually impaired with AI*.



## PARTICIPATION IN THE SOUTH EASTERN AGRICULTURAL SOCIETY OF KENYA MACHAKOS NATIONAL SHOW.

Machakos University participated in the 2024 ASK Machakos National Show that was held from 5<sup>th</sup> - 8<sup>th</sup> June, 2024 at Machakos Show ground as part of community outreach services. The theme of the show was “Promoting Climate Smart Agriculture and Trade Initiatives for Sustainable Economic Growth”. The University participated in nine (9) categories and won the following prizes;

**First prize** - The Best University stand

**First prize** - The stand that best interprets current show theme (Education and/or Research)

**First prize** - The best stand in research and development (Educational)

**First prize** - The best stand embracing information technology and communication system.

**Second prize** - the best innovation and invention stand

**Second prize** - the best stand in hospitality and catering services.

**Second prize** - the most striking display (demonstration of locally manufactured products)

**Third prize** - the best display and services in the health sector and pharmaceutical stand

**Third prize** - the best stand demonstrating the application of environmental quality standards.





## BUILDING SUSTAINBLE FUTURES AT MACHAKOS UNIVERSITY'S 6TH INTERNATIONAL CONFERENCE

Machakos University hosted its 6<sup>th</sup> International Conference from 29<sup>th</sup> to 31<sup>st</sup> May, 2024 at the University Amphitheatre under the theme **“Adaptive Responses to Global Challenges for Sustainable Socioeconomic Development”**. It focused on the need for flexible and effective strategies to address major global issues we face, such as climate change, economic inequality, and resource depletion. It featured six sub-themes namely:

- Climate Change, Environment, Food Security and Infrastructure Development.
- Health, Tourism and Entrepreneurship
- Innovation in Education and Knowledge Management
- Energy solutions, Industrialization and Computing Technologies.
- Science, Technology Engineering and Mathematics.
- Governance, Culture, Languages and Social Sciences.

The Conference was officially opened by Prof. Walter Oyawa, CEO/Director General of National Commission for Science, Technology & Innovation (NACOSTI). The keynote speaker during the ceremony was Prof. Raphael M. Munavu, Chairman of Konza Technopolis Development Authority (KotDA).

It emphasized on the importance of developing and implementing flexible and effective solutions to tackle worldwide problems in a way that promotes enduring economic and social growth while preserving the environment for future generations. It was attended by participants from various universities and institutions in Kenya, South Africa, Uganda and Eswatini (Swaziland). A total of 117 abstracts were received.



The Conference was officially closed by Dr. Rose Ngugi, Executive Director of KIPPRA with Prof. Meoli Karshoda, CEO of KENET as the key note speaker for the closing ceremony.



## VISIT BY NATIONAL ASSOCIATION OF VOCATIONAL EDUCATION OF CHINA

Machakos University hosted esteemed guests from the National Association of Vocational Education of China on 11<sup>th</sup> May, 2024. The delegation had come to visit the Luban Workshop, which was established through the joint collaboration between Tianjin City Vocational College (TCVC) and Konza Technopolis Development Authority (KoTDA).

The visit highlighted Luban Workshop's alignment with global educational trends

that prioritize practical skills. The discussions focused on future collaborations such as staff and student exchange programs, industry partnerships, language proficiency initiatives, curriculum development and, infrastructure enhancement to establish a center of excellence for Cloud Computing. The delegation expressed a keen interest in expanding the reach of the Luban Workshop reflecting China's vocational emphasis on employable skills and their commitment to strengthening ties with African institutions.



# PARTICIPATION AND EXHIBITION OF INNOVATIONS IN THE DEKUT/EBK CONFERENCE

The University participated in the 5th engineering.

Engineering Partnership Convention at Dedan Kimathi University of Technology, held from 7<sup>th</sup> to 10<sup>th</sup> May 2024. The convention marked the 60th anniversary of the engineering regulatory body which is responsible for the registration of engineers and firms, regulation of engineering professional services, setting standards, and the overall development and practice of engineering.

The convention's theme, "Engineering@60: Reflections, Response, Resetting," provided a comprehensive platform for engineers, scientists, innovators, and stakeholders to engage in meaningful discussions, exchange knowledge, and envision the future of

Kenya's engineering innovations were showcased including the University's two innovation projects namely;

1. The use of fibrous ceramic filters in the reduction of turbidity and pathogen in drinking water.
2. Blind Eye: Bridging accessibility and awareness for the visually impaired with AI.

These innovations are aimed at addressing current global challenges and they explore how engineering can provide solutions.



## AWARD OF SCHOLARSHIPS TO STUDENTS BY CHINESE AMBASSADOR TO KENYA

On 25<sup>th</sup> April, 2024, the Chinese Ambassador to Kenya, HE. Zhou Pingjian, visited the University to award the Chinese Ambassador Scholarship Award to 20 Machakos University students. The total amount received by the University was Kshs.1.2 million.



## TREE GROWING EXERCISE ON 9TH APRIL, 2024

The University is committed in ensuring forest cover by growing trees as per Government's directives. In an effort to mark this auspicious exercise, the University had a tree growing exercise on 9<sup>th</sup> April 2024 at Maruba Dam, Machakos, in collaboration with Machakos County Government and Equity Bank. The event served as an insightful platform to discuss the importance of clean and renewable energy sources for a sustainable future. The informative session, led by representatives from Equity Bank, emphasized the urgent need to adopt clean energy solutions to mitigate climate change and promote environmental sustainability. Attendees gained valuable insights of the benefits of renewable energy technologies and the role that individuals and organizations can play in driving the transition towards a cleaner and greener energy landscape.

Shortly after the Clean Energy Talk, a commemorative tree planting exercise took place at the University Hotel and Conference Centre. The Chairman of Council, Dr. Christopher Gakahu, together with other council members, participated in this symbolic exercise to emphasize our commitment to environmental stewardship and conservation.

This was followed by a tree planting activity in Maruba Dam that staff, students and our partners engaged in. 3000 tree seedlings were planted during the event. Out of these, 2000 seedlings were donated by Equity Bank while 1000 seedlings were purchased by the University.





## CELEBRATING AFRICAN CULTURE THROUGH DANCE, ART AND CUISINE

Machakos University celebrated its 1<sup>st</sup> Annual Culture Day on 4<sup>th</sup> April 2024, bringing together students, staff, and the community to embrace the rich diversity of cultures within the University. The event aimed to promote cultural awareness and foster cross-cultural understanding, between the various ethnic groups.

The festivities of the day featured a wide range of activities and performances which highlighted the University's cultural diversity. Students showcased traditional attires,

artifacts, cuisines and held performances like poetry and dance. Competitions under these categories were also held. Presenters competed in traditional dance-offs, costume contests, and cultural quizzes. The judges commended the participating groups for their high level of preparedness

The spirit of unity prevailed throughout the event, fostering meaningful connections and mutual understanding among participants from the diverse backgrounds.





## ACTIVATION OF AJIRA DIGITAL CLUB AT MACHAKOS UNIVERSITY

The Ajira Digital Club at Machakos University was activated on 1<sup>st</sup> March, 2024 at the University sports ground. The club is a part of the Ajira Digital Program, which is an initiative of the Government of Kenya and spearheaded by the Ministry of ICT and the Digital Economy. Its mission is to empower over 1 million young Kenyans annually with digital and digitally enabled skills, helping them earn a decent living through freelancing opportunities. The program aims to position Kenya as a leading labor destination and a Business Process Outsourcing Hub for multinational companies, while also encouraging local companies and the public sector to create digital work.

The activation of Machakos University Ajira Club was led by Ms. Edith Njeri, the Ajira Digital Program Assistant Manager, Ajira Clubs (Kenya). It aimed at:

- a) Creating awareness about Ajira Digital training and mentorship opportunities.
- b) Introducing students to the Ajira Digital Club.
- c) Informing students about the upcoming free Ajira training on different online job categories.
- d) Sharing the benefits and opportunities available for active members.
- e) Students are encouraged to actively participate in Ajira Digital Club activities and take advantage of the training and mentorship opportunities provided.

# MACHAKOS UNIVERSITY 6TH INNOVATION AND EXHIBITION WEEK

The University hosts an annual Innovation and Exhibition Week to highlight creative projects and ideas from students, staff, and the community. This event provides a platform for innovators to connect, exchange ideas, experiences, and enhance entrepreneurial culture and skills for the community's socio-economic growth and development. The University held its 6th Innovation and Exhibition Week from 21<sup>st</sup> -23<sup>rd</sup> February, 2023 at Machakos University Sports Ground, under the theme "Innovation for Environmental Sustainability". It was attended by 270 participants, and it attracted 41 innovators and two (2) exhibitors.

Experts from Kenya Industrial Property Institute (KIPI) served as judges for the innovations and exhibitions. The participating institutions included; Machakos University, Machakos Technical Institute for the Blind, Vyulya Girls Secondary School, and Machakos Women Prison. Innovations that won in specific categories were;

## Category: Machakos University Staff

| No | Innovation                | Name                        |
|----|---------------------------|-----------------------------|
| 1  | SILAGE SAW BLADE          | Benson Wang'ombe Ng'ang'a   |
| 2  | Creative Design           | Re-Use by Mary and Students |
| 3  | FRESHGUARD Deodorant Soap | Dr. Angeline and Students   |

## Category: Machakos University Students

| No | Innovation           | Name  |
|----|----------------------|---|
| 1  | Robox Farm           | Dickson Esamai, Mohamed Abubakar and Brian Albeit |
| 2  | Techno River Cleaner | Regina Ndungu and Anthony Makanga                 |
| 3  | Agri Lease           | Wayne Murunga                                     |

## Category: Technical and Vocational Education Training (TVET)

| No | Innovation                                       | Name                             |
|----|--|----------------------------------|
| 1  | Bags from surgical Masks and a Multi-purpose bag | James Munyau                     |
| 2  | Extraction of Banana Fibre                       | Daniel Mopel and Jecinta Muthoni |
| 3  | Assorted Knitted Woven Products                  | Lucy Wanjiru                     |



### Category: High School

| No | Innovation             | Name                                   |
|----|------------------------|--|
| 1  | Multi-Extendable Table | Abigail Kavenge and Joan Mwende        |
| 2  | Home-made sunscreen    | Patience Zawadi and Immaculate Wavinya |
| 3  | Urine Fertilizer       | Faith Mila and Jamila Behbi Yusuf      |

The judges recommended patenting of the innovations, and the participants were encouraged to continue coming up with more innovative ideas and prototypes.





## UNIVERSITY MEDICAL CAMP

The University's medical camp took place from 21<sup>st</sup> to 23<sup>rd</sup> February, 2024. It aimed at providing staff, students and members of the surrounding community with access to basic health services, as well as promoting health awareness. More than 170 people took part in the medical camp and had their blood pressure and weight measured among other things. The health services and awareness were provided by staff from the University Health Unit.



## VIRTUAL TRAINING ON ENGINEERING, PRACTICE, INNOVATION AND PROJECT (EPIP)

A virtual training on Engineering, Practice, Innovation and Project (EPIP) was held on 30<sup>th</sup> January, 2024 to train staff on practical teaching methodologies that enhance student's competencies and innovative skills. This collaborative workshop brought together three esteemed institutions: Tianjin City Vocational Training College, Meru University of Science and Technology, and Machakos University.

The EPIP model prioritizes practical learning experiences and immerses students in real-life work scenarios, fostering the development of comprehensive knowledge, competence, and innovative skills. It encourages creativity, stimulates critical thinking, and guides students in research and problem-solving endeavors. By integrating theory and practice, EPIP aims to cultivate students' competencies

and innovative capabilities, aligning with the competence-based teaching and learning model being introduced across Kenya's education system.

The Virtual EPIP Training served as a platform for collaboration and knowledge exchange among the participating institutions. It emphasized the importance of hands-on learning experiences in preparing students for real-world challenges and opportunities. EPIP's alignment with Kenya's competence-based teaching and learning model underscores its relevance and significance in contemporary education. The trainers were encouraged to integrate EPIP principles and practices into their teaching methodologies to enrich students' learning experiences.

## THE LAUNCH OF STEM CENTRE AT MACHAKOS UNIVERSITY

A STEM Center at Machakos University was launched on 25<sup>th</sup> January 2024, marking a significant milestone in our commitment to fostering innovation and empowering African youth through education. STEMpower, a leading Pan-African non-profit organization, partnered with Machakos University to establish this state-of-the-art facility.

The event was officially launched by the Permanent Secretary, State Department for University Education and Research, Dr. Beatrice Inyangala.

The STEM Center at Machakos University is the fourth center to be established by

STEMpower in Kenya. Equipped with cutting-edge resources, including computer and electronics labs, 3D printers, and robotics equipment, the center is poised to be a hub for academic excellence and innovation.

The Center will foster academic excellence in STEM (Science, Technology, Engineering, and Mathematics) fields, serve as a catalyst for innovation and entrepreneurship among students and the broader community, and, empower African youth by providing access to advanced educational resources and opportunities.

The Center is expected to have far-reaching effects, not only within the academic sphere but also in the socio-economic development of Kenya. By nurturing a culture of innovation and providing students with hands-on learning experiences, the STEM Center aims to drive growth and progress in key economic sectors through a wide range of programs, workshops, and initiatives designed to

engage students and foster their interest and proficiency in STEM fields.

Students and faculty are encouraged to take advantage of the center's resources and opportunities to enhance their skills and pursue innovative projects.



# PUBLIC LECTURE ON ENVIRONMENT AND CARBON CREDIT

Machakos University hosted its 7<sup>th</sup> Public Lecture on Environment and Carbon Credit on 19<sup>th</sup> January, 2024 as part of its commitment in promoting environmental sustainability and addressing climate change challenges. The lecture aimed at raising awareness on the importance of environmental conservation, the role of carbon credits in mitigating climate change, and the potential benefits of adopting sustainable practices.

The event commenced with a keynote address by Dr. Antony Fredrick Ogolla, Ph.D. (Bonn), an expert in environmental science and climate change. The address provided an overview of the current state of the environment, the impacts of climate change, and the importance of implementing mitigation strategies. Dr. Antony Fredrick Ogolla also discussed the concept of carbon credits and their role in incentivizing emission reduction efforts.

key issues and challenges related to environmental conservation and carbon credit implementation. Panelists engaged in a lively exchange of ideas, addressing questions from the audience and offering diverse perspectives on topics such as renewable energy, carbon offset projects, and policy frameworks for climate action.

The Lecture was highly informative and brought together experts, practitioners, policymakers, and members of the public to discuss pressing environmental issues and explore solutions for a sustainable future.. The University continues its commitment to environmental stewardship, and remains dedicated to facilitating dialogue, raising awareness, and driving positive change for the benefit of current and future generations.

A panel discussion was held to explore





## MACHAKOS UNIVERSITY RESEARCHERS FEATURE IN THE CUE RESEARCHERS BULLETIN

**M**achakos University was featured in the Commission for University Education (CUE) June – September 2024 Digest. The University stood as a beacon of pride in its representation of women scientists who have garnered substantial grants to bolster STEM-focused programmes. These women had played a pivotal role in positioning the University on the global stage through their innovative research endeavors.

The publication also noted that Machakos University was the first University in Kenya to benefit from the Luban Workshop. The University was selected to host one of these workshops, making it the sole institution privileged to house such a facility in Kenya and the East African Region. The publication also featured success stories such as establishment of STEMpower laboratories.