
TANZANIA COMMISSION FOR SCIENCE AND TECHNOLOGY

ISO 9001 : 2015 Certified

# 9th STICE DECEMBER 2nd – 4th 2024

Science, Technology and Innovation Conference & Exhibition

# REPORT

## Acknowledgements

The success of the 9th Annual Science, Technology, and Innovation Conference and Exhibition (STICE) would not have been possible without the invaluable contributions and support of numerous individuals and organizations.

First and foremost, we extend our deepest gratitude to the Government of Tanzania for its unwavering support and commitment to promote the science, technology, and innovation as pillars of national development.

We are alos grateful to our esteemed keynote speakers, panelists, and presenters who shared their expertise, insights, and research. Their contributions enriched the discussions and inspired actionable solutions to address climate resilience and economic competitiveness.

A special thank you goes to our sponsors and partners for their generous support, which made this event a reality. Their dedication to advancing innovation and research is deeply appreciated.

To the organizing committee, volunteers, and support staff, your tireless efforts, dedication, and professionalism ensured the seamless execution of this conference. Your hard work behind the scenes was instrumental in creating a memorable and impactful event.

We also acknowledge the participants—researchers, innovators, policymakers, students, and other stakeholders—whose active engagement and enthusiasm brought life to the conference. Their valuable input and collaborative spirit were the driving forces behind the success of this event.

Finally, we thank the Board of Commissioners of Tanzania Commission for Science and Technology (COSTECH) for its leadership and commitment to advancing STI in the country. Your vision and dedication continue to pave the way for a brighter future.

To everyone who contributed to the 9th STICE Conference, we express our heartfelt gratitude. Together, we have taken a significant step forward in leveraging science, technology, and innovation for sustainable development.

# Conference Quick Facts

**SNAPSHOT OF THE STICE 2024**

**1240Participants**

**47 Institutions**

**57 Speakers**

**7 Keynote Speakers**

**5 Parallel sessions**

**9 Side Events**

**85 exhibitors**

**2500** **times the #STICE2024 hashtag was tweeted between 2 – 4 December 2024**


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## Executive Summary

Established by Act No. 7 of 1986, the Tanzania Commission for Science and Technology (COSTECH) is a principal advisory organ of the Government on all matters relating to scientific research and technology development in the United Republic of Tanzania. The Commission is responsible for promoting, coordinating and monitoring scientific research and technology development and transfer; acquiring, storing, and disseminating scientific and technological data and information. COSTECH, in collaboration with other STI stakeholders has been organizing the Annual National Science, Technology and Innovation Conference and Exhibition (STICE) as the STI community platform for knowledge, expertise, and experience-sharing, showcasing cutting-edge innovations and fostering collaboration across sectors.

This year, from 2nd to 4th December, over 1,000 researchers, innovators, policymakers, industry professionals, and development partners convened at the Julius Nyerere International Convention Center (JNICC) in Dar es Salaam for a three-day event to discuss and deliberate on the importance, strategies, and approach of Harnessing Science, technology, and Innovation to Achieve Climate Resilience and a Competitive Economy in Tanzania. The event was also a platform for the STI stakeholders to share knowledge, expertise, and experience, and enhance linkage, collaboration, and networking among and between Learning Institutions, Research Institutions, Industries, Policymakers, and Development Partners to drive STI practical solutions. Students from primary and secondary schools learned different aspects of science, technology, engineering, and mathematics to inspire them in their future careers.

Speech by the Guest of honor, the Deputy Prime Minister and Minister for Energy, who represented the President of the United Republic of Tanzania, and remarks by the Minister for Education, Science and Technology, Ambassador of the Norwegian embassy and World Bank Country representative exemplified the commitments of the government and development partners in fostering STI in the country. The Guest of Honor launched a credit guarantee scheme worth 2.5b to support commercialization of innovations and awarded grants of 6b to 19 researchers for climate change research. He also recognized five researchers for their positive and significant research impacts to the socio-economic development of Tanzanians. The

conference and exhibition messages reached about 13.7 million people through mainstream media exposure, strategic social media campaigns, and influencer engagement. The 9th STICE discussions and deliberations came up with the following recommendations:

**To reposition STI to foster Industrial Linkages for Economic Transformation**

i. Technology transfer key players such as the government, COSTECH, higher learning institutions, research institutions, and industries speed up the implementation of the COSTECH Act 1986.
ii. COSTECH assesses, registers, and monitors imported and domestic technologies as required by the COSTECH Act.
iii. Government of the United Republic of Tanzania, Revolution Government of Zanzibar and other financing agencies prioritize STI programmes, projects and activities in their budget allocation.

**To leverage STI and Indigenous or Traditional Knowledge for food Security and Nutrition**

i. Research stakeholders to prioritize research on natural food and indigenous/traditional knowledge.
ii. Farmers grow drought-tolerant seeds to adapt to climate change.
iii. The government emphasizes appropriate solutions and technologies for climate change adaptation.

**To foster STI for Climate Change Resilient and Sustainable Bio-Economy**

i. COSTECH acquires sophisticated shared research facilities and equipment for Climate Change Resilient and Sustainable Bio-Economy research.
ii. Investors use appropriate technologies that reduce carbon emissions.
iii. Port authority expands its focus areas to include the reduction of sedimentation derived from human activities around the port.
iv. Government and other key players build the capacity of researchers to conduct adequate research to address climate change and bio-economy challenges and problems.

**To advance Open Science for knowledge-Driven Society and Sustainable STI Resource Governance in Tanzania**

i. STI stakeholders implement the National Framework for Research and Innovation data sharing.
ii. COSTECH to promote and support open science initiatives and knowledge exchange.
iii. COSTECH to establish clear indicators for measuring and tracking the progress of open science implementation in Tanzania.

**To Advance STEM Education for Competitive Future Generation**

i. The government revises national policies to incentivize STEM initiatives, programs, and projects.
ii. The government establishes centers of excellence in each region as focal points for STEM education, research, and innovation.
iii. The government and other stakeholders invest in capacity-building initiatives to train, recruit, and retain qualified STEM educators at all educational levels.

## LIST OF ABBREVIATIONS

| | |
|---|---|
| **4IR** | Fourth Industrial Revolution |
| **AATF** | African Agricultural Technology Foundation |
| **AOSP** | Open Science Platform |
| **AOSP** | African Open Science Platform |
| **ASD** | Anaerobic Soil Disinfestation |
| **BLS** | Bacterial Leaf Spot |
| **CLEs** | Creative Learning Environments |
| **CNNs** | Convolutional Neural Networks |
| **CoLs** | Communities of Learning |
| **COSTECH** | Tanzania Commission for Technology |
| **CPA** | C*ertified Public Accountant* |
| **CRDB** | Cooperative Rural Development Bank |
| **DFID** | Department for International Development |
| **DIT** | Dar es Salaam Institute of Technology |
| **DRC** | Democratic Republic of Congo |
| **DSBA** | Digital School-Based Assessment |
| **EAJSTI** | East African Journal for Science, Technology, and Innovation |
| **EU** | European Union |
| **FSM** | Faecal Sludge Management |
| **FY** | Financial Year |
| **GDP** | Gross Domestic Product |
| **GEE** | Google Earth Engine |
| **GTS** | Generation Tech Space |
| **HEET** | Higher Education for Economic Transformation |
| **HFFT** | Hydroponic Fodder Farming Technology |
| **ICT** | Information and Communication Technology |
| **IDRC** | The International Development Research Centre |
| **IMO** | International Maritime Organization |
| **IP** | Intellectual Property |

| | |
|---|---|
| **IPR** | Intellectual Property Rights |
| **KM** | Knowledge Management |
| **LBD** | Learning by Design |
| **LMS** | Learning Management System |
| **LRC** | Lukosi River Catchment |
| **MoEST** | Ministry for Education Science and Technology |
| **NECTA** | National Examinations Council of Tanzania |
| **NGOs** | Non-Governmental Organizations |
| ***NIMR*** | National Institute for Medical Research |
| **NMB** | National Microfinance Bank |
| **Norad** | The Norwegian Agency for Development Cooperation |
| **NORHED** | Norwegian Programme for Capacity Development in Higher Education and Research for Development |
| **NRF** | National Research Fund |
| **NRIRIL** | National Reference Industrial Research and Innovation Laboratories |
| **PBL** | Project-Based Learning |
| **POL** | Project-Oriented Learning |
| **PPH** | Postpartum Hemorrhage |
| **R&Ds** | Research and Development Institutions |
| **RAS** | Recirculating Aquaculture System |
| **SIDA** | *Swedish International Development Cooperation Agency* |
| **SMS** | Short Message Service |
| **SPE** | Solid-phase Extraction |
| **SRTM** | Shuttle Radar Topography Mission |
| **STEM** | Science, Technology, Engineering, and Mathematics |
| **STI** | Science Technology and Innovation |
| **STICE** | Science, Technology, and Innovation Conference and Exhibition |
| **STNA** | Standard Two National Assessment |
| ***TAEC*** | *Tanzania Atomic Energy Commission* |
| **TAFIRI** | Tanzania Fisheries Research Institute |

| | |
|---|---|
| **TALIRI** | Tanzania Livestock Research Institute |
| **TanBIF** | Tanzania Biodiversity Information Facility |
| **TARI** | Tanzania Agriculture Research Institute |
| **TDV** | Tanzania Development Vision |
| **TFNC** | Tanzania Food and Nutrition Authority |
| **TIE** | Tanzania Institute of Education |
| **TMIs** | Tanzanian Manufacturing Industries |
| **TPA** | Tanzania Port Authority |
| **UAE** | Ultrasonic-assisted Extraction |
| ***UDOM*** | *The University of Dodoma* |
| **UDSM** | The University of Dar es Salaam |
| **UKaid** | United Kingdom Aid |
| **UNCDF** | United Nations Capital Development Fund |
| **UNDP** | United Nations Development Programme |
| ***UNESCO*** | *United Nations Educational, Scientific and Cultural Organization* |
| **UNICEF** | United Nations Children's Fund |
| **VETA** | Vocational Education and Training Authority |
| **WFP** | World Food programme |

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## Chapter 1: Introduction

### 1.1. Background

The Tanzania Commission for Science and Technology (COSTECH) was established by the Act of Parliament No. 7 of 1986 being the principal advisory organ to the Government on all matters related to Science, Technology and Innovation (STI) and their application to socio-economic development. COSTECH contributes to the formulation of policy on the development of science and technology and recommends its implementation to the Government.

To fulfill its established mandate among other activities COSTECH in collaboration with other STI stakeholders has been implementing the Annual National Science, Technology and Innovation Conference and Exhibition (STICE) serving as a platform of the STI community to share knowledge, and showcase advancements in STI. In 2024, COSTECH hosted the 9th STICE event between 2nd and 4th December 2024, at the Julius Nyerere International Convention Center (JNICC) in Dar es Salaam.

The 9th STICE event brought together researchers, innovators, policymakers, and industry experts to explore the latest advancements in STI and their potential to create sustainable solutions for societal challenges. The event served as a platform for dialogue, showcasing cutting-edge innovations, and fostering collaboration across sectors. Researchers from all fields of science shared lessons, experience, and knowledge through keynote presentations, oral and poster presentations and showcased scientific and technological development to stakeholders including practitioners and policymakers.

STICE is an important platform for COSTECH not only to demonstrate its impact in fostering STI in the country but also bringing together researchers and innovators from various fields to discuss and exchange knowledge in the field. The platform also serves as a learning platform for students from primary and secondary schools which enables them to get an insight into STI and enables them to choose careers in STEM subjects.

## 1.2. Objectives

The main objective of the Science, Technology, and Innovation Conference (STICE) was to provide a platform for STI stakeholders across various sectors to engage in dialogue, share knowledge, and showcase advancements in STI for the purpose of driving sustainable socio-economic development while providing opportunity for the upcoming scientists to be aspired to pursue career in STEM.

The specific objectives of the STICE event included:

i. To provide a platform for knowledge exchange on recent advancements in science, technology, and innovation.
ii. To facilitate collaboration between researchers, academic institutions, and industries to drive practical innovation.
iii. To offer an opportunity for innovators and startups to exhibit their inventions and solutions.
iv. To enable discussions between stakeholders on challenges, opportunities, and the future landscape of STI.
v. To create a conducive environment for partnerships and networking across disciplines and sectors.

## 1.3. Scope

The 9th STICE focused on fostering collaboration and knowledge exchange in science, technology, and innovation. The conference aimed to address emerging challenges and opportunities through research and practical solutions to address climate change challenges. The conference looked at promoting economic growth and sustainability within a framework of climate change adaptation and mitigation. In addition, the role of STI in addressing consequences of climate change on agriculture, forestry, water resources, health, trade, environment, fishing, communication, energy, mining, infrastructure, defense and security sectors was articulated. Furthermore, the conference looked into how STI and Indigenous knowledge can be leveraged to address climate change challenges. In addition, the conference addressed the sustainable solutions for agriculture, food safety and security. STICE also brought together experts to discuss issues related to fostering STEM Education for resilient, competitive, and sustainable economic growth.

## 1.4. Participation

The 9th STICE event brought together a diverse group of participants, including scientists, innovators, policymakers, and industry stakeholders, to discuss and showcase research and innovation outcomes.

i. **Policy and Decision Makers:** Two (2) ministers, two (2) deputy ministers, two (2) Permanent secretaries and two (2) deputy permanent secretaries from the government of the United Republic of Tanzania and the Revolutionary Government of Zanzibar participated in the events. These leaders are:
   - Presidents' Office, Ministry of Regional Administration and Local Government: Deputy Minister, Dkt. Festo John Dugange (MP);
   - Ministry of Education, Science and Technology: Minister, Hon. Prof. Adolf Mkenda(MP) and Permanent Secretary, Prof. Carolyne Nombo Deputy, Professor Daniel Elius Mushi and Directors;
   - Ministry of Information Communication Technology: Minister, Hon. Jerry Silaa (MP) and Permanent Secretary, Mr. Gerson Msigwa;
   - Ministry of Education of the Revolutionary Government of Zanzibar: Deputy Minister, Hon. Ali Abdulgulam Hussein;
   - Parliamentary Committee for Education, Sports and Culture: Chairperson, Husna Juma Sekiboko and a Committee Member, Hon. Rose Vicent Busiga;
   - Regional Administrative Authorities: Dar es Salaam Regional Commissioner, Hon. Albert Chalamila.

ii. **Religious Leaders:** The event was graced by religious leaders representing the main denominations including CCT, TEC and BAKWATA;

iii. **Politicians:** CCM Chairman in Dar es Salaam Region, Mayor of Dar es Salaam City;

iv. **Development Partners**
   - **Embassies:** Fourteen (14) Ambassadors and Consulates of Norway, Oman, Rwanda, Indonesia, Ethiopia, Republic of Korea, Finland, Algeria, Sweden, Brazil, South Africa, Russia, Zimbabwe, Sudan and Egypt.

- **Multilateral and Bilateral Agencies:** Country director of WB, and Representatives of UNCDF, UNDP, UNESCO, UNICEF and SIDA, NORAD, WFP.

v. **Higher Learning and R&D Institutions:** In attendance there were Vice Chancellors, Rectors and Principals from HLI and R&D Institutions who are directly affiliated with COSTECH;

vi. **Regulators:** More than twenty regulatory bodies attended the event;

vii. **Private sectors:** More than ten industries attended the event;

viii. **Researchers and Innovators:** More than one thousand researchers and innovators participate in the event;

ix. **Students:** One hundred and twenty-five (125) primary and secondary students;

x. **Special Groups:** In attendance there were fifty young girls who dropped out from school due to several reasons including

xi. **Artists:** The renowned Bongo Flavor Artist Mr Peter Msechu perfomed the special COSTECH song while the Brass band led the participants to sing the National and East Africa Anthem.

## Chapter 2. Opening Ceremony

The opening ceremony for the STICE 2024 was held on the 2nd December 2024. The event was officiated by Dr. Dotto Mashaka Biteko, the Deputy Prime Minister and Minister for Energy, who represented Dr. Samia Suluhu Hassan, the President of the United Republic of Tanzania, as the Guest of Honour. Upon arrival, the Guest of Honour, led by Hon. Prof. Adolf Mkenda, the Minister for Education Science and Technology, in the accompaniment of the Director General of COSTECH Dr. Amos Nungu, the Permanent Secretary of the Ministry of Education Science and Technology Prof. Carolyne Nombo, the Deputy Permanent Secretary of the Ministry of Education Science and Technology Prof. Daniel ole Mushi, together with the Director for Science, Technology and Innovation, Prof. Stanislaus Mnyone, visited the exhibition booths to witness research outputs and innovation products and services that were showcased on the exhibition area by researchers and innovators.

**Figure 1: Guest of Honor with Prof Manji**

The Chairman of the COSTECH Board of Commission Prof. Makenya Maboko invited guests and STICE sponsors. The event was attended by reputable participants, including the Ministers, Deputy Ministers, the Dar es Salaam Regional Commissioner, Members of Parliament, COSTECH Board members, Local Politicians, Government Officials, Private

Sector representatives, Primary and Secondary school students, and Religious Leaders representing the main denominations of CCT, TEC and BAKWATA. In addition, Heads of R&Ds and HLIs, Researchers, Scientists, Innovators, Media personnel, and COSTECH staff, formed a great unit of key participants of the opening ceremony. Along with those, Ambassadors, Heads of Mission, Development Partners, Sponsors, Exhibitors, Industrial Partners as well as the general public were part and parcel of the participants during the opening ceremony.

Further to that, the Master of Ceremony, Mr. Shabani Kisu, along with the famous Bongo Flavor artist, Mr. Peter Msechu; the Brass Band Group from the Tanzania Police Force, the language interpreters, and sign language experts were present to make the event comprehensible, attractive, enjoyable and memorable.

The opening ceremony also encompassed speeches from key guests including the greetings from Hon. Albert Chalamila, the Dar es salaam Regional Commissioner; Remarks from Development Partners delivered by Ambassador Tone Tinnes of the Norwegian Embassy in Tanzania; Remarks from the World Bank delivered by Mr. Nathan Belete the WB Country Director for Tanzania, Zambia, Malawi and Zimbabwe.

Along with remarks from key guests, the event also accommodated the STI keynote presentation on the *Overview of STI Landscape in Tanzania* delivered by Dr. Amos Nungu the Director General of COSTECH.

Following the Director General's keynote presentation, Hon. Prof. Adolf Mkenda the Minister for Education Science and Technology, was present to deliver the welcoming remarks to the Guest of Honour and thereafter invited him to deliver the opening speech. The Guest of Honour's speech proceeded with the event of launching the Credit Guarantee Scheme of TZS. 2.3 billion to support commercialization of innovations, the award to Climate Change Research Grants to 19 researchers as well as the recognition of 5 research scientists whose research works have had positive and significant impact to the socio-economic development of Tanzania.


**Figure 2: Guest of Honor awarding Climate Change Researchers**

The profile of these research scientists was read by Prof. Carolyne Nombo, the Permanent Secretary of the Ministry of Education, Science and Technology.

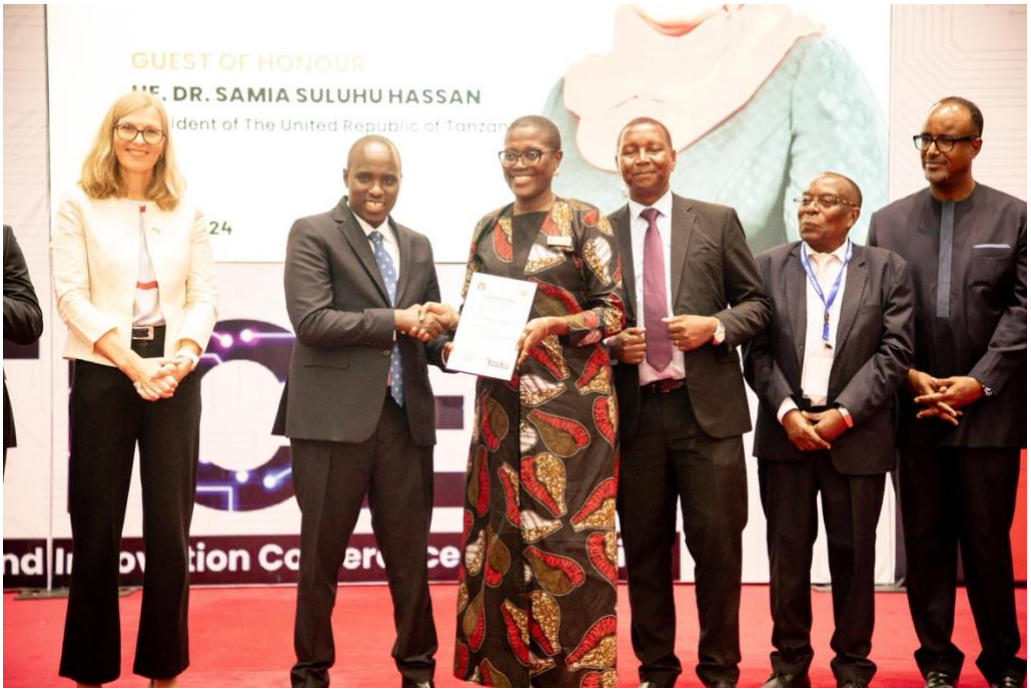



**Figure 3: Guest of Honor awarding one of the Prominent Scientist Prof. Julie Makani**

Right after the Guest of Honour launched the Credit Guarantee Scheme, awarded grants to researchers and recognized the eminent research scientists, the opening ceremony

was concluded by the group photo event where the Guest of Honour took photos with different groups of conference participants.

Below are key issues noted from the remarks, presentation and speeches delivered during the opening ceremony: -

### i. Remarks by Development Partners by Amb. Tone Tinnes

During her remarks, Ambassador Tone Tinnes had the following points to make:

a) The cooperation between Norway and Tanzania in research related projects goes back to about 50 years. One recent example is the Norwegian Programme for Capacity Development in Higher Education and Research for Development – the so-called (NORHED program). Currently, NORHED-II is providing funding for the 2021 – 2026 period and Tanzania has received a total of 18 out of 60 approved projects globally which demonstrates existing capacities at the universities.

b) Norway acknowledges the Tanzanian government effort, through the Vice President's Office in addressing climate change issues, citing the establishment of the National Carbon Monitoring Centre initiative since 2008.

c) Support to the Climate Research Grants is part of the implementation of an MoU on climate partnership between Norway and Tanzania that was signed by the Honourable Minister of State (Union and Environment), and the Norwegian Minister for Development Cooperation in September 2023.

d) The partnership between COSTECH and Norad which led to a Climate Change Research Programme whereby 19 research projects are currently being funded will strengthen the cooperation between Norwegian and Tanzanian governments in addressing climate change challenges.

e) In February 2024, Norway and Tanzania signed another MoU on food security. Norway hopes some of the research topics awarded during the opening ceremony will provide much needed knowledge on how to address climate challenges in the agriculture sector, and that research grants will inspire Tanzanian researchers to continue generating knowledge that can be a useful basis for climate policymaking.

f) Norway extends her deepest appreciation to COSTECH and the Tanzanian government for their commitment to the climate change project partnership.

COSTECH and the Tanzanian government's dedication to fostering innovation and promoting sustainable development is truly commendable and together, through collaborative research, knowledge sharing, and meaningful action, Norway and Tanzania can make a difference.

**Figure 4: Norwegian Ambassador giving her remarks**

### ii. Remarks by the World Bank Country representative Mr. Nathan Belete

During his remarks, the World Bank Country representative Mr. Nathan Belete had the following points to make:

a) The World Bank recognizes the COSTECH effort to promote STI in Tanzania and commends the initiative of establishing Credit Guarantee Scheme to empower Tanzania innovators and researchers to commercialize their innovations.
b) The World Bank plans to support innovation in vocational training colleges.
c) The World Bank will continue to support the Tanzania government initiative so as to make Tanzania a better place.

**Figure 5: World Bank Country Representative giving his remarks**

### iii. Overview of STI Landscape in Tanzania by COSTECH Director General

a) COSTECH, through this conference, has managed to fulfill the aim of the conference by bringing together key players in STI to share knowledge, expertise and experiences and chat the way forward in Harnessing STI for Climate Resilience and Competitive Economy.

b) COSTECH has managed to forge regional and international collaborations in the STI ecosystem which enabled it to receive research and innovation grants from key partners such as the World Bank, Norad, Sida, WFP, IDRC and NRF South Africa.

c) Currently, COSTECH works closely with a total of 10,000 researchers from 141 research and academic institutions conducting research as well as 15,000 innovators who are turning community challenges into solutions.

d) COSTECH has managed to strengthen the national research and innovation system whereby research conducted in R&Ds and HLIs are commercialized and disseminated to the public for use; to move close the innovation services to the public whereby through MAKISATU, more than 2,647 innovators have been

registered, 282 have been identified, 200 have been supported, and 71 innovations have been supported for commercialization in various sectors.

e) More than 10,000 youth have been trained; 60 innovation hubs have been established; more than 100 startup companies have been established and generate employment to more that 20 million youth, and contribute to the government the revenue amounting to 1 billion annually.

f) To achieve the national STI goals, there needs to be deliberate efforts to invest in both human and financial resources – inadequate financial resources constraint COSTECH from achieving its required STI goals.

**Figure 6: Director General presenting the STI Landscape**

### iv. Remarks by the Minister of Education, Science and Technology

a) The ministry continues implementing the Education Policy and Curricula that were recently reviewed for Primary and Teachers' Education whereby 39 secondary schools are offering training in the fields of vocational, engineering, sports, agriculture, livestock, etc., and that in FY 2024/25 the government plans to build 200 secondary schools that will offer vocational training courses along with other subjects.

b) The government has built 29 Vocational Colleges and continues to build 64 more. In addition, it has completed a modern Vocational College, Nala-Dodoma area, specializing in Aerospace Science and Technology, under the Dar es Salaam Institute of Technology (DIT). The government, through the HEET project, is building 15 new University Campuses in various regions of the country that will focus on skills programs. Similarly, the Government is in the process of starting the construction of four (4) Polytechnical Colleges, Mwanza, Kigoma, Mtwara and Unguja.

c) In order to strengthen the development and contribution of STU in the country based on the National Vision 2050 in line with the fact that the guarantee in these issues affects all sectors, the Minister noted that the ministry continues to take the following steps:

- It completes the process of establishing the STU Platform between the Sectoral Ministries (Inter-Ministerial STI Platform) to connect the plans and efforts of the sector.
- It completes the National Strategy to Increase the Participation and Contribution of the Diaspora in STU in the country.
- It continues with the process of establishing STU Desks in all Councils in the country, by July, 2024. The ministry wishes that it is time to start the Hon. President Award for the Leading Council in Science, Technology and Innovation.
- It has completed the evaluation of research laboratories in the country with the aim of improving ten (10) laboratories and giving them the status of National Reference Industrial Research and Innovation Laboratories (NRIRIL)
- It has started the process of preparing the National Technology Roadmap 2050 (National Technology Roadmap 2050), in line with the National STI Financing and Incentivization Strategy (National STI Financing and Incentivization Strategy).

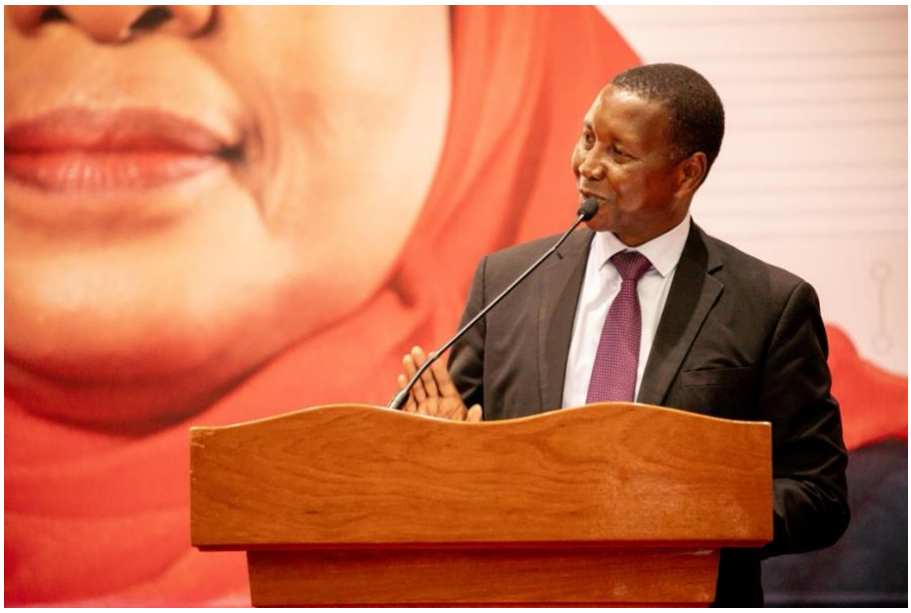


**Figure 7: Hon Prof Mkenda giving his speech**

### v. Speech by the Guest of Honour

During his inaugural speech the guest of honor:

a) Congratulated and commended the Ministry of Education Science and Technology and COSTECH for organizing the STICE and promoting STI in the country.

b) Noted the contribution of Tanzanian researchers and innovators in the socio-economic development of the country and assured them that the government acknowledges their efforts toward complementing the National Development Vision.

c) Acknowledged the contributions of development partners such as NORAD, DFID, AATF, Finland, German, UNDP, UKaid, EU, IDRC, NRF South Africa, and World Bank in supporting government initiatives towards funding STI undertaking in the country.

d) Acknowledged the contributions of local partners such as Tigo, Vodacom, CRDB Bank, and NMB for supporting government initiatives towards funding STI undertaking in the country.

e) Highlighted that the STI sector is growing at a slower pace, increasing by 5.5 percent in 2023, while its contribution to the Gross Domestic Product (GDP) is 0.7

percent. Directed the Ministry to enhance the sector to grow rapidly and hence contribute more to the country's economy.

f) Promised that the government will continue to allocate funds to research and academic institutions through COSTECH, and the relevant Ministry, to reach a target of 1% of gross national product (GDP) investment in research, as agreed in the Lagos Plan of Action of 1980 and subsequently incorporated in the Science and Technology Policy of 1985 and 1996. Called on other stakeholders to continue supporting these government efforts.

g) Directed COSTECH, through the Ministry of Education, Science and Technology to submit to him the deliberations that will be discussed and agreed in the conference, especially those that need the intervention of the Central Government.

**Figure 8: Guest of Honor giving his inaugural speech**

## Chapter 3: Plenary Sessions

During 9th STICE event five keynote papers were presented and discussed by the discussion panelists. The keynote presentations informed the audience the importance of *harnessing science, technology, and innovation to achieve climate resilience and a competitive economy*. They sparked meaningful discussions and the panel acted as catalysts for networking and collaboration among professionals from various disciplines. The following sections describe the five keynote presentations and discussions in the plenary sessions.

### 3.1. Repositioning STI to foster Industrial Linkages for Economic Transformation

The Moderator of the session, Dr Khadija Kweka, the National Coordinator Private Sector Engagement and Industrial Linkage HEET project opened the session on 3rd December 2024 by introducing the keynote presenter, Col. Joseph L. Simbakalia and discussants: Mr Sitta Ng'walida from the Tanzania Automotive Technology Centre of the Ministry of Defence and National Service, Mr Hussein Sufian from Bakhresa Group, Mr Edgar Masatu from United Nation Capital Development Fund, Mr Juma Mwampamba from the Ministry of Industry and Trade, and CPA(T) Anthony Mzee Kasore from Technology Vocational Education and Training Authority (VETA).

Col. Joseph L. Simbakalia emphasized the need for repositioning STI to foster Industrial Linkages for Economic Transformation. He stressed that advancing Science, Technology and Innovation is essential to reshape and expedite the implementation and the achievement of the United Nations Sustainable Development Goals in (i) the context, and (ii) alignment with the National Composite Tanzania Development Vision 2050 ("TDV 2050") Objectives and Strategies. He added that under the provisions of Article 8(1)(b) in conjunction with Article 9 of the Constitution of the United Republic of Tanzania, the Overall and Ultimate Objective of TDV 2050 is the welfare of the People manifest as

POVERTY ERADICATION with: Unity, Sovereignty, Peace, Harmony, Tranquility and Justice.

The panel discussed the status of STI in Tanzania and the challenges, opportunities and steps that can be taken to enhance effective collaboration among the players. They reported that the existing policies and legal frameworks are adequate for the STI to foster Industrial Linkages for Economic Transformation in the country. They identified inadequate research finances, insufficient research infrastructure and underutilization of research and innovative products by industries as one of the technology transfer constraints. They added that the lack of spin-off firms to commercialize technologies and inadequate human resources have constrained the smooth operationalization of technology transfer and acquisition policies.

The panel concluded that repositioning STI is crucial for fostering industrial linkages for Economic Transformation, and the existing legal framework defines the duties and responsibilities of COSTECH to create an environment that enhances interactions and collaborations between universities, research institutions and industries. The panel recommended that:

i. Technology Transfer is an essential ingredient in the economic transformation of Tanzania, particularly in the era of industrialization, and thus, technology transfer key players such as the government, higher learning institutions, research institutions and industries should take advantage of the existing Science and Technology (1985 and 1996) policies and legal framework (COSTECH Act, 1986) to catching-up from behind acquisition, development and transfer of technology in Tanzania.

ii. Technology Transfer requires firm arrangements in terms of agreements, registration, assessment and monitoring. Therefore, **COSTECH** should play a key role in promoting the transfer of imported technologies and those technologies developed in the country.

iii. Adequate research finances, insufficient research infrastructure and underutilization of research and innovative products by industries as technology transfer constraints. Thus, the government and other financing agencies prioritize STI programmes, projects and activities in their budget allocation.

iv. Within the context of Tanzania Development Vision 2050, the Higher Education for Economic Transformation (HEET) Project should play a meaningful role in fostering linkages between higher education institutions, research institutions and industries.

### 3.2. Leveraging STI and Indigenous or Traditional Knowledge for food Security and Nutrition

In this session held on 3rd December 2024, the moderator, Prof. Khamis Malebo, the Executive Secretary of the UNESCO National Commission invited the director general of the Tanzania Plant Health and Pesticides Authority, Prof. Joseph Ndunguru to deliver his keynote presentation. He also introduced members of the discussion panel: the director Generals of the Tanzania Agricultural Research Institute, Dr. Thomas Bwana, Tanzania Food and Nutrition Centre, Dr. Germana Henry Leyna and the Director of the Institute of Traditional Medicine, Prof. Joseph Otieno.

In his presentation, Prof. Joseph Ndunguru emphasized the need for transforming agriculture in Tanzania through Science, Technology and Innovation (STI). He explained that viral infection is the leading factor affecting the productivity of cassava in Tanzania. He further described nine (9) varieties of viruses affecting the growth and productivity of cassava in Tanzania.

The discussants underlined the use of agriculture science in climate change and resilience through the development of drought-tolerant seeds (rice, maize, cotton, figure millet) and soil conservation by integrating Indigenous knowledge. They highlighted that the Tanzania Agricultural Research Institute is mandated to conduct, regulate, promote and

coordinate all agricultural research activities conducted by public and private research institutes or organizations in Tanzania and that research on drought tolerant seeds is among their priority research area. They also informed the audience that, although cultivation of food crops is among the main occupations in Tanzania, there is inadequate knowledge and awareness of proper nutrition in the country resulting in 30% of stunted children. They emphasized the need for integration of indigenous knowledge in the scientific interventions, including research.

Members from the audience raised concern on how to maintain the quality of inorganic food knowing that organic foods are expensive for ordinary people to afford. Also, they wanted to know if genomic tools are available and accessible to enable farmers and livestock keepers to discover the disease and use appropriate pesticides and asked why traditional medicines are not prescribed in hospitals by doctors. The panel agreed that the organic food are more expensive than inorganic one, and added that there several institutions that guide and monitors food security and safety in the country, including Tanzania Food and Nutrition Authority (TFNC), Tanzania Bureau of Standards and Research Institutes such as NIMR, ITM, TARI, TALIRI and TAFIRI.

The panel concluded that Leveraging STI and traditional knowledge is essential for food Security and Nutrition. The panel added that Science, Technology and Innovation are pillars in transforming African Agriculture as they can control pests and diseases, soil fertility seed development and food fortification. They proposed use of locally produced food like senene as snacks for children. The panel recommended:

i. Food Security and Nutrition to support and conduct more research on natural food originating from Tanzania, Indigenous knowledge and plants
ii. Farmers to use of drought tolerant seed to adapt climate change
iii. Researchers, innovators and technology practitioners to come up with more solutions and technologies to adapt to climate change impacts

### 3.2. STI for Climate Change Resilient and Sustainable Bio-Economy

The session on STI for Climate Change Resilient and Sustainable Bio-Economy was held on 3rd November 2024. The moderator welcomed the keynote presenter, Prof. Pius Yanda from the Institute of Resources Assessment of the University of Dar es Salaam and the discussion panel members, including the Tanzania Fisheries Research Institute director general, Dr. Ishmael Kimirei, the representative of the Tanzania Port Authority (TPA), Dr. Makame O. Makame, the director of the Department of Marine Conservation at the Ministry of Blue Economy and Fisheries of the Revolutionary Government of Zanzibar and the State of the Fintech Policy and Regulatory (UNCDF) Environment in Tanzania.

Prof. Yanda's presentation stressed the importance of Science, Technology, and Innovation (STI) in addressing climate change and fostering a sustainable bio-economy. He highlighted that the global biotechnology market is booming, with its applications in agriculture, health, and environmental management. He also informed the audience that many countries are transitioning towards circular economies that emphasize waste reduction, resource efficiency, and material recycling. He added that Research and Development (R&D) investment in renewable energy technologies, carbon capture and storage, and sustainable land management are rising globally. Prof. Yanda mentioned funding gaps, intellectual property rights skills and policy fragmentation as global obstacles to applying STI for Climate Change Resilient and Sustainable Bio-Economy. Furthermore, he informed the audience that limited infrastructure, education and capacity building, political instability, research facilities, and poor access to technology constrain most African countries from applying STIs to address climate change challenges.

The discussants informed the audience that climate change is one of the major issues facing the fisheries sector, and thus, the Tanzania Fisheries Research institute conducts fisheries stock assessment annually for climate resilience. They also highlighted the development and execution of green port policy (2018) advocating for low carbon emission, social inclusivity and compliances. They added that the Ministry of Blue

Economy and Fisheries of the Revolutionary Government of-Revolutionary Government of Zanzibar has developed a blue economy policy with five focus areas: fisheries and aquaculture, marine governance, marine transport, oil, gas and renewable energy as a stepping stone for Climate Change Resilient and Sustainable Bio-Economy.

The audience wanted to know the need to transform agriculture in Tanzania in the face of a bioeconomy and why the country worries about carbon emissions while developed nations don't even care. They also asked how the Green Port policy contributes to economic growth in Tanzania and as per the International Maritime Organization (IMO) standard.

The panelists concluded that STI is essential for Climate Change Resilience and Sustainable Bio-Economy. They emphasized that investment in STI is critical for building a climate change-resilient and sustainable bio-economy across levels. They highlighted that, while there are challenges to overcome, the available opportunities present a path towards sustainable development and resilience in the face of climate change. Also, they emphasized that international cooperation, capacity building, and innovative technologies are the key facilitators in this transformative journey. The panel recommended:

i. COSTECH looks at the possibility of acquiring sophisticated shared research facilities and equipment for Climate Change Resilient and Sustainable Bio-Economy research.
ii. Investors use appropriate technologies that reduce carbon emissions.
iii. Port authority expands its focus areas to include the reduction of sedimentation around the port derived from human activities.
iv. Government and other key players to build the capacity of researchers to be able to undertake research to address climate change and bio-economy challenges and problems.

### 3.4. Advancing Open Science for knowledge-Driven Society and Sustainable STI Resource Governance in Tanzania

This session on Advancing Open Science for knowledge-driven Society and Sustainable STI Resource Governance in Tanzania was held on 4th December 2024. The moderator welcomed keynote presenter, Prof. Joel S. Mtebe and discussants: Prof. Peter Msoffe, the Director of Higher Learning at the Ministry of Education Science and Technology, Prof. Edda T. Lwoga, Rector of the College of Business Education, Dr. Julius Keyyu, Director of Research at the Tanzania Wildlife Research Institute and Dr. Abdulrahim Ali, the acting Head at the Centre for Digital Learning and Lecturer in the School of Computing, Communication, and Media Studies at the State University of Zanzibar.

Prof. Joel S. Mtebe informed the audience that Open Science refers to the movement that aims to make scientific research, data, and dissemination accessible to all levels of society, including professionals, academics, and the general public to promote transparency, collaboration, and inclusivity. He revealed, open-access publishing, open data sharing, open research methods, collaborative research, open-source software, and open educational resources as key principles of Open Science. These principles aim to democratize knowledge, promote interdisciplinary collaboration, and foster scientific rigor.

He mentioned that UNESCO recommendations on Open Science, adopted in 2021, is a key international policy that sets out guidelines for countries to promote openness, inclusivity, and collaboration in science. He further mentioned arXiv, BioRxiv, Zenodo, Figshare and Preprints as global open science platforms. Prof. Mtebe said that open science practices are gradually gaining ground in Africa as many African countries have started developing Open Science policies. For instance, Ethiopia introduced a National Open Access Policy in 2019, mandating open access for publicly funded research outputs. He added that South Africa has drafted an Open Science Policy requiring open access to publicly funded research and FAIR principles. He highlighted that in 2022, the African

Open Science Platform (AOSP) launched a framework to promote Open Science across the continent.

Prof. Mtebe informed that there are 17 institutional repositories in Tanzania registered and offering open access to various academic outputs, for example, the repositories at the University of Dar es Salaam, Sokoine University of Agriculture, and Mzumbe University. Also, COSTECH established and coordinates a national b iodiversity open data platform known as Tanzania Biodiversity Information Facility (TanBIF), which has 1.9M records of animals, plants and microorganisms from research. He highlighted inadequate infrastructure, funding, human resource constraints and policy and Institutional Barriers that hinder the application of open science.

The panel concluded that the future of open science is bright; and it is anticipated to:

i. Increase its adoption to $6.78 billion in 2026 from $3.5 billion in 2017;
ii. New technologies and tools, including the use of artificial intelligence and machine learning, are expected to play an increasingly important role in Open Science research;
iii. Increase collaboration and partnerships between institutions, researchers, and other stakeholders.

The panel recommended:

i. Stakeholders to implement and adhere to the existing Policy and Legal Frameworks: Leverage the national framework for data sharing, which has been developed by COSTECH in collaboration with STI stakeholders, to ensure effective operationalization and compliance.
ii. Foster Collaboration and Engagement Among Open Science Stakeholders: Promote and support partnerships between research institutions, higher learning institutions, and industries to strengthen open science initiatives and facilitate knowledge exchange.

### 3.5. Advancing STEM Education for Competitive Future Generation

This session was held on 4th December 2024, started by the introduction of the keynote presenter (Prof. Najat K. Mohammed - DG TAEC) by the moderator (Prof. Simon Msanjila – UDOM). The moderator was then introduced discussants: Prof. Nuhu Hatib, the Executive Chairman of Africa Academy of Science Arusha, Prof. Sylvester E. Rugeihyamu, the Head of the department of Mathematics of the University of Dar es Salaam (UDSM) and Ms. Asya Issa from the Ministry of Education of the Revolution Government of Zanzibar and Representative – Tanzania Institute of Education (TIE).

The presentation by Prof. Najat K. Mohammed highlighted the pivotal role of STEM (Science, Technology, Engineering, and Mathematics) education in driving sustainable development and fostering innovation. It emphasized that STEM education is a catalyst for inclusive economic growth and competitiveness, especially in the era of the Fourth Industrial Revolution (4IR). She mentioned that globally, countries with strong STEM capacities, such as the United States and South Korea, demonstrate higher economic productivity and technological advancement.

Prof. Najat said that in Tanzania, STEM education is recognized in policy documents and integrated into primary and secondary school curricula. However, the number of students pursuing STEM subjects decreases at higher education levels. She mentioned that key challenges in advancing STEM Education for the competitive future generation include gender disparities, with women underrepresented in STEM-related careers, resource constraints, and inadequate teacher training. She highlighted that in Tanzania, women constitute only 33.6% of higher education students and 15.07% of engineers. She further mentioned that the female-to-male ratio is 1 to 5. She added that from 2018 to 2023, only 35% of all graduate students were female. Her presentation highlighted several opportunities, such as the growing demand for STEM professionals, digital transformation, and potential industry partnerships. She called for curriculum reforms, infrastructure development, and enhanced teacher training to advance STEM education. Also, she added that policy updates are recommended to encourage industry-academia

collaboration, along with strategies to mobilize funding from the government, private sector, and NGOs.

The audience wanted to know if the universities teach technology and if yes, why are they not seen in industries? Also, they doubted universities and Research and Development as their applications are not seen in the industries. In her response, the presenter informed the audience that universities teach technology but there are problems with assessing the students. She informed further that changing the assessment model or system, for example, the introduction to virtual reality laboratories and practical-based teaching will make students more competent. She also added that most of the research is for academic purposes and is not meant to address industrial challenges and problems.

The penal concluded that advancing STEM Education is critical for Competitive Future Generation. They also emphasized that a collective effort involving government, private sector, and civil society is needed for building a future-ready Tanzania through STEM education. It was recommended:

i. Policy and Legal Framework
    - Update Policies: Revise national policies to provide stronger incentives for the implementation and growth of STEM programs;
    - Strengthen Industry-Academia Collaboration: Establish regulations that facilitate partnerships between academia and industry, promoting knowledge exchange, innovation, and technological development.

ii. Infrastructure and Facilities Capacity
    - Develop STEM Labs and Technology Centers: Build and equip STEM laboratories and technology hubs in schools to support hands-on learning and practical skills development.
    - Establish Regional STEM Hubs: Create regional centers of excellence to serve as focal points for STEM education, research, and innovation.

iii. Human Resources Capacity

- Train and Retain STEM Educators: Invest in capacity-building initiatives to train, recruit, and retain qualified STEM educators at all educational levels.
- Enhance Mentorship and Professional Development: Provide mentorship programs and continuous professional development opportunities to strengthen educators' skills and improve STEM learning outcomes.

iv. Financing Strategy

- Diversify Funding Sources: Mobilize funding from diverse sources, including government, private sector, and non-governmental organizations (NGOs), to ensure sustainable financial support for STEM initiatives.
- Incentivize STEM Investments: Introduce targeted incentives to encourage investments in STEM-related infrastructure, training, and research initiatives.

v. Broader Vision for STEM Education

- Investing in STEM education is not merely about preparing youth for future careers — it is about empowering them to shape the future.
- STEM graduates should serve as architects of technological breakthroughs, pioneers of sustainable solutions, and drivers of economic growth for national development.

## Chapter 4. Technical sessions

### 4.1. Climate Vulnerability Across Diverse Sectors

The session on climate vulnerability across various sectors aimed to analyze the diverse impacts of climate change. In agriculture, for instance, shifting weather patterns, droughts, floods, and rising temperatures pose threats to crops, livestock, and food security, leading to economic losses. Infrastructure sectors, including transportation, energy, and urban development, are vulnerable to extreme weather events such as storms, floods, and rising sea levels, which can damage buildings, roads, and power grids, causing service disruptions and high repair costs. During the session the following papers were presented as described below;

#### 4.1.1 Human activities and their impact on health condition of Lukosi River catchment using selected physio-chemical parameters as indicators of water quality

**Presenter:** Ahmad Nyagongo

The paper aimed at providing critical insights into the effects of human activities on the ecological health and functional integrity of the Lukosi River Catchment (LRC). It reported utilization of a multidisciplinary approach to evaluate the interactions between human activities and the ecological health of the catchment. The study assessed the impacts of agriculture, urbanization, and industrial activities on water quality, biodiversity, and hydrological processes. By integrating scientific data, case studies, and ecological assessments, the paper offered a comprehensive foundation for sustainable catchment management and informed policies that balance development with environmental conservation, contributing to global freshwater ecosystem sustainability. It further recommended enhancing public awareness and strengthening riparian vegetation, emphasizing their roles in stabilizing soil, reducing erosion, filtering pollutants, providing habitats, and regulating water temperature through shading—critical for maintaining aquatic ecosystem health.

### 4.1.2 The Impacts of Anthropogenic Activities on the Physicochemical Water Quality of Pinyinyi River, Arusha-Tanzania

**Presenter:** Rajab Omary

The study investigated the impact of human activities on the Pinyinyi River within the Lake Natron Ramsar Site by analyzing physicochemical parameters such as temperature, pH, dissolved oxygen, turbidity, and pollutants. Results showed significant human-induced changes in water quality, disrupting ecological balance and threatening biodiversity. Recommendations included establishing water quality monitoring programs to track stressors, promoting sustainable land use practices, and strengthening collaboration among communities, authorities, and conservation organizations. The study also emphasized stricter enforcement of pollution controls to minimize harmful discharges and ensure the river's long-term health, highlighting the importance of addressing environmental challenges for sustainable management of this vital aquatic resource.

### 4.1.3 Assessment of Water Quality and Community Perception on Cave Water At Shehia of Mangapwani In Unguja Zanzibar: The Case of Mangapwani Historical Cave

**Presenter:** Sara Sallanya

The paper emphasized the importance of assessing cave water quality in Mangapwani by analyzing parameters like pH, turbidity, dissolved oxygen, and contaminants to evaluate health risks. It highlighted the value of integrating scientific data with community insights gathered through surveys or interviews to understand concerns, usage patterns, and awareness. This combined approach provides a holistic perspective, aligning environmental protection with community well-being. Recommendations stressed involving the local community in water quality assessments to incorporate their concerns and practices, ensuring effective and sustainable water management strategies. This integration of local knowledge and scientific analysis was deemed essential for safeguarding both public health and the environment.

### 4.1.4 Interrelationship of Factors Affecting the Functional Response of Telenomus remus Against Spodoptera frugiperda

**Presenter:** Ms. Elizabeth Olambo

The paper examines factors influencing the parasitism efficiency of Telenomus remus, a parasitoid wasp targeting Spodoptera frugiperda eggs. Key variables like egg density, temperature, and parasitoid age were analyzed to understand their impact on the wasp's functional response. Findings highlight the complexities of parasitoid-host interactions, offering insights into optimizing biological control strategies. The study underscores the need for tailored approaches that consider environmental conditions to enhance pest management while maintaining ecological balance. Recommendations include further research on parasitoid-host dynamics and adapting strategies to specific contexts for sustainable control of S. frugiperda populations, ensuring more effective and adaptable biological pest management.

### 4.1.5 Pathogenicity of Sisal Brown Leaf Spot and Associated Fungal Species in Tanzania: A Multi-Site Investigation

**Presenter:** Dr. Nuria Majaliwa/Hellen Kanyaga

The paper explores fungal pathogens and a virus, focusing on identifying species causing diseases and understanding their pathogenic mechanisms. It emphasizes the need for multi-site studies to assess pathogen prevalence and pathogenicity, particularly for Bacterial Leaf Spot (BLS) disease. Pathogenicity testing is highlighted as essential for identifying specific pathogens, guiding targeted interventions such as selecting resistant crops, timely treatments, and improved monitoring. These strategies aim to enhance disease control, reduce pesticide reliance, and promote sustainable agriculture. Recommendations include regular pathogenicity testing, multi-site investigations, and developing management strategies to effectively control pathogens while fostering ecological balance and sustainable agricultural practices.

### 4.1.6 Postharvest Quality Loss Causing Microorganisms of Tomato Fruits at Selected Market Segments in Dar es Salaam and Morogoro

**Presenter:** Novatus Marki

The paper investigates postharvest quality loss of tomatoes in Dar es Salaam and Morogoro, focusing on microorganisms responsible for spoilage. It identifies microbial pathogens affecting appearance, texture, and shelf life and examines their variation across market segments. Factors like poor handling, inadequate storage, and environmental conditions exacerbate spoilage. The findings emphasize the need for

targeted interventions, including better sanitation, optimized storage, and farmer and vendor training on hygiene. Recommendations highlight reducing microbial contamination and adopting integrated strategies to improve postharvest practices, extend freshness, and minimize spoilage. This approach aims to preserve tomato quality and enhance handling and storage in the regions.

### 4.1.7 Reasoning From the Heights of the Giants "Refining Newton's – Einstein's Gravity"

**Presenter:** Dr. Peter Nyagawa

The project developed simplified expressions for gravity applicable to both physical and subatomic scales, refining Newton's gravitational constant (G) for various contexts. It explores how gravity operates at macroscopic and microscopic levels, proposing distinct gravitational constants tailored to each realm. The study introduces a cosmic mass constant unique to each universe, addressing variations in gravitational behavior across systems. This unified framework reconciles differences between large-scale and subatomic interactions, providing deeper insights into gravitational forces. By enhancing the understanding of gravity's complexities and offering a precise mathematical approach, the work advances the study of gravitational effects across diverse scales, from everyday objects to subatomic particles.

## 4.2 Harnessing Technological and scientific innovation for Competitive and inclusive economic growth

The session on the first day (2nd December 2024) of the 9th STICE event focused on leveraging technology and research to drive competitive and inclusive economic growth. It emphasized the role of innovation in enhancing productivity, creating new markets, and improving global competitiveness, while highlighting the importance of inclusive strategies for equitable growth and sustainable development. The following papers were presented during the session, as detailed below;

### 4.2.1 Mathematical Formulation for a Stockpile Combustion in Analyzing Temperature, Carbon dioxide Emission and Depletion of Oxygen Gas

**Presenter:** Dr. Anord Mwapinga

The paper developed mathematical models to study stockpile combustion, focusing on temperature changes, $CO_2$ emissions, and oxygen depletion. These models enhance understanding of combustion processes, predict risks, improve safety, and manage emissions effectively. Simulating these factors provides insights into the complex interactions during combustion, aiding in better predictions and risk management. The study emphasized the importance of such models in improving safety and minimizing environmental impacts. It also highlighted the need for environmental conservation and sustainable practices, recommending continuous awareness campaigns to educate communities about preserving natural resources and ecosystems. Engaging and informed communities are crucial for protecting the environment for future generations.

### 4.2.2 Smokeless (Automated) Incinerator for Sanitary Pad Disposal

**Presenter:** Augustino Njowoka

The paper highlighted the environmental and health challenges of disposing of used sanitary pads, introducing a smokeless incineration system for safe and efficient management. It was observed that drying pads before incineration reduces liquid content, a process completed inside the incinerator. The project contributes to a cleaner environment, lowers disease risks, and supports sustainable development. It is recommended to secure additional funding to produce and distribute more incinerators to hospitals and schools, enhancing waste management and public health outcomes.

### 4.2.3 Unlocking the potential value of Intellectual Property Rights among Engineering students at the University of Dar es Salaam, Tanzania

**Presenter:** Dr. Juliana Machuve

The project assessed engineering students' awareness, knowledge, attitudes, and practices regarding Intellectual Property Rights (IPR). It aimed to identify gaps and challenges students face with IPR and explore factors hindering effective utilization. The study found that most students have a basic understanding of Intellectual Property (IP), but many lack knowledge about filing for IP or where to seek advice. Recommendations include improving IPR literacy, building capacity for both students and staff, strengthening IP offices, and enhancing access to IP databases. These steps aim to foster

respect for intellectual property, encourage better utilization for innovation, and support academic advancement.

### 4.2.4 Making sense of 'late hatching and unhatched eggs' in university business incubators

**Presenter:** Hassan Ali

The paper identifies the causes of delays and failures in startups within University Business Incubators and proposes strategies for improvement. It suggests that incubators should operate independently with dedicated management teams, rather than being part of the university administration. This independence would enhance flexibility, focus, and responsiveness to startup needs, improving performance and success. The paper emphasizes the importance of awareness among incubator management, policymakers, startups, and stakeholders about their roles in addressing delays and failures. It advocates for better management practices, optimal resource allocation, and collaboration between the government and private sectors. Further research on incubation mechanisms, especially in developing countries like Tanzania, is also recommended.

### 4.2.5 Establishing the maturity level of Predictive maintenance 4.0 adoption for selected Tanzania manufacturing industries

**Presenter:** Fred Peter

The paper on Industry 4.0 predictive maintenance (PdM4.0) explores an advanced approach to managing operations and maintenance in manufacturing industries. Using cutting-edge technologies and data analytics, PdM4.0 predicts equipment failures, enabling optimized maintenance schedules and supporting sustainable production systems. Unlike traditional time-based maintenance, which can lead to unnecessary work or unexpected breakdowns, PdM4.0 helps forecast potential faults, reducing downtime and improving efficiency. The study assessed the maturity of PdM4.0 adoption in Tanzanian Manufacturing Industries (TMIs) and found that few have reached level 4, with none at level 5. This highlights the need for TMIs to embrace technological advancements for sustainable, competitive manufacturing and economic growth.

## 4.3 Leveraging STI and indigenous knowledge to Address Climate Change Challenges

During the 9th STICE event, the session of leveraging STI and indigenous knowledge to address climate change challenges was among the topics discussed. This section investigated the forward-thinking solutions, early warning systems, cutting-edge technologies and local or traditional knowledge aimed at alleviating and adapting to the impacts of climate change in Tanzania. Presentations and in-depth discussions highlighted the essential role of scientific research, technological advancements, and innovation in strengthening climate resilience. Additionally, the use of space science and satellite technologies for monitoring and predicting climate changes, as well as Tanzania's readiness to address these challenges as a nation, where discussed. During this session, 10 scientific papers were presented as summarized below.

### 4.3.1 Assessment of baseline physicochemical qualities of synthesized bioplastics from Kappaphycus alvarezii seaweed for their packaging applications

**Presenter:** Mr. Mohammed Amran

This study explored bioplastics synthesized from Kappaphycus alvarezii seaweed as a sustainable alternative to synthetic plastics. Seaweed-based bioplastics demonstrated promising mechanical and thermal properties for packaging applications, with additives significantly enhancing their performance for specific uses. The bioplastics are biodegradable, addressing the environmental issues caused by non-biodegradable petroleum-based plastics. The research emphasizes the need for further studies on cost-effective production methods and raw materials to promote sustainable bioplastic development. Seaweed-based bioplastics offer an environmentally friendly solution, with the potential to reduce land degradation and pollution while supporting sustainable packaging innovations.

### 4.3.2 Omega-3 and Omega-6 Fatty Acid content of selected fish, seeds and nuts consumed by pregnant and breastfeeding women in Morogoro Municipality, Tanzania

**Presenter:** Dr. Anna Tesha

This study analyzed 29 food samples, including fish (tuna, red mullet, East African sardines) and nuts (walnuts), to assess their Omega-3 and Omega-6 fatty acid content. Tuna, red mullet, and sardines were identified as excellent Omega-3 sources, while walnuts were rich in Omega-6. Foods were selected based on their consumption by pregnant and breastfeeding women to address nutritional deficiencies and promote maternal and child health. Recommendations include prioritizing these foods in diets, incorporating findings into nutrition guidelines, and developing value-added products from fish, seeds, and nuts. This research aims to improve community health through enhanced omega fatty acid intake.

### 4.3.3 Exploring the opportunities, challenges and the way forward for biomass briquettes in Tanzania

**Presenter:** Dr. Jerome Gadi Kimaro

This study explored biomass briquettes as a sustainable energy alternative in Tanzania to reduce reliance on charcoal and firewood, which drive deforestation and pollution. Briquettes offer environmental, social, and economic benefits, including job creation for youth and women and forest conservation. However, challenges such as high material costs, market limitations, misconceptions, and lack of policy support hinder adoption. Recommendations include community education, capacity building through training programs, advocating for supportive policies, and targeting large consumers like schools and prisons. The study emphasizes involving women in production and creating a supportive ecosystem to expand the briquette sector.

### 4.3.4 Unlocking National Competitiveness through Knowledge Management: A systematic review

**Presenter:** Ms. Jackline M. Martine

This study systematically reviewed 54 studies (2006–2023) to examine the role of knowledge management (KM) in fostering innovation and enhancing national competitiveness. Effective KM—managing tacit and explicit knowledge—was shown to drive organizational innovation, creating economic growth and boosting global competitiveness. The presenter emphasized the need for investment in KM infrastructure, such as digital tools and research institutions, and highlighted the importance of education and technology to support KM practices. Recommendations included promoting

collaboration, fostering idea-sharing, and creating policies that enable organizations to leverage KM for innovation and economic advancement, ensuring sustainable contributions to national competitiveness.

### 4.3.5 Assessing Farmer's Perception of Conservation Status of Agrobiodiversity in Selected Agroecological Zones of Tanzania

**Presenter:** Michael B. Kazyoba

This study assessed farmers' perceptions of agrobiodiversity conservation across Tanzania's agroecological zones, highlighting its role in sustainable food production and ecological resilience. Results showed the highest species abundance in the coastal zone and lowest in the semi-arid zone, with farmers perceiving agrobiodiversity as moderately secure. The research emphasized the importance of rural communities as custodians of agrobiodiversity and their role in conservation. Recommendations included using farmer insights to monitor biodiversity trends, address drivers of biodiversity loss, and develop targeted interventions to protect threatened species. Supporting rural livelihoods through sustainable conservation practices is vital for balancing biodiversity and agricultural needs.

### 4.3.6 Factors Driving Participation in the Rice Export Markets by Rice Traders from Selected Regions in Tanzania

**Presenter:** Ms. Win Luhwago

This study examined socio-economic and institutional factors affecting rice traders' participation in Tanzania's export markets, using survey data from 150 traders across eight trading zones. Key drivers included gender, trade experience, financial capital, and access to market information, with limited information and resources posing significant barriers. Recommendations emphasized specificity in government actions, enhancing access to export prices, procedures, and logistics, and providing financial support to traders. Establishing a multi-stakeholder innovation platform was proposed to foster collaboration among public and private actors. These measures aim to overcome challenges, increase rice exports, and strengthen Tanzania's economic growth through inclusive trade strategies.

### 4.3.7 Assessing the role of Nature-based solution for Improving Agricultural Production and Biodiversity Conservation

**Presenter:** Dr. Never Zekeya

This study evaluated natural pest control methods in cotton fields in Meatu, Simiyu, comparing untreated fields, fields treated with Vuruga Biocide, and fields treated with chemical pesticides. Over eight weeks, Vuruga Biocide-treated fields had the highest number of beneficial insects like bees and spiders, while chemical pesticide-treated fields had the fewest. Recommendations included promoting natural pest control methods to enhance biodiversity, sustain pollinators, and improve agricultural productivity. Discussions highlighted the need for a mobile app to guide farmers in pest identification and treatment selection. Supporting farmers with tools and resources will foster sustainable farming and mitigate challenges from synthetic pesticides and climate change.

### 4.3.8 The Use of Comfrey (Symphytum spp) as Soil Amendment to Improve Growth of Maize and Amaranth Vegetables

**Presenter:** Dr. Hilda G. Sanga

This study examined the use of comfrey as a natural fertilizer to enhance soil quality and boost the growth of maize and amaranth. Soil enriched with comfrey leaf and root powders resulted in taller maize with more leaves and healthier amaranth with stronger shoots. Comfrey proved effective in adding nutrients, particularly potassium, which supports plant growth. Concerns about comfrey's health risks as traditional medicine were addressed, focusing on its soil benefits. Recommendations include applying comfrey in appropriate amounts for each crop and further research on its long-term soil benefits and application with other crops to promote sustainable agricultural productivity.

### 4.3.9 Antifungal potential of comfrey leaf powder and liquid extract against Ffusarium verticillioides and Aspergillus flavus phytopathogens

**Presenter:** Dr. Richard R. Madege

This study investigated comfrey's antifungal properties against Fusarium verticillioides and Aspergillus flavus, harmful fungi that reduce crop yields and contaminate food with toxins. Comfrey leaf powder significantly inhibited fungal growth, outperforming liquid extracts. The powdered form showed higher antifungal activity and versatility for agricultural applications. The research underscores comfrey's potential as a natural alternative to synthetic chemicals, promoting sustainable agricultural practices.

Recommendations include further studies to identify the active compounds in comfrey and optimize its antifungal effectiveness. These findings pave the way for developing a comfrey-based biofungicide to mitigate agricultural challenges while protecting human and animal health.

### 4.3.10 Solid Phase Extraction and Ultrasonic Assisted Extraction methods for determination of non-opioid analgesics in adulterated Herbal Medicines: A comparative LC-MS/MS study

**Presenter:** Dr. Anna L. Mpanyakavili

This study evaluated the detection of non-opioid painkillers (e.g., acetaminophen, aspirin, ibuprofen) adulterating herbal products, comparing ultrasonic-assisted extraction (UAE) and solid-phase extraction (SPE) methods. UAE proved more effective, economical, and user-friendly, delivering clearer and more consistent results than the complex and costly SPE. The research highlighted UAE's potential to complement existing regulatory methods for monitoring herbal medicine quality. Recommendations included refining extraction techniques and strengthening regulatory capacities to ensure product safety. By advancing reliable detection methods, the study aligns with sustainable development goals, promoting safer, high-quality herbal products for consumers while supporting regulatory authorities' efforts.

### 4.3.11 LC-MS/MS detected lower Values of Dexamethasone and Prednisolone in Powdered Herbal Medicines Sold in Tanzania

**Presenter:** Ms. Anna Kibiki

This study investigated the adulteration of herbal medicines in Tanzania with synthetic corticosteroids dexamethasone and prednisolone. Using LC-MS/MS analysis, 14 herbal samples were tested, confirming the presence of these undeclared substances, though at low levels. Despite small amounts, their inclusion raised safety and transparency concerns. The research highlighted LC-MS/MS as a reliable tool for detecting such adulterants. Recommendations included strengthening regulations, educating herbal practitioners on the risks of adulteration, and developing robust screening protocols to ensure consumer safety. These efforts aim to maintain the integrity of herbal products and protect the public while supporting the growth of the herbal medicine market.

### 4.3.12 Enzyme activities and wheat growth response in soils amended with coal ash from the UK and Tanzania

**Presenter:** Dr. Hilda G. Sanga

This study evaluated the potential of coal ash as a soil amendment for improving wheat growth. UK coal ash, with a high pH (12), increased soil pH and enhanced wheat growth at low concentrations (0-4%), while Tanzanian ash (pH 5.8) showed limited benefits. The research emphasized that the pH and composition of coal ash significantly influence its effectiveness as a soil amendment. Recommendations include strategic use of coal ash at low concentrations to avoid negative effects on soil enzymes and plant growth. Understanding ash properties and soil characteristics is critical for sustainably utilizing coal ash to boost agricultural productivity.

### 4.3.13 Enhancing Gold Exploration in Tanzania through Remote Sensing Techniques Utilizing Google Earth Engine

**Presenter:** Engelbert Wangabo

This study explored the use of remote sensing techniques on the Google Earth Engine (GEE) platform for efficient gold exploration in Tanzania. By analyzing Sentinel-2A satellite imagery with Selective Principal Component Analysis and Crosta Color Composite methods, and integrating Shuttle Radar Topography Mission (SRTM) data, the research identified hydrothermal gold deposits and geological lineaments associated with gold mineralization. Remote sensing proved to be an efficient, cost-effective, and sustainable alternative to traditional exploration methods. Recommendations included expanding research to other regions, testing additional remote sensing techniques, and validating results through field investigations to enhance Tanzania's mineral exploration efforts sustainably.

### 4.3.14 A Systematic review of Indigenous Climate Knowledge in East Africa

**Presenter:** Mr. Martinus E. Sospeter

This study examined the use of indigenous knowledge systems in East Africa for predicting weather patterns and adapting to climate challenges. Analyzing 43 studies (2009–2023) focused on Tanzania, Kenya, and Uganda, it highlighted gaps in research on countries like Rwanda, Burundi, South Sudan, and the DRC. Indigenous knowledge, rooted in cultural traditions and passed orally, often uses observations of animals, plants,

and celestial movements. The study emphasized the need to preserve and document this qualitative knowledge for sustainable climate adaptation. Recommendations included expanding research to underrepresented nations and integrating diverse indigenous perspectives into regional climate resilience strategies.

### 4.3.15 Enhancing effective faecal sludge management in urban settings: Stakeholder engagement and network mapping in Arusha city, Tanzania

**Presenter:** Mr. Petro Mwamlima

This study investigated faecal sludge management (FSM) in Arusha, where over 70% of the population relies on onsite sanitation systems, posing public health and environmental risks. Using a Power vs. Interest matrix and social network mapping, the research identified key stakeholders, including the Ministries of Water, Health, and Education, AUWSA, and ACC, as central to FSM planning. Findings emphasized the need for collaboration among stakeholders to enhance FSM services. Recommendations included integrating FSM into urban development plans, promoting user-friendly containment systems, improving sludge handling technologies, and establishing sustainable treatment systems to ensure better public health and environmental protection.

## 4.4 Resilient system for food safety and security (Productive sectors)

The 9th STICE event emphasized innovative approaches to achieving resilient systems for food safety and security in Tanzania. Research presented highlighted sustainable agricultural practices, advanced technologies, and economic solutions to address challenges in food production and environmental sustainability. The event underscored the need for multi-sectoral collaboration, policy support, and community education to enhance productivity, ensure food safety, and strengthen resilience. These efforts align with sustainable development goals and aim to build a secure and prosperous future for Tanzania's agricultural sector. Highlighted scientific contributions included:

### 4.4.1 Potential of Host resistance and Anaerobic Soil disinfestation as sustainable strategies for managing bacterial wilt in Tanzania

**Presenter:** Dr. Hellen E. Kanyagha

The study highlights host resistance and Anaerobic Soil Disinfestation (ASD) as sustainable strategies for managing bacterial wilt in tomatoes caused by Ralstonia

solanacearum. Pre-screening identified resistant lines EG190 (eggplant) and MT56 (tomato), which were successfully grafted with the susceptible variety Moneymaker, significantly reducing disease incidence. ASD treatment with carbon sources also proved effective in minimizing bacterial wilt in greenhouse and field trials. EG190 emerged as the most resistant rootstock, with MT56 and WG120 moderately resistant. The study recommends further integration of resistant rootstocks and ASD in tomato cultivation to enhance productivity and environmental sustainability in Tanzania.

### 4.4.2 Pepper (Piper nigrum L.) Harvest and post-harvest handling used by smallholder farmers in Morogoro district, Tanzania

**Presenter:** Christian Anitha Katushabe

This study examined harvest and postharvest handling practices of smallholder pepper farmers in Morogoro district, Tanzania. Farmers primarily harvest pepper when one berry on the spike turns red and rely on sun-drying (86.2%) and polypropylene bags (98.6%) for storage. However, 95.75% reported postharvest losses due to mould growth. Discussions highlighted the need for universities to enhance technology transfer to farmers and commercialize research findings. Recommendations included optimizing drying and storage techniques, breeding disease-resistant varieties, and leveraging COSTECH's technology database for commercialization. Improved postharvest management can reduce losses, enhance crop quality, and support farmers' livelihoods amid growing climate challenges.

### 4.4.3 Characterization of phenotypic traits associated with anthracnose resistance in selected common bean (Phaseolus vulgaris L.) breeding material

**Presenter:** Ms. Edith Kadege

This study identified phenotypic traits associated with anthracnose resistance in 22 common bean varieties to support breeding programs. Traits such as plant vigor, days to maturity, plant stands at harvest, and grain yield were strongly correlated with resistance. Varieties NUA 48, NUA 64, and RWR 2154 were highly resistant and high-yielding, while Sweet Violet and VTT 923-23-10 were stable across environments. Environmental factors significantly influenced resistance and yield. Recommendations include integrating phenotypic and genotypic screening, conducting multi-location trials, adopting marker-

assisted selection (MAS), and enhancing seed systems for resistant varieties to improve disease tolerance and productivity for smallholder farmers.

### 4.4.4 Predicting the current and future suitability and expansion of cassava brown streak disease in cassava plantations in Africa

**Presenter:** Dr. Geofrey Sikazwe

This study predicts the current and future suitability of cassava and the spread of Cassava Brown Streak Disease (CBSD) across Africa under climate change scenarios. Using species distribution models and climate projections (2041–2080), it highlights that 54.6% of Africa is suitable for cassava production, while 33.7% is at risk of CBSD spread. Key factors driving disease expansion include rising temperatures and changing rainfall patterns. Recommendations include developing disease-resistant cassava varieties, establishing early warning systems, training farmers, and incorporating non-climatic factors like soil health into future models. Regional collaboration is crucial for mitigating CBSD's impact on food security and livelihoods.

### 4.4.5 Comparative of storage conditions on the post-harvest losses and quality of Tomato (Lycopersicon esculentum L.) fruits

**Presenter:** Mr. Elias W. Sawe

This study assessed the impact of storage conditions on post-harvest losses and quality of tomatoes. Cold storage at 16±1°C significantly reduced weight loss (3.01%), extended shelf life, and preserved marketability (98.9%) compared to ambient storage at 26±1°C. Key findings showed that cold storage maintained physiochemical quality, such as color and firmness, but had no effect on titratable acidity or TSS/TA ratio. Recommendations include adopting low-cost cold storage solutions and scaling up community-based cold storage facilities to reduce post-harvest losses for smallholder farmers. Capacity-building initiatives for farmers and traders on best practices can improve tomato preservation and market returns.

### 4.4.6 Impacts of Gibberellic acid (GA3) on growth and yield of green beans (Phaseolus vulgaris l.) in Northern Tanzania

**Presenter:** Mr. Joseph A. Leonard

This study evaluated the impact of Gibberellic acid (GA3) on green bean growth and yield in Northern Tanzania. Conducted at TARI-Tengeru, it showed that GA3 significantly

increased leaf area, plant height, and yield. The optimal application rate, 12.5 g/ha, resulted in an 11.86% yield increase compared to the control. GA3 at 18.75 g/ha also improved yields but was less efficient. GA3 can complement existing fertilizers, enhancing productivity and addressing soil fertility challenges. Recommendations include applying GA3 during vegetative and flowering stages and conducting further economic studies before upscaling its use as a cost-effective alternative in horticultural production.

### 4.4.7 Insight into the Phylogeny and Binding Ability of WRKY Transcription Factor

**Presenter:** Kuan-Ting Hsin

The study investigated the phylogeny and functional characteristics of WRKY transcription factors (TFs), focusing on Arabidopsis thaliana WRKY54. WRKY TFs regulate critical plant processes like embryogenesis, senescence, and stress responses. Phylogenetic analysis classified WRKY TFs into five clades, tracing the evolution of the zinc-finger motif. Using fluorescence-based electrophoretic mobility shift assay and quartz crystal microbalance analysis, the study revealed how flanking regions of W-box sequences affect WRKY54 DNA-binding ability. These findings provide insights into molecular recognition mechanisms, aiding research in plant molecular biology. Recommendations include assigning expert presenters and advancing research on WRKY TFs across plant species.

### 4.4.8 Enhancing Cassava Disease Detection Using CNN Models Trained from Scratch: A Comparative Study with Transfer Learning Approaches

**Presenter:** Florens C. Kifyoga

This study compared convolutional neural networks (CNNs) trained from scratch with transfer learning models (InceptionV3 and VGG16) for cassava disease detection. A custom 15-layer CNN achieved 84% accuracy over 50 epochs, outperforming transfer learning models by 24%. The model's performance is expected to improve with additional training. CNNs offer faster, cost-effective, and user-friendly alternatives to molecular methods, allowing farmers to detect diseases without expert intervention. Recommendations include synthesizing results from related COSTECH-supported projects to evaluate scalability and broader adoption of AI in plant disease management, providing an accessible and efficient solution for enhancing agricultural productivity and food security.

### 4.4.9 Performance of a simple pilot recirculating aquaculture system for small-scale farmers in developing countries

**Presenter:** Dr. Mang'era Samwel Mnyoro

This study developed a simple pilot recirculating aquaculture system (RAS) using locally available materials for Tilapia farming in Tanzania. The RAS provides a stable, controlled environment, efficiently removing toxic nitrogenous compounds through biofiltration. Testing demonstrated high fish growth rates and survival, validating its performance. Compared to conventional systems, the locally developed RAS is cost-effective and accessible for small-scale farmers. Recommendations include scaling up RAS adoption to reduce space demands in aquaculture and expanding demonstrations to farmers nationwide. This innovation supports sustainable aquaculture expansion and enhances fish production in developing countries, promoting food security and economic opportunities.

### 4.4.10 Assessment of heavy metal contamination in vegetables in Dodoma: Implications on human health

**Presenter:** Sartaz Begum

This study assessed heavy metal contamination in vegetables (spinach, carrots, bell peppers, tomatoes) in Dodoma, Tanzania, using Atomic Absorption Spectroscopy. While most samples were within acceptable limits, some exceeded thresholds (e.g., lead in carrots, copper in spinach), posing risks of carcinogenic and chronic diseases. The findings highlight the need for regular monitoring, sustainable agricultural practices, and education for farmers and consumers to mitigate contamination risks. Future phases will analyze soil and pesticide contributions to contamination. Recommendations include strengthening regulations, raising awareness, and promoting dietary diversification to ensure food safety and protect public health in the region.

### 4.4.11 Economic potentials of hydroponics fodder farming to reduce income poverty and food insecurity among Tanzania's smallholder dairy farmers

**Presenter:** Ms. Proscovia Kamugisha

This study highlights the economic potential of Hydroponic Fodder Farming Technology (HFFT) to mitigate pasture scarcity, improve milk productivity, and address income poverty and food insecurity among Tanzania's urban and semi-urban smallholder dairy

farmers. HFFT uses 90% less water and land compared to traditional methods, producing 600 kg of fodder in just 7–10 days within 50m². It offers a sustainable solution to declining pasture availability exacerbated by climate change. Recommendations include experimental research on diverse fodder cultivars, cost analysis, and tailoring the technology to Tanzania's context. HFFT presents a climate-smart, viable alternative to conventional fodder farming practices.

### 4.4.12 Economic Analysis of Broiler Production using Black Soldier Flies Larvae Meals (BSFLM) in Tanzania

**Presenter:** Ms. Proscovia Kamugisha

This study analyzed the economic feasibility of using Black Soldier Fly Larvae Meals (BSFLM) as an alternative protein source in broiler production in Tanzania. Despite BSFLM's high protein content and sustainability, profitability declined with increased BSFLM inclusion due to high import costs, which were double those of fishmeal. Promoting local BSF farming could mitigate these costs, as Tanzania's agroecological conditions are favorable for year-round production. Recommendations include conducting further studies in diverse agroecological zones with larger flocks, encouraging local BSF farming, and assessing the integration of BSF farming into poultry production systems to enhance profitability and sustainability.

### 4.4.13 Seedling Stage Phenotypic Screening for Salinity Tolerance in Rice Genotypes from Eastern and Southern Africa

**Presenter:** Ms. Kefrine Kennedy Lutambi

This study screened 13 rice genotypes from Eastern and Southern Africa for salinity tolerance at the seedling stage under 12 dS $m^{-1}$ salinity stress. Key traits linked to salinity tolerance included sodium-to-potassium ratio, shoot and root dry weights, and canopy temperature. PCA identified six promising moderately tolerant genotypes (e.g., K5, Intsindagira Bigega) as candidates for breeding programs. Despite lacking the Saltol allele, 16 genotypes showed salinity tolerance, indicating alternative mechanisms. Recommendations include regional adaptation research, genotypic screening, and field evaluation to enhance salinity-resilient rice varieties. Future steps focus on farmer adoption and improving rice yield in saline-affected areas.

### 4.4.14 Potential of Host resistance and Anaerobic Soil disinfestation as sustainable strategies for managing bacterial wilt in Tanzania

**Presenter:** Dr. Hellen E. Kanyagha

This study evaluated anaerobic soil disinfestation (ASD) and host resistance as strategies to manage bacterial wilt in tomatoes. Field and greenhouse trials using ASD with carbon sources like wheat bran, rice bran, molasses, and cow manure reduced bacterial wilt incidence significantly compared to untreated controls. EG190 emerged as the most resistant rootstock, while MT56 and WG120 showed moderate resistance. Grafted plants and ASD-treated soils demonstrated potential in managing the disease. Recommendations include promoting ASD with locally available carbon sources, using resistant rootstocks for grafting, and integrating these strategies with crop rotation and IPM to enhance tomato productivity and soil health.

### 4.4.15 Cost-Benefit Analysis of Fruit Blended Yoghurt in Mbeya City, Tanzania

**Presenter:** Dr. Amina Ahmed

This study analyzed the cost-benefit potential of fruit-blended yoghurt production in Mbeya City, Tanzania, as a strategy to reduce milk postharvest losses and promote entrepreneurship. Testing mango pulp yoghurt in local markets revealed high consumer acceptability, encouraging diversification with other fruits like jackfruit and grapes. Cost-benefit analysis showed profitability, with TZS 100,000/- as initial capital yielding viable returns. Challenges included inconsistent quality raw milk supply. Recommendations include supporting youth and women entrepreneurs with value addition projects through affordable loan schemes, promoting innovative products, and addressing raw milk supply issues. This approach enhances market variety, reduces milk losses, and improves livelihoods.

### 4.4.16 Effects of Storage Conditions and Packaging Materials on Physico-Chemical, Sensory and Microbial Properties and Shelf-Life of Extruded and Non-Extruded Nutritious Composite Flour

**Presenter:** Dr. Rashid Suleiman

This study evaluated the effects of storage conditions and packaging materials on the physico-chemical, sensory, and microbial properties of extruded and non-extruded nutritious composite flours made from maize, soybeans, millet, beans, sesame, and

sugar. Flour stored at 4°C in polyethene bags had the longest shelf life, up to 12 months for extruded samples, while non-extruded flour stored at 25°C showed faster quality deterioration. Paper bags had higher moisture absorption, reducing shelf life. Sensory scores for aroma and color were highest for paper-packed flour stored at 4°C for 45 days. The presentation looked at the Proper packaging and storage practices can extend shelf life and improve marketability.

### 4.5 Fostering STEM Education for resilient, competitive, and sustainable economic growth

The session delved into the role of Science, Technology, Engineering, and Mathematics (STEM) education in preparing the future workforce to effectively address the persistent challenges of climate change. The submitted papers underscored the transformative potential of technology in enhancing STEM education. Key issues outlined include: leveraging technology in advance STEM education; developing a decentralized, school-based model for STEM education by implementing innovative digital teaching platforms and cultivating essential soft skills among students by deploying Constructionist Learning Environments. Under this theme a total of six (6) scientific papers were submitted of which four (4) were presented. The description of the presented papers is under items 4.5.1-4.5.4 and non-presented papers is under 4.5.5-4.5.6

#### 4.5.1 Empowering tomorrow's innovators: the role of generation tech space in fostering STEM education for economic development

**Presenter:** Davina Kanan

The study highlighted the important role of technology in education and its numerous benefits, which include access to information, personalized learning, improved collaboration and communication, interactive learning experiences, remote learning opportunities, data-driven insights, and support for lifelong learning. As countries work to remain competitive in an increasingly digital world, leveraging technology has become essential.

STEM education equips individuals with the skills needed to solve complex problems, drive technological advancements, and contribute to the growth of various industries. Generation Tech Space (GTS) is leading efforts to democratize access to STEM education

and empower young people to become leaders in the digital age. By addressing the challenges faced by underserved communities, fostering a culture of innovation, and promoting social impact and sustainability, GTS is making significant progress toward building a brighter and more inclusive future for everyone.

### 4.5.2 Developing a User-Centric LMS Dashboard for Tanzanian Primary Schools: A Combined SCRUM and HCD Approach

**Presenter:** Aron Kondoro

The study outlines the importance of integrating SCRUM and Human-Centered Design (HCD) to enhance the professional development of primary school teachers. The goal is to address the existing challenges such as lack of evaluation tools, diverse stakeholder requirements, and coordination issues among education stakeholders that hindered effective management of learning systems among the primary schools. As part of addressing these challenges, a decentralized, school-based model was proposed, which delivers professional development directly within schools through Communities of Learning (CoLs) likewise the structured learning opportunities in this model are essential for enhancing teachers' skills and promoting continuous professional development.

Therefore, the study came up with an integrated Learning Management System (LMS) dashboard that serves as a crucial digital platform to enhance access to resources, facilitates tracking, and encourages collaboration among teachers. The developed dashboard acts as a monitoring tool, offering stakeholders insights into teacher registration, module engagement, content access, and device usage. The operationalization of dashboard supports informed decision-making to relevant stakeholders

### 4.5.3 Constructionist Learning Environment as a key Resource for fostering critical soft skills development among students through STEM Education in Tanzania

**Presenter:** Zebedayo Kyomo

The study highlighted the effectiveness of constructivist teaching methods such as Learning by Design (LBD), Project-Oriented Learning (POL), and Project-Based Learning

(PBL) in developing students' soft skills. These approaches emphasise constructing knowledge and products that benefit the community and align with contemporary constructionism and the revised Bloom's taxonomy, which prioritizes the skill of creating.

It recommended that educational authorities implement Creative Learning Environments (CLEs) in schools to foster essential soft skills for the 21st century and the Fourth Industrial Revolution (4IR). This will empower students to create practical solutions to emerging challenges and develop the creative skills necessary for success in the 4IR.

### 4.5.4 Inconspicuous Practices that Discourage Students from Taking STEM Subjects in Secondary Schools: Analysis of Teachers and Students Experiences

**Presenter:** Jimmy E. Kihwele

This study examined the inconspicuous practices that discourage students from taking Physics and Chemistry subjects as part of STEM in ordinary-level secondary schools from 12 secondary schools in Mvomero, Mbeya, Tabora, and Nzega districts in Tanzania. Despite the importance of STEM education in Tanzania, the study noted that there is still a decrease in the number of students taking Chemistry and Physics subjects, poor performance, and the fact that they are optional subjects in many schools. This led to increased reliance on a few nations that have made significant investments in these fields. The study also pointed out certain practices in secondary schools that discourage enrollment in STEM subjects such as Chemistry and Physics. Recommendations included avoiding students streaming, as it does not help students improve their performance rather it neglects the needs and interests of students, ensuring adequate resources in schools, and, where possible, revising education policies to make science subjects mandatory rather than elective.

### 4.5.5 Supportive strategies to foster Technology Integration in the Classroom: A case of Iringa Municipality Secondary Schools

**Presenter:** Moabu Chandafa

The study underlined the crucial role of adopting digital technology is to facilitate effective learning and teaching in secondary schools in Iringa Municipal. The aim was to identify strategies for integrating supportive technology to enhance the educational process.

The study's findings indicated that teachers need to be equipped with ICT resources, receive computer literacy training, and have access to both technical and administrative support to promote the integration of technology in their teaching practices. Consequently, the study recommends that governmental and non-governmental organizations assist teachers by providing in-service training and ICT facilities.

### 4.5.6 The adoption of Digital School Based Assessment tool for improved Teaching and Learning Standard Two pupils in Primary Schools of Songwe Region, Tanzania

**Presenter:** Seleman Chisibho Mafuru

The study examined the summative assessment of the Standard Two National Assessment (STNA) conducted by the National Examinations Council of Tanzania (NECTA) in 2015, which focused on reading, writing, and arithmetic skills (the "3Rs"). According to the 2015 3Rs NECTA Report, it was noted that 13.8% of students did not master the intended skills. The study aims to investigate the adoption of the Digital School-Based Assessment (DSBA) tool in Standard Two primary education in the Songwe Region of Tanzania. It evaluates the acceptance of the DSBA tool, its relevance in assessing cognitive skills, and its effectiveness in supporting a learner-centered approach in differentiated and overcrowded classrooms.

The findings revealed that to effectively enhance the mastery of the 3Rs among standard two pupils in such challenging classroom environments, the supervised DSBA tool should be implemented as part of formative assessment practices.

## Chapter 5. Side events

During the 9th STICE event several side events were implemented to complement the main conference objectives which served as specialized platforms for in-depth discussions, practical demonstrations, and targeted networking opportunities. The events aimed at: Deepening Engagement on Specific Topics, Fostering Specialized Collaboration, Building Capacity and Share Knowledge. The following were the side events during the 9th STICE event:

i. Inter-Ministerial Dialogue on Industrial Linkage
ii. Development Partners Forum
iii. National Meeting on IP Journey of the young Innovators of Tanzania
iv. Blue Economy and Green Port Innovations

## Chapter 6. Exhibitions

The 9th STICE Exhibitions featured diverse innovators and researchers showcasing groundbreaking solutions addressing societal challenges, fostering resilience, and driving economic growth. About 40 participants from public and private institutions attended. The exhibitions were in the following key categories:

i. **Research:** Cutting-edge studies on climate resilience, food security, health and sustainable development including bioengineered crop resilience, water quality assessment and renewable energy research. A total of five (5) researchers showcased their knowledge products disseminating the outputs of their research work.

ii. **Innovations:** Solutions addressing societal challenges through advancement in technology and creativity including prepaid water meters, organic fertilizers and smart agricultural tools. A total of twenty-two (22) exhibitors showcased their innovative products.

iii. **Institutions:** There was a total of thirteen (13) Institutions which showcased their services during the 9th STICE event.

Below is the detailed description of the exhibitors during STICE event and the description of what they exhibited:

### i. Health Sector

- **Mkanda Salama:** This is a belt-like garment designed to be wrapped around the abdomen, below the umbilicus, to compress the uterus and provides minimal compression to the abdominal aorta. The innovation solves the problem related to Postpartum Hemorrhage (PPH) deaths.
- **Hospital Queue** Management: This is a software solution which helps to manage queues in hospitals. Hospitals often struggle with long patient queues, leading to delays, confusion, and dissatisfaction due to poor flow management and communication gaps. The system streamlines patient flow across departments, enabling patients to use the same ticket number throughout their visit with the help of QR code scanners, and providing real-time updates through screens and SMS for a seamless and efficient experience.

**ii. Agricultural Innovation:**

- **Waste to Compost:** This is an innovation which composts agricultural and kitchen wastes into protein feed for chicken and fertilizer through larvae farming. The innovation seeks to recycle agricultural and kitchen organic wastes into affordable protein and organic fertilizers.
- **Rafiki Planter:** This is a motorized planter designed to help smallholder farmers in sowing cotton, maize and sunflower seeds in recommended space. Rafiki Planter, a tool for planting cotton, and sunflower seeds.
- **YaKwetu Biofertilizer:** This is a Climate Smart Crop Nutrition Solutions branded as HALISI-Bio-NPK Fertilizer and NURU-Bio-NPK Liquid Booster, which are cost-effective and eco-friendly agro-inputs derived from waste and eco-formulations. Soil fertility and postharvest loss.
- **Bee Venom Harvesting machine:** This is an IoT device that helps bee keepers in harvesting bee venom for the pharmaceutical industry without killing bees, hence becoming the eco-friendly device. The innovation seeks to solve the conventional bee venom harvesting techniques which are inefficient, harmful to bees, and unsustainable, posing a threat to bee populations and the environment.
- **Honey Growth and Ripeness Monitoring System**. This innovation is about a honey growth and ripeness monitoring system provided in this invention. The system comprises a hung beehive weight sensing device, a sound frequency sensing device, and a communication system that informs a beekeeper of the status of the beehive and honey in it via a Short Message Service (SMS). The innovation solves the problem of sub optimal honey harvesting timing, which often resulted in low yields or unripe honey. The system informs a beekeeper bee colony health, and the optimal time to harvest a ripe honey via the mobile phone
- **Palm oil processing machine for value addition:** It involves manufacturing of all the equipment required for value addition processes. The innovation seeks insufficient of nutrient rich cooking oil and environmental pollution caused by palm wastes. The innovation provides solution for extraction of palm oil from the palm fruits; extraction of palm kernel oil from the palm kernel seeds; separation of red

palm oil from the yellow one in order to obtain nutrient rich palm oil; and utilization of the palm oil and the kernel palm oil in the production of soaps.

- **Sunflower seed oil mini-refinery plant**. It is about an optimized sunflower oil refinery process. The process comprises the following steps: The crude oil is heated at temperature not below 65C and then mixed with hot water low quality of sunflower seed oil due to lack of simple mini-refinery machines.
- **Combined Slicing and drying machine**. The innovation is about a combined slicing and drying machine, which comprises: a slicing chamber in which the fruits or vegetables are sliced; a drying chamber for drying the sliced products. The innovation enables agricultural products to be stored in powder form for a long time and reduce post-harvest losses hence fetching high prices.

**iii. EduTech**

- **Smart Darasa:** This is an innovation where students and teachers are able to learn and do laboratory practices using 3D features. The innovation looks to solve the problem of scarcity of laboratory facilities in public schools.
- **Shuleyetu:** This is a digital digital school management system that integrates the school administrators, staff, students, and parents together in facilitating school cooperation and administration. The platform seeks to bridge the gap between parents and teachers so as to improve the learning outcome for students
- **Elimunity:** This is an interactive hub revolutionizing education through creation of a dynamic and interactive learning ecosystem for primary and secondary schools. The platform bridges the gap between students, teachers, and parents, fostering a collaborative environment that enriches education experience among students.

**iv. Water**

- **Prepaid Water Meter,** is an innovative solution aimed at improving transparency and efficiency in water management. The innovation looks to solve the lack of transparency and accountability between water service providers and users, leading to inefficiencies in water distribution and billing.

- **FESAM** offers an innovative prepaid water metering system designed to enhance transparency, accountability, and efficiency in water management. Traditional water metering systems lack transparency and accountability due to outdated manual processes and periodic billing cycles
- **A Jet Sprinkler Irrigation Device:** This innovation solves the problem of waste water in irrigation so as to ensure efficient management of water in agriculture.
- **Go-Safe Water Purifier:** Go-Safe Water Purifier is a system that helps households, institutions and companies to access safe drinking water. This innovation is about a water purifier system, which is composed of a multi-stage filtration process. The innovation looks to solve the unavailability of clean and safe water in some of the communities.

**v. Environment and Climate Change**

- **Production of Activated Carbon.** It involves conversion of solid waste to valuable products namely Activated carbon hence reducing the waste generation as far as the environment is concerned. The Activated Carbon used on Gold extraction, water purification and oil refinery. This innovation looks to recycle coconut shells to produce activated carbon to reduce importation and help the artisanal and small-scale gold miners.
- **Manufacturing Amino Acid and liquid fertilizer from human hair waste.** It presents an environmentally friendly solution by repurposing human hair waste to produce Amino Acid+ Liquid fertilizer. The innovation looks to provide a proper disposal of human hair wastes and prevalent use of chemical fertilizers in farming
- **Formulation of Mosquito Repellent and Air freshener:** The innovation involves development of eco-friendly mosquito repellent products by utilizing natural active ingredients extracted from lemongrass plants. This provides a safe and sustainable solution for long-lasting mosquito protection.
- **Solar-heated Air System**. It is about a solar heated air system, which comprises: a heat harvesting system to collect the heat energy from solar; heat absorbing system to absorb heat collected from the heat collector. The innovation

solves the problem of inefficient stored energy for indoor cooking stove during low sun seasons or during cloudy and rainy days.

**vi. Manufacturing**

- **Manufacturing Process of Paving Tiles from Recycled Abandoned Industrial and Municipal Solid Wastes**: This innovation is about a waste glass paving tile, from mixture: 25% binder; 50% aggregates; and 25% metakaolin. Raw materials are prepared through drying, crushing, grinding and sieving to definite particle size. The innovation reduces the environmental pollution through recycling of mining and plastics wastes hence reduction of environmental pollution.
- **Improved Biomass Briquettes**. Biomass briquettes can be produced from forest waste or agricultural waste. Coconut shells have high calorific value and hence produce briquettes of high quality that meet set national standards. Rice husks that are abundant are less utilized in briquettes production due to their high ash content and low calorific value. The innovation addresses the green gas emission, deforestation as well as climate change by mixing agricultural wastes such as rice husk with coconut shell to increase its coloristic value hence high burning rate.

## Chapter 7. Closing Ceremony

The closing ceremony for STICE 2024 was held on the 4th December 2024. The event was officiated by Hon. Prof. Adolf Mkenda, the Minister for Education Science and Technology (MoEST). Upon arrival, the Guest of Honour, led by the Director General of COSTECH Dr. Amos Nungu, in the accompaniment of COSTECH Management team, visited the exhibition booths to witness research outputs and innovation products and services that were showcased on the exhibition area by researchers and innovators.

The event accommodated a word from COSTECH where Dr. Nungu presented the conference communique containing a synopsis of what the conference was all about, its achievements and the deliberations that were agreed upon as way forward during the sessions. Among the deliberations from the conference were:

i. The need for stakeholders to come together and reposition STI to foster industrial linkages for economic transformation by enhancing stakeholder dialogues; operationalizing the industrial linkages policy; promoting industrial linkages as a partnership of mutual benefit, and organizing regular joint meetings and workshops to foster engagement and align goals among stakeholders.

ii. The need for stakeholders to leverage STI and indigenous or traditional knowledge for food security and nutrition by emphasizing more research on natural food originated from Tanzania; conducting more research on indigenous knowledge and plants; emphasizing the use of drought tolerant seed varieties to adapt to climate change, and developing solutions and technologies that will support adaptation of climate change impacts.

iii. The need for stakeholders to enhance STI become the prime driver for climate change resilient and sustainable Bio-Economy by investing in renewable energy and capacity building programmes for youth who are potential drivers of bioeconomy as well as to invest more on climate change research and provision of shared facility; investing on low costs technologies that reduce emission of Carbon Dioxide; expand the port areas of focus to by reducing sedimentation derived from the human activities around the port; building capacity of researchers to be able to undertake researches in the area of climate change, and funding more research that address bio-economy.

iv. The need for the government, through the MoEST, to increase investment in research so that COSTECH can see the possibility of purchasing big research facilities/equipment that could be shared by a variety of researchers (shared research facility).

Prof. Daniel Mushi, the Deputy Permanent Secretary, of the Ministry of Education, Science and Technology (Science), delivered the greeting from the ministry before inviting the Guest of Honour to deliver his speech. The Deputy Permanent Secretary thanked the guest of honor for dedicating time out of his busy schedule to come and grace the closing of the 9th STICE. He asserted that Prof. Mkenda has a sincere commitment in pushing the Science, Technology and Innovation Agenda forward as he has been keen in making sure the sector contributes greatly to solving challenges facing the society.

Deputy Permanent Secretary reiterated that for three consecutive days, a community of scientists, researchers, innovators, private sector, policy and decision-makers and other STI stakeholders gathered at the Julius Nyerere International Conference Centre to exchange ideas, experiences, knowledge and skills with the aim of strengthening science, technology and innovation in the country. He made a commitment before the guest of honour that the recommendations from the conference that require direct involvement of the MoEST, once brought to ministry, he will make sure the ministry works on them.

The Guest of Honour Hon. Prof. Adolf Mkenda, the Minister for Education Science and Technology delivered his speech by acknowledging that climate change is one of the main threats of the universe. He mentioned some of the initiatives that the government has taken towards combating the effects of climate change, including the implementation of the Paris Agreement, by producing a national guidelines for reducing air pollution and combating climate change challenges known as Nationally Determined Contribution (NDC); allocating a large budget to implement large-scale projects that contribute to addressing climate change challenges such as Standard Gauge Railway (SGR), Bus Rapid Transfer (BRT), Julius Nyerere Hydropower Station; and distribution of clean and safe water in urban and rural areas.

The guest of honour also acknowledged the fact that in order for Tanzania to become a better place, investment in STI is crucial and that the MoEST will continue to solicit funds from different sources in order to make Tanzanians depend largely on STI to solve various challenges, including those associated with climate change. He underscored the importance of education in transforming the society and pleased that the MoEST will continue to invest in education in order to have an educated Tanzanian with knowledge, skills, competence, capabilities and positive attitudes to contribute to the development of the nation.

Before concluding his speech, the guest of honour reiterated the essence of the STICE organisers i.e. COSTECH to submit the recommendations from the conference so that the MoEST can make informed decisions based on them. He also urged COSTECH to work on stakeholders' feedback and recommendations, including continuing to advertise and disseminate to the public research results and innovative products displayed during the conference.

Right after the speech, the guest of honour presented certificates to acknowledge the contribution of keynote presenters, best innovation exhibitors and STICE 2024 sponsors. The closing ceremony was concluded by the group photo event where the Guest of Honour took photos with different groups of conference participants.

## Chapter 8. Publicity of the 9th STICE event

The 9th Annual Science, Technology, and Innovation Conference and Exhibition, showcased the immense potential of strategic public communication in fostering a national dialogue on research, innovation, and technology. With Deputy Prime Minister Hon. Doto Mashaka Biteko attending on behalf of Her Excellency Dr. Samia Suluhu Hassan, President of the United Republic of Tanzania, the conference attracted significant attention and sparked widespread discussions across diverse platforms, including mainstream media, social media, and public forums.

This chapter outlines the extensive publicity efforts, key achievements, and the overall impact of the conference in shaping public perceptions. It also highlights how these efforts supported COSTECH's mission to position Tanzania as a leader in Science, Technology, and Innovation (STI) on the global stage.

### 8.1 Promotion Strategies for the 9th STICE

To promote the 9th STICE Conference, COSTECH employed a well-rounded mix of digital and traditional media strategies to ensure widespread visibility and public engagement. The promotional efforts were tailored to reach diverse audiences through multiple communication channels, including mainstream media, online platforms, and influencer collaborations.

#### 8.1.1. Mainstream Media Coverage

Traditional media played a vital role in generating awareness for the event. The efforts included extensive coverage in national newspapers, television, and radio programs as shown in Table 1.

**Table 1: Mainstream media coverage**

| Media Type | Details |
|---|---|
| **Newspapers** | 22 stories published in leading daily and weekly newspapers. |

| | |
|---|---|
| **Television** | 13 broadcasts, including coverage by major national and regional TV channels. |
| **Radio** | 11 programs and news bulletins aired on popular stations. |

These media outlets helped establish STICE as a significant national event, reaching a broad audience across the country.

### 8.1.2. Online and Social Media Campaigns

The online and social media campaigns were designed to engage a younger, more tech-savvy audience. These campaigns focused on creating buzz and encouraging participation in the event. Table 2 shows the level of digital coverage.

**Table 2: Online and social media engagement**

| Platform | Number of Posts/Stories |
|---|---|
| **Blogs** | 19 stories published across various blogs. |
| **Websites** | 16 posts and updates on relevant websites. |
| **Facebook** | 34 posts highlighting key aspects of the conference. |
| **Instagram** | 49 posts, including event highlights and behind-the-scenes content. |
| **Twitter** | 42 posts, including updates, news, and engagements. |
| **YouTube** | 18 video posts and promotional clips. |

These platforms were essential in engaging the public, especially youth, in real-time updates and event-related content. COSTECH successfully reached diverse groups, ensuring that the 9th STICE Conference generated the necessary attention and excitement to drive national and international participation.

## 8.2 Achievements and Reach of STICE Promotion

The publicity efforts for the 9th STICE Conference yielded remarkable achievements and an impressive reach across various media platforms, ensuring widespread visibility and engagement.

### 8.2.1 Visibility and Public Support

The presence of the Deputy Prime Minister, Hon. Doto Mashaka Biteko, significantly elevated the profile of the event, emphasizing the government's strong commitment to Science, Technology, and Innovation (STI). This high-level attendance reflected the importance of the conference and sparked increased discussions on research, innovation, and technology both in social media and public forums.

### 8.2.2 Mainstream Media

The event garnered extensive coverage in mainstream media, providing mass exposure to the public. The newspaper coverage, including impactful stories in leading outlets such as *Mwananchi*, *Citizen*, and *Daily News*, reached millions of readers nationwide. Television and radio coverage also contributed to the visibility, with programs aired on major national channels like TBC1, ITV, and Wasafi TV, as well as popular radio stations, ensuring the conference reached a broad audience.

### 8.2.3 Social Media Growth

Social media played a key role in engaging younger and more tech-savvy audiences. COSTECH saw significant growth on platforms like Instagram and Twitter, gaining over 1,100 new followers on Instagram and more than 1,700 on Twitter during the campaign. Additionally, a single YouTube post by Wasafi TV generated an impressive 1.3 million views, highlighting the widespread public interest in the conference and its focus on innovation.

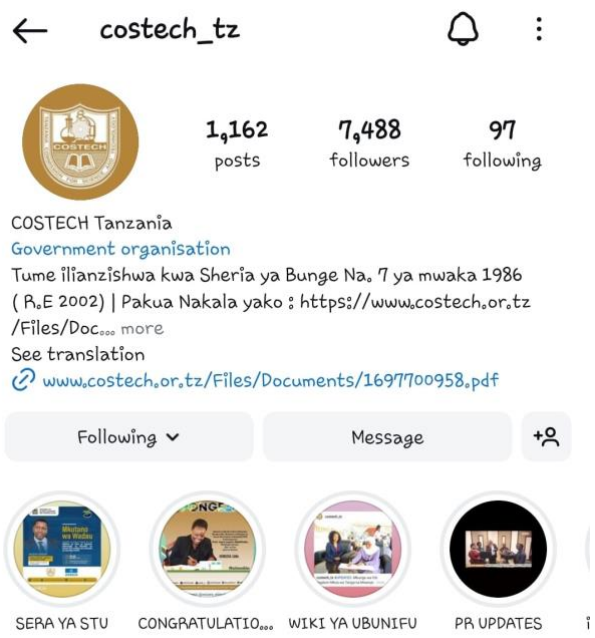



**Figure 9: COSTECH Instagram Page**

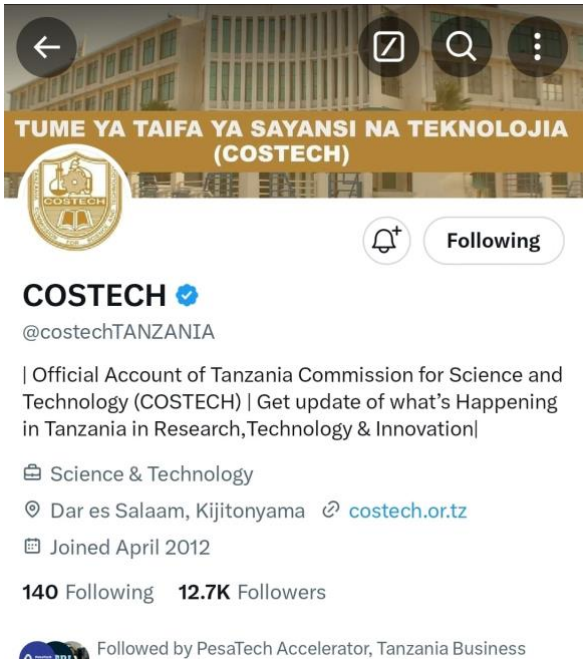



**Figure 10: COSTECH Twitter Page**

### 8.2.4 Positive Public Perception

Public reception of the conference was overwhelmingly positive, with the majority of feedback being supportive of both COSTECH and the STICE event. Only two negative comments were observed, demonstrating strong public acceptance and appreciation for the conference's objectives and execution.

### 8.2.5 Influencer Impact

Social media influencers contributed significantly to the campaign's success, generating over 30,000 impressions. Their creative content helped expand the reach of the conference's message, further emphasizing the importance of STI in national development.

### 8.2.6 Audience Reach

The collective efforts of COSTECH, combined with mainstream media exposure, strategic social media campaigns, and influencer engagement, successfully reached an estimated 13.7 million people (Table 3), significantly amplifying the conference's message and objectives.

**Table 3: Summary of estimated Reach of the promotion**

| **Platform** | **Number of Stories/Posts** | **Estimated Reach** |
|---|---|---|
| Newspapers | 22 | 2,372,000 |
| Television | 13 | 9,000,000 |
| Radio | 11 | 6,000,000 |
| Websites | 16 | N/A |
| Blogs | 19 | N/A |

| | | |
|---|---|---|
| YouTube | 18 | 1,300,000 |
| Facebook | 34 | N/A |
| Instagram | 49 | 6,432 per post (average) |
| Twitter | 42 | 53,800 impressions, 1,700 engagements |
| TikTok | 1 | N/A |
| **Total Reach: 13.682 million people** | | |

### 8.3 Impacts and Implications of STICE Publicity

The publicity campaign surrounding the 9th STICE Conference was instrumental in positioning COSTECH and the conference as central to national discussions on Science, Technology, and Innovation (STI). Leveraging a mix of traditional media, digital platforms, and public engagement, the campaign effectively amplified the significance of STI for Tanzania's national development and global positioning. The extensive media coverage and outreach directly contributed to several key achievements, each of which plays a critical role in advancing the national agenda on STI.

#### 8.3.1 Increased Awareness of STI

One of the primary goals of the publicity campaign was to increase public awareness of the importance of STI in driving economic and social progress. Through comprehensive coverage in newspapers, television, radio, and social media platforms, millions of Tanzanians were exposed to the concept of STI and its potential to transform the country. The messages conveyed in these media outlets highlighted how research, innovation, and technology could lead to sustainable development, create jobs, and enhance the overall quality of life. By bringing these topics into public discourse, the campaign successfully ignited a national conversation about the crucial role that STI plays in shaping

the future of Tanzania. This broadening of public understanding is essential for fostering a culture of innovation and scientific inquiry within the country.

### 8.3.2 Support for COSTECH

The publicity campaign also significantly bolstered public perception of COSTECH, reinforcing its role as the country's leading body for STI advocacy and implementation. Positive coverage in both traditional and digital media reinforced COSTECH's authority and credibility in driving the national STI agenda. The widespread exposure helped position COSTECH as a central player in fostering innovation and research, not only within Tanzania but also in the broader regional and global contexts. The campaign's success in generating a positive public sentiment highlighted the growing recognition of COSTECH's efforts in STI governance and policy advocacy. This, in turn, enhanced COSTECH's ability to secure continued support and resources for its programs, further establishing its leadership in the field.

### 8.3.3 Policy Influence

The publicity efforts also played a crucial role in influencing policy discussions and garnering greater support for research and innovation. The visibility of the STICE Conference and its coverage in mainstream and social media prompted important conversations around the need for robust policy frameworks that support STI development. These discussions, which included both critical debates and endorsements, are expected to contribute to stronger policy backing for STI initiatives at the national level. By engaging policymakers, stakeholders, and the general public, the campaign helped lay the groundwork for future policy shifts aimed at creating a more conducive environment for innovation and research. As Tanzania moves forward, the heightened visibility of STI through this campaign will likely lead to greater investments in research infrastructure, as well as improved access to funding and support for innovators.

### 8.3.4 Inspiration for Innovators

The campaign's ability to inspire the next generation of innovators and researchers was another key achievement. By showcasing the government's commitment to supporting innovation, particularly through the 2.3 billion TZS credit fund for innovators and the 6.3 billion TZS awards for researchers, the publicity campaign encouraged individuals and organizations to actively engage with COSTECH's programs. The visibility of these funding initiatives signalled a clear message to the public that the government is serious about nurturing innovation and fostering a dynamic research environment. This, in turn, inspired many to pursue their entrepreneurial ideas, knowing that there are tangible financial resources and institutional support available to help bring their projects to fruition. The campaign, therefore, not only raised awareness but also directly contributed to motivating potential innovators to contribute to the country's STI ecosystem.

### 8.3.5 Positioning Tanzania on the Global Stage

By effectively positioning the 9th STICE Conference as a national and regional focal point for STI, the publicity campaign also supported Tanzania's positioning on the global stage. The widespread media coverage and global attention garnered by the event helped to showcase Tanzania's growing leadership in science, technology, and innovation within the African continent and beyond. As more international partners and organizations observe Tanzania's commitment to STI, there is greater potential for collaboration, investment, and knowledge exchange. This enhances Tanzania's standing as a key player in the global innovation landscape and positions it as a hub for cutting-edge research and development in East Africa. The campaign's success in bringing global attention to Tanzania's STI initiatives is a significant step towards ensuring that the country continues to be recognized as a progressive leader in innovation.

The publicity campaign surrounding the 9th STICE Conference not only achieved extensive visibility but also laid a strong foundation for advancing the national STI agenda. By increasing public awareness, bolstering support for COSTECH, influencing policy, inspiring innovation, and positioning Tanzania on the global stage, the campaign played a pivotal role in shaping the country's future in STI.

## Chapter 9. Key Achievements, Lessons Learned and Recommendations

The 9th STICE Conference provided a platform for diverse stakeholders to exchange ideas on leveraging science, technology, and innovation to address pressing climate challenges. The conference, themed "Harnessing STI for Climate Resilience and Competitive Economy," highlighted valuable lessons that are key for driving impactful and sustainable development initiatives. This chapter synthesizes the key achievements, lessons learned, focusing on critical areas such as stakeholder management, team building, value creation, and effective communication. This chapter aims at providing actionable recommendations that can guide future efforts in achieving strategic objectives.

### 9.1 Key Achievements of the 9th STICE event

The 9th STICE event brought together stakeholders from academia, industry, government, and civil society, resulting in several notable achievements that reflect the conference's success. The following are some of the notable achievements from the event:

i. Fostering Research and Innovation (R&I) Knowledge Sharing: Seven (7) keynote papers on STI were presented and discussed. Over 70 technical research papers were presented, with 45 anticipated for publication in the East African Journal for Science, Technology, and Innovation (EAJSTI).
ii. Showcasing R&I Products: More than 40 diverse R&I products were displayed at the event. Exhibitors included representatives from government ministries, regulatory agencies, research and development (R&D) institutions, higher learning institutions, industries, and startup companies.
iii. Conducting STI Dialogues and Workshops: Five (5) side events, including workshops and dialogues, were held. These sessions focused on enhancing industrial linkages within R&I, promoting green port innovations, increasing knowledge of intellectual property rights among innovation stakeholders, encouraging innovation and entrepreneurs' skills among school dropouts, and securing increased financial support from development partners to advance STI in Tanzania.

iv. Increasing Participation of R&I Stakeholders: Over 1200 stakeholders attended the 9th STICE, which represents an increase of nearly 10% compared to the previous year. Participants came from various sectors, including government ministries, diplomatic bodies, development partners, R&D institutions, industries, entrepreneurs, religious organizations, and students.

v. Enhancing COSTECH's Visibility: In preparation for the 9th STICE, COSTECH reached out to approximately ten million stakeholders through various communication channels, including radio, television, social media, and its website.

vi. Launching Innovation Credit Facility: The Hon. Dr. Dotto Biteko on behalf of the President of URT launched Innovation Credit Facility with a start-up injection of TZS 2.3 billion to support the commercialisation of innovations including those originating from local grassroots innovators, aimed at driving job creation and economic growth.

vii. Awarding Research Grants to Beneficiaries: The Hon. Dr. Dotto Biteko also awarded a total of TZS 6.3 billion research funding to 19 local researchers. The funding was supported by the Government of Norway through NORAD. This funding will empower Tanzanian scientists to conduct cutting-edge research addressing critical climate change challenges in Tanzania.

viii. Recognizing Scientific Excellence: Five (5) local scientists, including Prof. Emeritus Karim Manji, Prof. Gerald Misinzo, Dr. Kiddo Mtunda, Dr. Aviti Mmochi and Prof. Julie Makani, received National Research Recognition Awards for their impactful research contributions to addressing societal challenges.

ix. Parliamentary Willingness to Support STI: The Chairperson of the Parliamentary Standing Committee on Education, Culture, and Sports, Hon. Husna Juma Sekiboko, reaffirmed parliamentary commitment to prioritizing science, technology, and innovation agendas.

## 9.2 Lessons Learned from 9th STICE

As stated in section 1.2, the aim of the 9thSTICE was to provide a platform for researchers, innovators, policy makers, politicians and the STI financing stakeholders to share ideas, acquire knowledge and foster relationships for harnessing science,

technology, and innovation to achieve climate resilience and a competitive economy. The platform provided a unique opportunity for stakeholders to present and share their knowledge, skills, innovations and technologies in a way, which could have otherwise been impossible to achieve. The following are the lessons learned from the STICE event.

i. **Scope management:** The scope and objectives of the 9th STICE were well defined and agreed upon by all key stakeholders, including the MOEST and COSTECH management and the organizing team timely. There were no rigorous changes to delay and affect budget overruns. Few scientists submitted papers outside the conference scope, and reviewers rejected them. In future, scientists should observe the STICE guideline to get opportunities to present their papers at the conference, publish in the agreed journals, and avoid wasting time and resources.

ii. **Time management:** Realistic scheduling is essential for a successful event. The organizers set enough time for most of the key tasks. However, underestimating time for a few activities led to bottlenecks, including late hours working at the late stage of the event and insufficient time for stakeholders to connect and network during the event. Future events will benefit from more realistic time allocations and contingency planning.

iii. **Cost management:** It is critical to prepare an accurate budget early and get it approved timely. An initial budget that did not account for all potential costs led to a funding shortfall. Nevertheless, the organizers reviewed and adjusted the budget regularly, and the authority approved the budget accordingly. There was no overspending. Future events should include a more thorough estimation and contingency funding in the budget. In addition, continuous monitoring is crucial for keeping an event on track financially.

iv. **Quality management:** Incorporating regular quality checks throughout the event lifecycle is vital. The Organizing Team, Management, and the Commission held a series of meetings before, during, and after STICE as one of the quality checks strategies. However, to some extent, the organizing team did not involve sponsors, researchers, and innovators early and frequently to ensure STICE meets their needs. In the future, it is critical to conduct extensive evaluations at all event

stages to get feedback from the stakeholders and use the feedback to improve the event.

v. **Risk management:** A comprehensive risk management plan is essential to avoid reactive firefighting in the event. However, although the STICE event organizers did not conduct a robust risk assessment during the event planning, no risks merged. In the future, the organizing team should conduct a robust risk assessment with proactive risk mitigations and appoint a risk champion to track the risks and appraise the committee for risk management.

vi. **Stakeholder Management:** Keeping stakeholders informed and involved is necessary for event success. The STICE Organizing Committee identified key event partners such as policy and decision-makers, development partners, higher learning and research institutions, and industries but did not establish clear communication channels with stakeholders. Future events should conduct a thorough stakeholder mapping and establish a clear and open communication plan for both internal and external to align diverse interests and achieve common goals. It is also essential to appoint personnel to manage stakeholders' communications.

vii. **Resource management:** Matching task requirements with team members' positions and skills is crucial for efficient task execution. To some extent, ineffective resource allocation and management in the STICE organizing committee led to committee exhaustion. Financially, organizers engaged sponsors at a bit late stage, which led to insufficient finances and resource reallocation. In the future, management should allocate adequate human resources to prevent team exhaustion, and the organizing committee should engage prospective sponsors at the initial planning stage to ensure smooth implementation and a highly successful event.

viii. **Communication:** A structured communication plan is crucial for keeping everyone informed. A few members of the organizing committee and stakeholders were out of the loop due to unstructured communication practices in the STICE. Also, tracking STICE decisions and changes was difficult due to poor documentation. Future events should establish effective communication plans and documentation to track decisions and changes.

## Chapter 10. Financial Management

### 10.1. Budget

The commission planned and budgeted TZS 636,161,600.00 for organizing and executing the 9th Science, technology and Innovation Conference and Exhibition (9th STICE) which was held from 2nd to 4th December 2024. This budget was a result of fund mobilization from COSTECH, partners and sponsors that were invited to support the event.

A total sum of TZS 256,029,600.00 equivalent to 40% was budgeted from sponsorship, also TZS 34,131,800 equivalent to 6% was budgeted from registration and booth fees and the rest of the amount TZS 346,000,000.00 equivalent to 54 % was budgeted from the Government funds for various activities that were planned to be conducted during the event. The funds from government funds aimed at accomplishing various planned annual activities at the Commission which were achieved during the 9th STICE event.

### 10.2. Sponsorship Revenue

From the total sum of 256,029,6000 from sponsors and partners the Commission managed to collect TZS 189,785,600 equivalent to 74% of the target. There is still outstanding amount of TZS 95,725,950/= from sponsors. From the total sum of TZS 34,131,800/= of the registration fees and booth the Commission managed to collect a total of TZS 4,650,050 with most of the funds coming from selling of booths to different organizations. Table 4 shows a list of sponsors who funded the event;

**Table 4: STICE Revenue**

| No | Organization / Sponsors | Budgeted Amount | Amount Received | Outstanding Amount | Collection Capacity |
|---|---|---|---|---|---|
| 1 | TPA | 20,000,000 | 20,000,000 | - | 100% |

| | | | | | |
|---|---|---|---|---|---|
| 2 | UNDP - FUNGUO Project | 50,000,000 | 50,000,000 | - | 100% |
| 3 | UNICEF | 29,276,800 | 29,276,800 | - | 100% |
| 4 | World Bank - HEET Project | 94,953,000 | 86,508,800 | 8,444,200 | 91% |
| 5 | WIPO | 8,000,000 | 4,000,000 | 4,000,000 | 50% |
| 6 | TCRA | 8,000,000 | - | 8,000,000 | 0% |
| 7 | VETA | 5,000,000 | - | 5,000,000 | 0% |
| 8 | CRDB | 20,000,000 | - | 20,000,000 | 0% |
| 9 | UNCDF | 20,800,000 | - | 20,800,000 | 0% |
| | **TOTAL** | **256,029,800** | **189,785,600** | **66,244,200** | **74%** |

### 10.3. Expenditure

The 9th STICE event had a total expenditure of TZS 622,245,378.00. This is equivalent to 97.8% of the approved budget. Procurement activities cost a total of TZS 299,067,178.00 equivalent to 49% of actual expenditure and non-procurement amounted TZS 323,178,200.00 equivalent to 51% of actual expenditures.

A table below shows the detailed 9th STICE budget versus expenditure

**Table 5: STICE Expenditure**

| NO | ITEM | BUDGET (TZS) | EXPENDITURE (TZS) | VARIANCE |
|---|---|---|---|---|
| 1 | Conference facility/ package | 164,908,000 | 163,453,000 | 1,455,000 |
| 2 | Prime Minister's Office | 8,600,000 | 12,876,000 | -4,276,000 |
| 3 | Ministry delegation | 10,580,000 | 19,340,000 | -8,760,000 |
| 4 | Keynote speaker | 50,000,000 | 26,621,000 | 23,379,000 |

| | | | | |
|---|---|---|---|---|
| 5 | Conference branding, printing and publicity | 156,300,000 | 170,359,000 | -14,059,000 |
| 6 | Conference MC & Religious Team | 4,450,000 | 2,000,000 | 2,450,000 |
| 7 | Secondary School Teachers Allowances | 1,500,000 | 750,000 | 750,000 |
| 8 | Entertainment | 7,500,000 | 6,350,000 | 1,150,000 |
| 9 | Conference preparation | 98,400,000 | 80,570,400 | 17,829,600 |
| 10 | Rapporteurs | 7,200,000 | 7,820,000 | -620,000 |
| 11 | Compilation of report - Rapporteurs | 22,620,000 | 39,890,000 | -17,270,000 |
| 12 | Stationeries | 3,000,000 | 1,319,178 | 1,680,822 |
| 13 | Costs for Trophies | 3,000,000 | 1,445,000 | 1,555,000 |
| 14 | Proceeding and Journal publishing | 8,250,000 | 3,000,000 | 5,250,000 |
| 15 | Budget for Security (RAS-Fire, First Aid, Ushers) | 8,430,000 | 8,830,000 | -400,000 |
| 16 | COSTECH Management & Organizing Committee | 35,000,000 | 38,240,000 | -3,240,000 |
| 17 | Contingency | 10,000,000 | 11,800,000 | -1,800,000 |
| 18 | HEET - Awareness | 37,953,000 | 29,508,800 | 8,444,200 |
| | **TOTAL** | **637,691,000** | **624,172,378** | **13,518,622** |

## 10.4. Financial Implication of COSTECH

The Commission budgeted a total of TZS 346,000,000/= of its annual Government funds to facilitate the 9$^{th}$ STIECE event. In addition to this, a total of TZS 124,461,800/= from HEET allocated fund were utilized to facilitate the event. However, the event enabled

COSTECH to achieve various activities which were planned and budgeted for the financial year 2024/2025.

**Table 6: Annual Activity Plan Accomplished during STICE**

| NO | ACTIVITY | % ACHIEVED |
|---|---|---|
| 1 | To organize STI Conference by June 2025 | 100 |
| 2 | Support Strategic Engagement Meetings with Government by June 2025 | 50 |
| 3 | To organize /facilitate and participate in 4 STI Conferences and Exhibitions (9th STICE, Sabasaba, Nanenane, TCU, ZCU Young Scientist Women in Science, NIMR, etc) By June 2025. | 25 |
| 4 | To Faciliatate preparation of 4 COSTECH quarterly newsletter by June 2025 | 25 |
| 5 | To conduct one press release and advertise climate change research call in print and digital media by June 2025 | 100 |
| 6 | To facilitate preparation of 10 different groups of brochures, 10 banners, 5 posters and 5 different fliers/leaflets of knowledge product/information by June 2025 | 80% |
| 7 | To facilitate printing of 10 developed STI knowledge products from COSTECH departments by June 2025 | 80% |
| 8 | Post 8th STICE Review Meeting with National Committee Members | 100 |
| 9 | To publicity and brand at least 5 events (Validation of media houses, press conferences, validation of COSTECH Funded projects etc) by June 2025 | 90 |
| 10 | To produce and broadcast at least three (3) STI documentaries by June 2025 | 33.3% |

# Chapter 11. Conclusion and Recommendations

## 11.1. Conclusion

The 9th Annual Science, Technology, and Innovation Conference and Exhibition (STICE) was a resounding success, serving as a dynamic platform for collaboration, knowledge sharing, and the advancement of innovative solutions to address climate resilience and economic competitiveness. Throughout the conference, stakeholders from diverse sectors came together to deliberate on critical issues, showcase groundbreaking knowledge products, and propose actionable strategies for leveraging science, technology, and innovation (STI). The event highlighted the transformative potential of STI in addressing climate challenges while fostering sustainable development.

The overwhelmingly positive reception of the conference publicity campaign evidenced by the supportive feedback from the public and the growing recognition of COSTECH's efforts reflects a significant shift in public perception. Tanzanians now increasingly view STI as a critical component of the country's progress. This acceptance and enthusiasm provide a solid foundation for future initiatives aimed at strengthening the STI ecosystem. The campaign's success in fostering such positive public sentiment is a vital step toward solidifying COSTECH's position as the leader in STI advocacy and implementation in Tanzania. In addition, the publicity efforts of the 9th STICE Conference lay the groundwork for the development of stronger partnerships, both within Tanzania and internationally, as well as more robust STI policies and programs. The visibility generated by this campaign will likely lead to increased investment in innovation, better access to research funding, and greater collaboration with global partners. Furthermore, the campaign has inspired a new generation of innovators and researchers, helping to cultivate an environment conducive to entrepreneurial growth and scientific inquiry.

The strategic publicity campaign for the 9th STICE Conference not only achieved significant visibility and engagement but also played a crucial role in advancing Tanzania's STI agenda. By successfully creating a national conversation around innovation, fostering

positive public sentiment, and positioning Tanzania as a key player in the global STI landscape, the campaign has set the stage for continued progress and development in the field of science, technology, and innovation

Furthemore, key takeaways from the conference emphasized the importance of stakeholder engagement, capacity building, policy alignment, and the integration of local innovations into national and regional development agendas. The lessons learned and achievements recorded during the event provide a robust foundation for future initiatives and partnerships.

As we move forward, it is important to sustain the momentum generated by the conference. This includes implementing the recommendations made, fostering continuous collaboration among stakeholders, and ensuring adequate investment in research and innovation. By doing so, we can collectively harness the power of STI to drive impactful change and create a resilient and competitive economy.

In conclusion, the 9th STICE Conference has reaffirmed the critical role of COSTECH and STI in general in shaping a sustainable future. We extend our gratitude to all participants, partners, and organizers for their contributions to this remarkable event. Together, let us continue to innovate, collaborate, and transform challenges into opportunities for the betterment of society.

### 11.2. Recommendations

The 9th STICE event served as a dynamic platform for fostering collaboration, and knowledge exchange in science, technology, and innovation. While the conference achieved significant milestones in terms of participation and knowledge dissemination it also highlighted areas for improvement and growth.

This chapter outlines key recommendations aimed at enhancing the impact, operational efficiency, and long-term sustainability of future STICE events. These recommendations are informed by insights gathered from event outcomes and best practices. By addressing

these areas, COSTECH can strengthen STICE's position as a flagship event, driving transformative change in STI in the country and beyond.

The recommendations are categorized into stakeholder engagement, event delivery, financial model, impact measurement, long-term vision, and strategic framework. These actionable steps provide a roadmap for COSTECH and its partners to maximize the conference's value and ensure its continued success.

### i. Long Term Vision

COSTECH should look to institutionalize the STICE event and build its other annual activities plan as part of the STICE event. A dedicated team should be established to support in event coordination and preparation. The Commission should establish the multi-year roadmap to ensure contuity and growth of the event. The Commission should aim to position STICE in the national and regional calendar of major STI events.

### ii. Strategic Framework

In line with its manadate it is recommended to position STICE as an annual flagship event with a growing scale, ensuring each year builds on the success of the previous one. This will include define specific themes for each year aligned with defined national research priorities. A broader stakeholders' mapping should be developed including government ministries, private sector players, academic institutions, and international organizations. Engagement with startups and innovators to showcase their work should be done early to ensure maximum utilization of exhibition spaces. Furthermore, the event should ensure diverse participation, including youth, women, and underrepresented groups in STEM.

### iii. Event Structure

It is recommend the event to feature global and regional thought leaders rather than local speakers alone. The exhibition should cater for cutting-edge technologies and innovation emanating from Tanzania. The event should include competitions and innovation challenges like hackathons to foster creativity. In order to maximize reach it is recommended to improve the online participation to maximize reach and accessibility.

It is also recommended to include an outreach activity one of the day to enable participants to be more aware of the COSTECH activities and STI initiatives in the country.

### iv. Branding and Marketing

It is recommend COSTECH to brand STICE as the ultimate platform for innovation and collaboration in the region. Building on the success of the 9th STICE event the Commission should develop a robust digital strategy, including a dedicated up-to date website, social media campaigns, and virtual networking opportunities. The Commission should start enganging the media houses so as to obtain the official STICE media partner so as to obtain the extensive coverage. The Commission should also engage influential figures in STI as event ambassadors.

### v. Financial Model

Building from the 9$^{th}$ STICE experience it is crucial to engage key sponsors and partners early during preparation. In addition it is recommended COSTECH to allocate funding from its Government funding for the event. The funds can be obtained from planned different departmental activities which can be implemented during annual STICE event. This will make the activities success while innovatively increasing participation of stakeholders in the STICE. Some of the activities which can be planned to take place during STICE including the R&D Advisory Committees. With this approached the operations will be streamlined while ensuring efficient utilization of funds.

In order to ensure maximum participation while cementing the role of COSTECH in STI it is recommended to waive the registration fees for researchers and innovators.

### vi. Measuring Impact

It is critical to measure the impact of the event and develop the key metrics such as: Attendance and participation metrics, Number of partnerships or investments generated, Policy or project outcomes influenced by the event, Media reach and engagement statistics. While this year the media reach and engagement statistics have been documented it is essential to develop the clear metrics from the beginning and use the metrics to monitor success.

By positioning STICE as its flagship event, COSTECH can significantly amplify its impact and drive regional and global collaboration in science and technology.

## Appendices

Appendix I: The 9th STICE Program Book

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
TANZANIA COMMISSION FOR SCIENCE AND TECHNOLOGY

# THE 9TH NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION CONFERENCE AND EXHIBITIONS

**THEME** *Harnessing Science, Technology and Innovation for Climate Resilience and Competitive Economy*

9th STICE DECEMBER 2nd – 4th 2024

Science, Technology and Innovation Conference & Exhibition

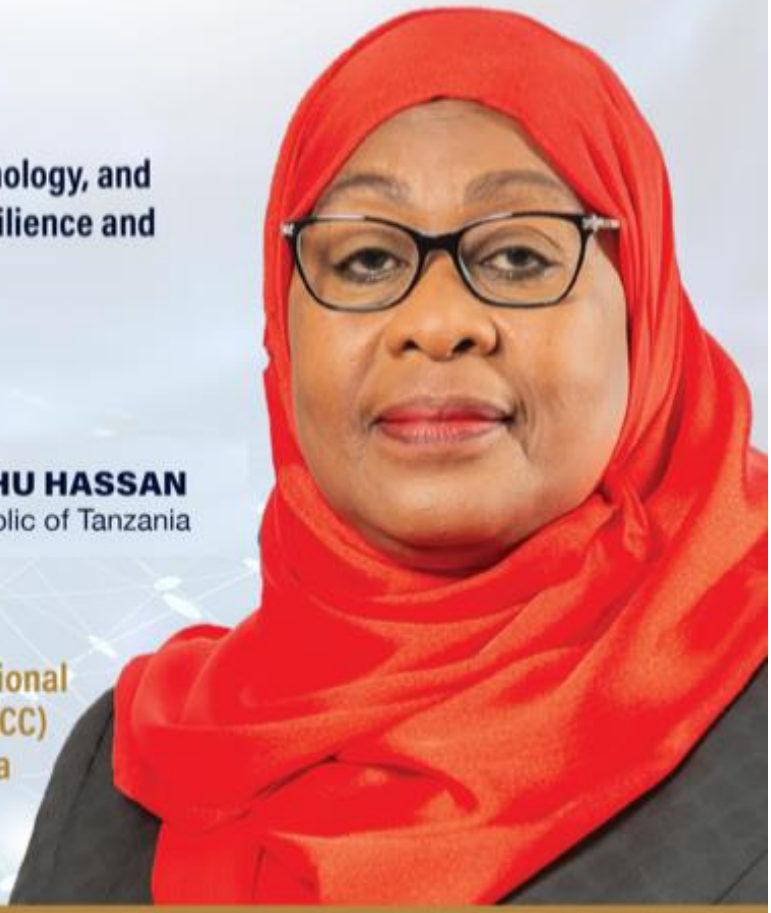
Julius Nyerere International Convention Centre (JNICC)
Dar es Salaam Tanzania.

# PROGRAM

# 9th STICE

DECEMBER 2nd – 4th 2024

Science, Technology and Innovation Conference & Exhibition



**THEME**

**Harnessing Science, Technology, and Innovation for Climate Resilience and Competitive Economy**

**GUEST OF HONOR**

**H.E DR. SAMIA SULUHU HASSAN**
President of the United Republic of Tanzania

Julius Nyerere International Convention Centre (JNICC)
Dar es Salaam Tanzania

9th STICE DECEMBER 2nd – 4th 2024

Science, Technology and Innovation Conference & Exhibition

# DAY 1

## MONDAY 2nd DECEMBER 2024

# DAY 1 : MONDAY 2nd DECEMBER 2024

9th STICE DECEMBER 2nd – 4th 2024
Science, Technology and Innovation Conference & Exhibition

| TIME | SESSION | RESPONSIBLE |
|---|---|---|
| 07:30 - 08:30 | **Participants Arrival and Registration** | Secretariat |
| 08:30 - 09:00 | **Arrival of Invited Leaders** | Secretariat |

| TIME | SELOUS HALL | RUAHA HALL | MIKUMI HALL | GOMBE HALL | UDZUNGWA HALL |
|---|---|---|---|---|---|
| | **Technical Symposia (Presentation of Research Papers)** | | | **Side Events (Invitees Only)** | **Side Events (Invitees Only)** |
| 09:00- 09:10 | Harnessing Technological and scientific innovation for competitive and inclusive economic growth | Climate Vulnerability Across Diverse Sectors | Leveraging STI and Indigenous Knowledge to Address Climate Change Challenges | | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| | **Moderator:** Dr. Harun Makandi<br><br>**Rapporteurs:** Ms. Hilda Lyatuu<br><br>Dr. Joseph Maziku | **Moderator:** Dr. Philbert Luhunga<br><br>**Rapporteurs:** Dr. Samson F. Kambona<br><br>Ms. Neema Tindamanyire | **Moderator:** Dr. Prosper Massawe<br><br>**Rapporteurs:** Mr. Clavery Makoti<br><br>Dr. Zebedayo Baniga | | |
| | **Annord Mwapinga**<br><br>Mathematical formulation for a stockpile combustion in analyzing the carbon dioxide emission and depletion of oxygen gas | **Ahmad Nyagongo**<br><br>Human activities and their impact on health condition of Lukosi River catchment using selected physico-chemical parameters as indicators of water quality | **Mohammed Amran**<br><br>Title: Assess-ment of baseline physicochemical qualities of synthe-sized bioplastics from Kappaphycus alvarezii seaweed for their packaging applications | | |
| 09:10- 09:20 | **Augustino Njowoka**<br><br>Automated Incinerator For Sanitary Pad Disposal. | **Rajabu Omary**<br><br>The Impacts of Anthropogenic Activities on the Physicochemical Water Quality of Pinyinyi River, Arusha-Tanzania | **Deodatus Stanley Kiriba**<br><br>Effectiveness of a homemade bio-pesticide in controlling pests of common bean (Phaseolus vulgaris L.) grown by smallholder farmers in Northern-Tanzania | | |

## DAY 1: MONDAY 2nd DECEMBER 2024

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| **09:20- 09:30** | **Juliana Machuve**<br><br>Unlocking the potential value of Intellectual Property Rights among Engineering students at the University of Dar es Salaam, Tanzania | **Sarah Sallanya**<br><br>Assessment of Water Quality and Community Perception on Cave Water at Shehia of Mangapwani in Unguja- Zanzibar: The Case of Mangapwani Historical Caves | **Anna Tesha**<br><br>Omega-6 and Omega-3 Fatty Acid Content of selected foods consumed by pregnant and breastfeeding women in Morogoro Municipality, Tanzania | | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| **09:30- 09:40** | **Happiness Joseph**<br><br>WhatsApp Usage in Higher Learning Education in Tanzania: A Boom and Boon Perspective | **Sartaz Begum**<br><br>Assessment of heavy metal contamination in vegetables in Dodoma: implications on human health . | **Jerome Gadi Kimaro**<br><br>Exploring the opportunities, challenges and the way forward for biomass briquettes in Tanzania | | |
| **09:40- 10:00** | **Discussion** | | | | |
| **10:00- 10:10** | **Hassan Ali**<br><br>Making sense of 'late hatching and unhatched eggs' in university business incubators. | **Elizabeth Olambo**<br><br>Interrelationship of Factors Affecting the Functional Response of Telenomus remus on Parasitism of Spodoptera frugiperda Eggs | **Jackline Martine**<br><br>Unlocking National Competitiveness through Knowledge Management | **Inter- Ministerial Dialogue on Industrial Linkage – MoEST** | |
| **10:10- 10:20** | **Happiness Joseph**<br><br>A Systematic Review of African Library Service Adoption in the Fourth Industrial Revolution | **George Makingi**<br><br>Community Health-Education Intervention Trial against Human Taenia solium Taeniasis/ Cysticercosis in Central and Southern Zones of Tanzania | **Joachim Madeni**<br><br>Evaluation of elite cashew hybrids developed in 1998 under the agro-ecological conditions of Nachingwea in Southern Tanzania | | |

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| **10:20- 10:30** | **Fred Peter**<br><br>Establishing the maturity level of Predictive maintenance 4.0 adoption for selected Tanzania manufacturing industries | **Nuria Majaliwa**<br><br>Pathogenicity of Sisal Brown Leaf Spot and Associated Fungal Species in Tanzania: A Multi-Site Investigation | **Alex Kiria**<br><br>Investigation of the Medicinal Potential of Culturable Marine Microalgae from the Dar Es Salaam Coastline | **Inter-Ministerial Dialogue on Industrial Linkage – MoEST** | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| **10:30- 10:40** | **Jerome Kimaro**<br><br>Briquettes from an invasive plant, Eleusian Jaegeri: A sustainable solution for rangelands health in Ngorongoro Conservation Area | **Novartus Marki**<br><br>Postharvest Quality Loss Causing Microorganisms of Tomato Fruits at Selected Market Segments in Dar es Salaam and Morogoro. | **Kazyoba, M. B.**<br><br>Assessing Farmer's Perception of Conservation Status of Agrobiodiversity in Selected Agroecological Zones of Tanzania | | |
| **10:40 -11:00** | **Discussion** | | | | |
| **11:10 – 11:55** | **Plenary Session at SELOUS HALL** | | **ALL** | | |
| | **Keynote Presentation:** Repositioning STI to Foster Industrial Linkages for Economic Transformation | | **Presenter:** Col. (retd) Joseph Leon Simbakalia | | |
| | **Reflection on Keynote Presentation** | | **Moderator:** Dr. Khadija Kweka - National Coordinator Private Sector Engagement and Industrial Linkage HEET project<br><br>**Discussants**<br>• Mr. Sitta Ng'walida - TATC Nyumbu<br>• Mr. Hussein Sufian – Bakhresa Group<br>• Mr. Edgar Masatu - UNCDF (Tanzania)<br>• Mr. Juma Mwampamba - Ministry of Industry and Trade<br>• CPA(T). Anthony Mzee Kasore - DG VETA | | |
| **12:00 – 13:00** | **LUNCH** | | **All** | | |
| **12:00 – 13:00** | **The Meeting for Development Partners Group at GOMBE HALL** | | **DPG & Invited Guests** | | |

# DAY 1 : MONDAY 2nd DECEMBER 2024

9th STICE DECEMBER 2nd – 4th 2024
Science, Technology and Innovation Conference & Exhibition

**OPENING CEREMONY**
**VENUE : SELOUS HALL**

**MC :** Mr. Shaban Kissu

**RAPPOTEURS :** Dr. Hulda Gideon
Dr. Rigobert Ngeleja
Mr. Merchades Rutechura

| TIME | SESSION | RESPONSIBLE |
|---|---|---|
| 12:50 – 13:00 | **Arrival of Participants** | Secretariat |
| 13:00 – 13:30 | **Arrival of Invited Guests** | Secretariat |
| 13:30 – 14:00 | **Arrival of the Guest of Honor** | Hon. Prof. Adolf Mkenda - Minister, MoEST |
| 14:00 – 14:15 | **Visit to Exhibitions** | Hon. Prof. Adolf Mkenda - Minister, MoEST |
| 14:15 – 14.20 | **National & EAC Anthems** | Brass Band |
| 14:20 - 14:25 | **Prayers** | CCT, TEC & BAKWATA |
| 14:25 - 14:30 | **Introduction of invited Guests and STICE Sponsors** | Prof. Makenya A. H. Maboko – Chairperson of the Commission, COSTECH |
| 14:30- 14:40 | **Profiling Scientists whose works have positively impacted the society** | Prof. Carolyne Nombo – Permanent Secretary, MoEST |
| 14:40- 14:45 | **Entertainment** | Mr. Peter Msechu |
| 14:45 - 14:50 | **Remarks from Regional Commissioner** | Hon. Albert Chalamila - Regional Commissioner Dar es salaam |
| 14:50 – 14:55 | **Remarks from Development Partners** | Hon. Tone Tinnes – Ambassador Norwegian Embassy |
| 14:55 – 15:00 | **Remarks from World Bank** | Mr. Nathan Belete - Country Director for Tanzania, Zambia, Malawi & Zimbabwe |
| 15:00 - 15:15 | **An Overview of STI landscape in Tanzania** | Dr. Amos M. Nungu - Director General, COSTECH |
| 15:15- 15:25 | **Remarks from Minister and Welcoming the Guest of Honor** | Hon. Prof. Adolf Mkenda - Minister, MoEST |
| 15:25 - 15:55 | **Speech from the Guest of Honor** | Guest of Honor |
| | • Launch of credit guarantee scheme to support commercialization of innovations | Guest of Honor |
| | • Award of Climate Research Grants to Researchers | Guest of Honor |
| 15.55 - 16:00 | **Group Photo** | MC |

## DAY 1 : MONDAY 2nd DECEMBER 2024

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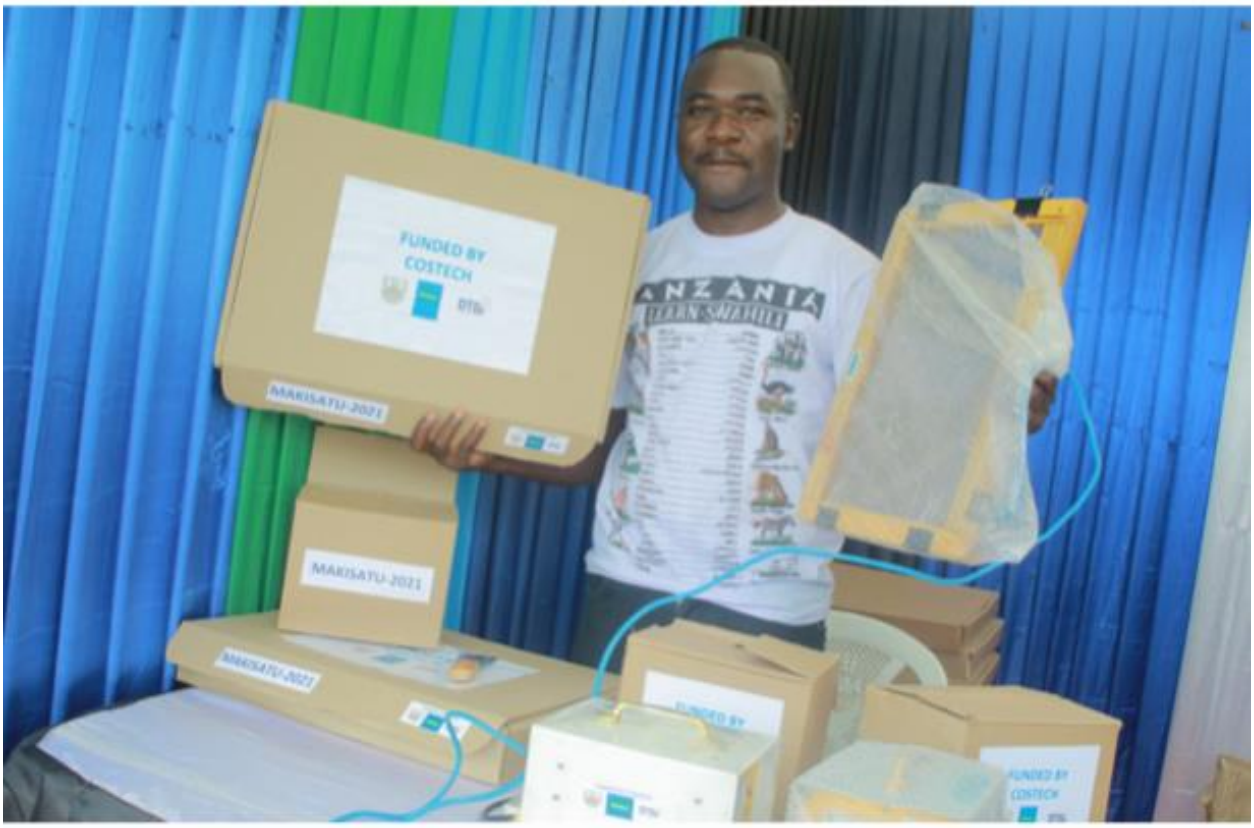
|---|---|---|
| 16.00 - 16:30 | EVENING TEA | ALL |
| 16:30 - 17:00 | Posters Presentations | |
| 09:00 - 17:00 | Exhibitions | |
| 17:00 | End of Day 1 | |



9th STICE DECEMBER 2nd – 4th 2024

Science, Technology and Innovation Conference & Exhibition

# DAY 2

## TUESDAY 3rd DECEMBER 2024

## DAY 2 : TUESDAY 3rd DECEMBER 2024

9th STICE DECEMBER 2nd – 4th 2024
Science, Technology and Innovation Conference& Exhibition

**FACILITATOR:** Dr. Bakari Msangi

| THEME: Harnessing STI for Climate Resilience and Competitive Economy | | |
|---|---|---|
| **RAPPOTEURS :** Dr. Philbert Luhunga<br>Ms. Neema Tindamanyire<br>Mr. Ntufye Mwakigonja | | |
| **TIME** | **SESSION** | **RESPONSIBLE** |
| **07:30 - 09:00** | **Participants Arrival, Registration & Breakfast** | Secretariat |
| **09:00 - 09:10** | **Recap of Day One** | **Dr. Bugwesa Katale** - Director for Research Coordination and Promotion - COSTECH |
| **09:10 – 10:00** | **Plenary Session I:**<br><br>**Keynote Presentation:** Leveraging STI and Indigenous or Traditional Knowledge for Food Security and Nutrition | **Presenter:** Prof. Joseph Ndunguru – DG TPHPA<br><br>**Moderator:** Prof. Khamis Malebo - UNESCO National Commission<br><br>**Discussants**<br>• Dr. Thomas Bwana - DG TARI<br>• Dr. Germana Henry Leyna - DG TFNC<br>• Prof. Joseph Otieno – ITM MUHAS<br>• Dr. Canius Kanangire – CEO AATF<br>• Mr. Sushil Mate - WFP |
| **10:00 – 10:50** | **Plenary Session II:**<br><br>**Keynote Presentation:** STI for Climate Change Resilient and Sustainable Bio-Economy | **Presenter:** Prof. Pius Yanda – IRA UDSM<br><br>**Moderator:** Dr. Julius Francis - UDSM<br><br>**Discussants**<br>• Prof. Dos Santos Silayo - Conservation Commissioner- TFS<br>• Dr. Ishmael Kimirei - DG TAFIRI<br>• Representative - Department of Environment VPO<br>• Representative -Tanzania Port Authority<br>• Dr. Makame O. Makame - Director Department of Marine Conservation, Ministry of Blue Economy- Zanzibar |
| **10:50 – 11:00** | **The state of the Fintech Policy and Regulatory (UNCDF) Environment in Tanzania UNCDF** | **Presenter:** Edgar Masatu, Innovation Analyst, UNCDF |

## DAY 2 : TUESDAY 3rd DECEMBER 2024

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| TIME | SELOUS HALL | RUAHA HALL | MIKUMI HALL | GOMBE HALL | UDZUNGWA HALL |
|---|---|---|---|---|---|
| 11:00- 11:10 | **Technical Symposia (Presentation of Research Papers)** | | | **Side Events** | |
| | Harnessing Technological and scientific innovation for competitive and inclusive economic growth | Climate Vulnerability Across Diverse Sectors | Leveraging STI and Indigenous Knowledge to Address Climate Change Challenges | **Blue Economy and Green Port Innovations** | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| | **Moderator:** Dr.Wilbert Manyilizu<br><br>**Rapporteurs:** Dr. Kulwa Kangeta<br><br>Ms. Selina Mchao | **Moderator:** Dr. Zebedayo Baniga<br><br>**Rapporteurs:** Ms. Hilda Lyatuu<br><br>Dr. Evordius Rulazi | **Moderator:** Ms. Hildegalda Mushi<br><br>**Rapporteurs:** Ms. Fatma Ubwa<br><br>Mr. Joseph Ndanu | | |
| | **Juliana Machuve**<br><br>Rethinking University-Technology Transfer Models for Effective Commercialization of Technologies and Innovations | **Musa Mpelwa**<br><br>The repercussions of mercury pollution: A reflection on human health, food security, and economic consequences with evidence from third-world countries | **Nsajigwa Mbije**<br><br>The status of coral reefs in Tanzania | | |
| 11:10- 11:20 | **Joram Ngilangwa**<br><br>Assessment of technology transfer practices from Higher Learning Institutions to Small and Medium Enterprises in Tanzania. | **Richard Madege**<br><br>Sympytum officinale and Moringa oleifera potential for management of stem wilt and spike shedding on pepper (Piper nigrum L.) | **Win Luhwago**<br><br>Factors Driving Participation in the Rice Export Markets by Rice Traders from Selected regions, Tanzania | | |

## DAY 2 : TUESDAY 3rd DECEMBER 2024

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| **11:20- 11:30** | **Joseph Joseph**<br><br>Improvement of Round Potato Productivity through the Use of a Simple Planter in Potato growing communities in Tanzania. | **Jackline Kiwango**<br><br>Isolation and Identification of Gut Bacteria of Honeybees and Stingless bees from Coastal Forests. | **Never Zekeya**<br><br>Assessing the role of Nature-based solution for Improving Agricultural Production and Biodiversity Conservation | **Blue Economy and Green Port Innovations** | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| **11:30- 11:40** | **Lawrence Kerefu**<br><br>Rethinking the Commercializa-tion Pathways of University Re-search Outputs in Tanzania | **Philbert Luhunga**<br><br>Projected changes in dimate extremes over Tanzania | **Hilda Sanga**<br><br>The use of comfrey (Symphytum spp) as soil amendment to improve growth of maize and amaranth vegetable | | |
| **11:40-12:00** | **Discussion** | | | | |
| **12:00-12:10** | **Mary James**<br><br>Anti-glossina Repellant Technology (A.R.T) | **Erick Christopher**<br><br>Effects of compositions of growth medium on multiplication of Napier grass (Pennisetum purpureum). | **Richard Madege**<br><br>Antifungal potential of comfrey leaf powder and liquid extract against Fusarium verticillioides and Aspergillus flavus phytopathogens | | |
| **12:10-12:20** | **Michael Matonya**<br><br>Object-Centric Process Mining for Industrial Safety Inspection and Quality Conformance Validation. | **Happyness Hurdson**<br><br>A Designed Framework on Perceived Privacy Preservation of Electronic Medical Records in Government Hospitals in Tanzania. | **Anna Mpanyakavili**<br><br>Solid Phase Extraction and Ultrasonic Assisted Extraction methods for determination of non-opioid analgesics in adulterated Herbal Medicines: A comparative LC-MS/MS study | | |

## DAY 2 : TUESDAY 3rd DECEMBER 2024

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|---|---|---|---|---|---|
| **12:20-12:30** | **Ramadhani Majubwa**<br><br>Comparative Efficiency of Innovative and Improved vs. Traditional Avocado Fruit Pickers: Sothern Highlands, Tanzania Experience | **Ben Kapela**<br><br>Climate change implications of electronic waste: strategies for sustainable management at Local Government in Tanzania. | **Anna Kibiki**<br><br>LC-MS/MS Detected Lower Values of Dexamethasone and Prednisolone in Powdered Herbal Medicines Sold in Tanzania | **Blue Economy and Green Port Innovations** | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| **12:30-12:40** | **Rebeca Kachembeho**<br><br>Unlocking Tanzania's Innovation Potential: A Systematic Review of the National Innovation Landscape | **Dorothea Deus**<br><br>Towards a climate smart community: A Web based GIS App for Multi-hazard Early Warning against Climate-based Disaster Risks | **Anthony Nyangarika**<br><br>Harmonizing Indigenous Knowledge and Cutting-Edge Tech: A Blueprint for Carbon-Neutral Energy | | |
| **12:40-13:00** | **Discussion** | | | | |
| **13:00 – 14.00** | **LUNCH** | | | | |
| **14:00-14:10** | **Wendy Mombo**<br><br>Adoption of Advanta Sunflower Hybrid Seeds and Its Well-Being Impact on Smallholder Farmers in Dodoma, Singida and Manyara Regions | **Kobusinge Aloys Nyabwisho**<br><br>Improving Crop Water-limited Productivity of Rainfed Maize in a Semi-Arid Catchment: Field Experiment and Modeling in Varied Soil Fertility and Climate Conditions. | **Hilda Sanga**<br><br>Enzyme activities and wheat growth response in soils amended with coal ash from the Uk and Tanzania. | | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| **14:10-14:20** | **Abdul Shaban Rajabu**<br><br>Digital Agriculture Transformation: Empowering Farmers for Inclusive Economic Growth in Tanzania | **Paulo Michael**<br><br>Uncovering spatiotemporal pattern of floods with Sentinel-1 synthetic aperture radar in major rice-growing river basins of Tanzania. | **Engelbert Wangabo**<br><br>Enhancing Gold Exploration in Tanzania through Remote Sensing Techniques Utilizing Google Earth Engine | | |

## DAY 2 : TUESDAY 3rd DECEMBER 2024

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| **14:20-14:30** | **Lupakisyo Mwakyusa**<br><br>Screening of potential donors for anaerobic stress tolerance during germination in rice | **Livingstone Swilla**<br><br>Evaluating the Effectiveness of Low-Impact Development Practices in Mitigating Runoff Floods in the Kinyerezi River Catchments in Dar es Salaam, Tanzania. | **Martinus Sospeter**<br><br>A Systematic Review of Indigenous Climate Knowledge in East Africa | | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| **14:30-14:40** | **Jacqueline Majuva**<br><br>Determination of Farmers Willingness to Pay for Improved Maize seeds in Morogoro using Field Experiment | **Jordan Hossea**<br><br>Analytical design of a portable surface plasmon resonance sensor by using a divergence beam for measuring multiple heavy metals and other contamination simultaneously | **Petro Mwamlima**<br><br>Enhancing effective faecal sludge management in urban settings: Stakeholder engagement and network mapping in Arusha City, Tanzania | | |
| **14:30-15:00** | **Discussion** | | | | |
| **Resilient System for Food Safety and Security (productive sectors)** | | | | | |
| **15.00 -15.10** | **Moderator:**<br>Dr. Beatrice Lyimo<br><br>**Rapporteurs:**<br>Ms. Joanitha Balema<br><br>Eng. Faraji Katabaro | **Moderator:**<br>Dr. Harun Makandi<br><br>**Rapporteurs:**<br>Mr. Festo Maro<br><br>Ms. Erica Nkonoki | **Moderator:**<br>Eng. Mashuhuri Mwinyihamisi<br><br>**Rapporteurs:**<br>Ms. Adeline Ajuaye<br><br>Ms. Minza Tukuchele | | |
| | **Adriano John Mvile**<br><br>Genotype x Environment Interaction of Selected Common Bean (Phaseolus vulgaris L.) Genotypes for Fe and Zn concentrations | **Ramadhani Majubwa**<br><br>Pepper (Piper nigrum L.) Harvest and Postharvest Handling Practices used by Smallholder Farmers in Morogoro District, Tanzania | **Joseph A. Leonard**<br><br>Impacts of Gibberellic acid (ga3) on growth and yield of green beans (Phaseolus vulgaris l.) in Northern Tanzania | | |

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| 15:10 -15:20 | **Anthony M. Bujiku**<br><br>Impact of Groundnut (Arachis hypogea L.) Genotypes as an oil crop in the venture of leveraging scarcity of oil in the country in Three Agro-ecological Zones | **Edith Kadege**<br><br>Characterization of phenotypic traits associated with anthracnose resistance in selected common bean (Phaseolus vulgaris L.) breeding material | **Kuan-Ting Hsin**<br><br>Insight into the Phylogeny and Binding Ability of WRKY Transcription Factor | | **National Meeting on IP Journey of the young Innovators of Tanzania** |
| 15:20- 15:30 | **Hellen Kanyagha**<br><br>Anaerobic Soil disinfestation as a Potential Management Strategy for Bacterial Wilt in Tomatoes | **Geofrey Sikazwe**<br><br>Predicting the current and future suitability and expansion of cassava brown streak disease in cassava platations in Africa | **Dwasi Matondo**<br><br>Effect of shoot let size and rooting medium in multiplication of cassava planting material | | |
| 15:30- 15:40 | **Hellen Kanyagha**<br><br>Potential of Host Resistance as Important Tool in the Management of Bacterial Wilt in Tomatoes | **Eliasy W. Sawe**<br><br>Comparative of Storage Conditions on the Post -Harvest Losses and Quality of Tomato (Lycopersicon esculentum L.) Fruits | **Florens C. Kifyoga**<br><br>Enhancing Cassava Disease Detection Using CNN Models Trained from Scratch: A Comparative Study with Transfer Learning Approaches | | |
| 15:40 -16:00 | **Discussion** | | | | |
| 16:00 -17:00 | **Poster Presentations** | | | | |
| 09:00- 17:00 | **Exhibitions** | | | | |
| 17:00- | **End of Day 2** | | | | |

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# DAY 3

## WEDNESDAY 4th DECEMBER 2024

## DAY 3 : WEDNESDAY 4th DECEMBER 2024

9th STICE DECEMBER 2nd – 4th 2024
Science, Technology and Innovation Conference & Exhibition

**MC:** Mr. Shaban Kissu

| THEME: Harnessing STI for Climate Resilience and Competitive Economy | | |
|---|---|---|
| **RAPPOTEURS :** Dr. Haruni Makandi<br>Mr. Clavery Makoti<br>Mr. Festo Maro | | |
| **TIME** | **SESSION** | **RESPONSIBLE** |
| **07:30 - 09:00** | **Participants Arrival, Registration & Breakfast** | Secretariat |
| **09:00- 09:05** | **Recap of Day Two** | **Dr. Athuman Mgumia** - Director of the Centre for Development and Transfer of Technology - COSTECH |
| **09:05- 09:50** | **Plenary Session I:**<br><br>**Keynote Presentation:** : Advancing Open Science for a Knowledge-Driven Society and Sustainable STI Resource Governance in Tanzania | **Keynote Presentation:** Prof. Joel Mtebe - DVC ARC MJNUAT<br><br>**Moderator:** Dr. Hassan Mshinda - Former Director General COSTECH<br><br>**Discussants**<br>• Prof. Peter Msoffe – Director of Higher Learning MoEST<br>• Prof. Edda T. Lwoga – Rector CBE<br>• Dr. Julius Keyyu - TAWIRI<br>• Dr. Abdulrahim Ali- SUZA<br>• Cde. Vitumbiko Chinoko – Manager OFAB Africa |
| **09:50 - 10:35** | **Plenary Session II:**<br><br>**Keynote Presentation:** Advancing STEM Education for Competitive Future Generations | **Presenter:** Prof. Najat K. Mohammed - DG TAEC<br><br>**Moderator:** Prof. Simon Msanjila - UDOM<br><br>**Discussants**<br>• Prof. Nuhu Hatib Executive Chairman AfricAcademy-Arusha Science<br>• Sylvester E. Rugeihyamu - Head Department Mathematics UDSM<br>• Mr. Jumanne Mtambalike CEO-Sahara Venture<br>• Ms. Asya Issa - MoE Zanzibar<br>• Representative - TET |
| **10:35 – 10:55** | An Overview on National Information System for Science, Technology & Innovation (NISSTI) | Mr. Daudi Mboma - Ag. Director -Directorate of Knowledge Management - COSTECH |

## DAY 3 : WEDNESDAY 4th DECEMBER 2024

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Science, Technology and Innovation Conference & Exhibition

| TIME | SELOUS HALL | RUAHA HALL | MIKUMI HALL | GOMBE HALL |
|---|---|---|---|---|
| 11:00- 11:10 | **Technical Symposia (Presentation of Research Papers)** | | **Side Events** | |
| | Resilient System for Food Safety and Security (productive sectors) | Fostering STEM Education for resilient, competitive, and sustainable economic growth | **Awareness Workshop on Research and Innovation Frameworks** | **Meeting for the Next Gen Philanthropists (Closed)** |
| | **Moderator:** Dr. Erasto Mlyuka<br><br>**Rapporteurs:** Dr. Prosper Massawe<br><br>Dr. Deogracious Protas | **Moderator:** Dr. Gerald Kafuku<br><br>**Rapporteurs:** Ms. Bestina Daniel<br><br>Dr. Samson F. Kambona | | |
| | **Sartaz Begum**<br><br>Assessment of heavy metal contamination in vegetables in Dodoma: implications on human health. | **Davina Kanan**<br><br>Empowering tomorrow's innovators :the Role of generation tech space in fostering STEM education for economic development | | |
| 11:10- 11:20 | **Proscovia Kamugisha**<br><br>Economic potentials of hydroponics fodder Farming to reduce income poverty and food Insecurity among Tanzania's smallholder dairy Farmers. | **Jimmy E. Kihwele**<br><br>Inconspicuous Practices that Discourage Students from Taking STEM Subjects in Secondary Schools: Analysis of Teachers and Students Experiences | | |
| 11:20- 11:30 | **Proscovia Kamugisha**<br><br>Economic Analysis of Broiler Production using Black Soldier Flies Larvae Meals in Tanzania | **Aron Kondoro**<br><br>Developing a User-Centric LMS Dashboard for Tanzanian Primary Schools: A Combined SCRUM and HCD Approach | | |

## DAY 3 : WEDNESDAY 4th DECEMBER 2024

9th STICE DECEMBER 2nd – 4th 2024
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|---|---|---|---|---|
| **11:30- 11:40** | **Regan Nyoni**<br><br>Enhancing Biocontrol Efficiency of Key Isolated Entomopathogenic Fungi against Spodoptera frugiperda (J.E. Smith) in Maize Crops | **Moabu Chandafa**<br><br>Supportive strategies to foster Technology Integration in the Classroom: A case of Iringa Municipality Secondary Schools | **Awareness Workshop on Research and Innovation** | **Meeting for the Next Gen Philan-thropists (Closed)** |
| **11:30- 11:40** | **Discussion** | | | |
| **12:00 - 12:10** | **Kefrine Kennedy Lutambi**<br><br>Seedling Stage Phenotypic Screening for Salinity Tolerance in Rice Genotypes from Eastern and Southern Africa | **Michael Nicodemus**<br><br>Supportive strategies to foster Technology Integration in the Classroom: A case of Iringa Municipality Secondary Schools | | |
| **12:10 - 12:20** | **Martin Komba**<br><br>Efficiency of rice production in Kilombero-Tanzania using stochastic profit frontier model: Farming household as a unit of analysis. | **Zebedayo Kyomo**<br><br>Constructionist Learning Environment as a key Resource for fostering critical soft skills development among students through STEM Education in Tanzania | | |
| **12:20 -12:30** | **Rashid Suleiman**<br><br>Effects of storage conditions and packaging materials on physico- chemical, sensory and microbial properties and shelf-life of extruded and non-extruded nutritious composite flour | **Seleman Chisibho Mafuru**<br><br>The adoption of Digital School Based Assessment tool for improved Teaching and Learning Standard Two pupils in Primary Schools of Songwe Region, Tanzania | | |
| **12:30 – 12:40** | **Amina Ahmed**<br><br>Cost-benefit analysis of fruit blended yoghurt in Mbeya City, Tanzania | **Salome Maro**<br><br>Harnessing AI for Automatic Generation of Multimedia Enhanced Educational Content | | |
| **12:40 – 13:00** | **Discussion** | | | |
| **9:00 - 13:00** | **Posters Presentations and Exhibitions** | | | |
| **13:00 - 14:00** | **LUNCH** | | | |

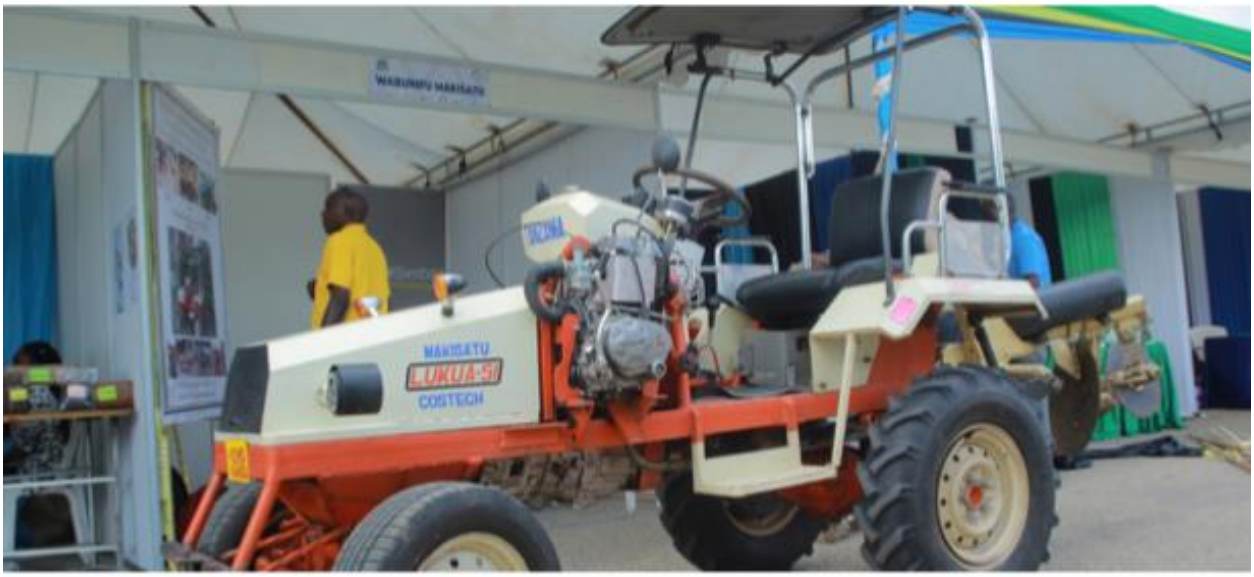
## DAY 3 : WEDNESDAY 4th DECEMBER 2024

**CLOSING CEREMONY**
**VENUE : SELOUS HALL**

**MC :** Mr. Shaban Kissu

**RAPPOTEURS :** Dr. Hulda Gideon
Dr. Rigobert Ngeleja
Mr. Merchades Rutechura

| TIME | SESSION | RESPONSIBLE |
|---|---|---|
| 14:00 - 14:10 | **Arrival of the Guest of Honor** | Dr. Amos Nungu - Director General COS-TECH |
| 14:10 – 14:30 | **Visiting the Exhibitions** | Dr. Amos Nungu - Director General COS-TECH |
| 14:30 - 14:40 | **A word from COSTECH** | Dr. Amos Nungu - Director General COSTECH |
| 14:40 - 14:55 | **Deliberations from STICE Conference** | Prof. Carolyne Nombo – Permanent Secretary, MoEST |
| 14:55 - 15:10 | **Speech from the Guest of Honor** | Hon. Dr. Ashatu Kijaji - Minister of State Vice President's Office (Union and Environment) |
| | **Presenting Certificates to the Keynote Presenters** | Hon. Dr. Ashatu Kijaji - Minister of State Vice President's Office (Union and Environment) |
| 15:10 – 16:30 | **Group Photo** | MC |
| 16:30 - | **End of the STICE 2024 Event** | |



## Tanzania National Anthem

Mungu Ibariki Afrika,
Wabariki Viongozi Wake,
Hekima, Umoja na Amani
Hizi ni Ngao Zetu,
Afrika na Watu Wake.
Ibariki, Afrika,
Ibariki, Afrika,
Tubariki, Watoto wa Afrika,

Mungu Ibariki Tanzania,
Dumisha Uhuru na Umoja,
Wake kwa Waume na Watoto,
Mungu, Ibariki,
Tanzania na Watu Wake
Ibariki, Tanzania,
Ibariki, Tanzania,
Tubariki, Watoto wa Tanzania

## EAC Anthem

Ee Mungu twaomba ulinde
Jumuiya Afrika Mashariki
Tuwezeshe kuishi kwa amani
Tutimize na malengo yetu.

***Chorus***
Jumuiya Yetu sote tuilinde
Tuwajibike tuimarike
Umoja wetu ni nguzo yetu
Idumu Jumuiya yetu.

Uzalendo pia mshikamano
Viwe msingi wa Umoja wetu
Natulinde Uhuru na Amani
Mila zetu na desturi zetu.

Viwandani na hata mashambani
Tufanye kazi sote kwa makini
Tujitoe kwa hali na mali
Tuijenge Jumuiya bora.

9th STICE DECEMBER 2nd – 4th 2024

Science, Technology and Innovation Conference & Exhibition

Tanzania Commission for Science and Technology (COSTECH)
P.O. Box 4302, Ali Hassan Mwinyi Road, Kijitonyama (Sayansi)
COSTECH Building, Dar es Salaam.

Appendix II: Institutions Recorded to Attend the 9th STICE Event

**Table 7: Ambassadors who attended the event**

| NO | COUNTRY | NAME |
|---|---|---|
| 1 | Arab Republic of Egypt | H.E. Mr. Sherif Abdehamid Ismail |
| 2 | Republic of the Sudan | H.E. Mr. Asim Mustafa Ali |
| 3 | Counsellor of Zimbabwe | H.E. Rangarirai G. Chikwizo |
| 4 | Counsellor of Zimbabwe | H.E. Chris Masocha |
| 5 | Russian Embassy-First Secretary | H.E. Mr. Nikita Rassokhin |
| 6 | Russian Embassy-Third Secretary | H.E. Mr. Georgy Glavatskikh |
| 7 | South African High Commissioner | H.E. Ms Noluthando Mayende-Malepe) |
| 8 | Brazil Ambassador | H.E Gustavo Martins Nogueira |
| 9 | Embassy of Sweden-Program Manager for Research | H.E. Dr. Eva Ohlsson |
| 10 | Embassy of Algeria | H.E. Ahmed Djellal |
| 11 | Embassy of Finland-Counsellor Forestry and Innovation | H.E. Ms. Sanna-Liisa Taivalmaa |
| 12 | Norwegian Ambassador | H.E. Tone Tinnes |
| 13 | Norwegian Embassy Officer | Guro Glavin |

| | | |
|---|---|---|
| 14 | Norwegian Embassy Officer | Yassin Mkwizu |
| 15 | Norwegian Embassy Officer | Gladys Mkuchu |
| 16 | Norwegian Embassy Officer | Grete Benjaminsen |
| 17 | Ambassador Republic of Korea | H.E. Ms. Ahn Eunju |
| 18 | Pakistan | |
| 19 | Indonesia | H. E. Michael Bastian Supit |
| 20 | Ambassador Ethiopia Embassy | H. E. Fekadu Beyene Ayna |
| 21 | Ambassador Somali Government | H. E. Ilyas Ali Hassan |
| 22 | Second Secretary Embassy of Somali | Abdiwali Jibril Hassan |
| 23 | Rwanda Embassy | H.E. Gen. Patrick Nyamvumba |
| 24 | Ambassador of Oman | H. E. Saud Al Shidhan |

**MINISTERS AND DEPUTY MINISTERS**

**Table 8: Ministers and Deputy Ministers who attended the event**

| **NO** | **MINISTRY** | **NAME** |
|---|---|---|
| 1 | Minister of Education, Science, and Technology | Hon. Prof. Adolf Mkenda |
| 2 | Minister of Communication and Information Technology | Hon. Jerry Silaa |
| 3 | Minister of Education and Vocation Training Zanzibar | Hon. Lela Muhamed Mussa |

## PERMANENT SECRETARIES AND DEPUTY PERMANENT SECRETARIES

### Table 9: Permanent Secretaries and Deputy Permanent Secretaries

| NO | MINISTRY | NAME |
|---|---|---|
| 1 | Permanent Secretary Ministry of Education, Science, and Technology | Prof Caroline Nombo |
| 2 | Permanent Secretary Ministry of Information, Culture, Arts, and Sports | Gerson Msigwa |
| 3 | Deputy Permanent Secretary Ministry of Education, Science, and Technology | Prof Daniel Mushi |
| 4 | Deputy Permanent Secretary Presidents' Office Regional Administration and Local Government | |

## HIGH LEARNING INSTITUTIONS (HLIs) AND RESEARCH AND DEVELOPMENT INSTITUTIONS

### Table 10: HLI and R&D Institutions

| NO | NAME |
|---|---|
| 1 | University of Dar es Salaam (UDSM) |
| 2 | University of Dodoma (UDOM) |
| 3 | Sokoine University of Agriculture (SUA) |
| 4 | Ardhi University (ARU) |
| 5 | Muhimbili University of Health and Allied Sciences (MUHAS) |

| | |
|---|---|
| 6 | Open University of Tanzania (OUT) |
| 7 | Mzumbe University (MU) |
| 8 | Dar es Salaam University College of Education (DUCE) |
| 9 | Mkwawa University College of Education (MUCE) |
| 10 | State University of Zanzibar (SUZA) |
| 11 | Zanzibar University (ZU) |
| 12 | Mbeya University of Science and Technology (MUST) |
| 13 | Nelson Mandela African Institute of Science and Technology (NM-AIST) |
| 14 | Moshi Cooperative University (MoCU) |
| 15 | Mwalimu Julius K. Nyerere University of Agriculture and Technology (Butiama) |
| 16 | Mbeya University of Health and Allied Sciences (MCHAS) |
| 17 | St. Augustine University of Tanzania (SAUT) |
| 18 | Catholic University of Health and Allied Sciences (CUHAS) |
| 19 | Mwenge Catholic University (MWECAU) |
| 20 | St. John's University of Tanzania (SJUT) |
| 21 | University of Iringa (UoI) |
| 22 | Aga Khan University (AKU) |
| 23 | Tumaini University Makumira (TUMa) |
| 24 | Ruaha Catholic University (RUCU) |
| 25 | Teofilo Kisanji University (TEKU) |
| 26 | Stefano Moshi Memorial University College (SMMUCo) |

| | |
|---|---|
| 27 | Muslim University of Morogoro (MUM) |
| 28 | Mount Meru University (MMU) |
| 29 | Kilimanjaro Christian Medical University College (KCMC) |
| 30 | Kairuki Memorial University (KU) |
| 31 | University of Arusha (UoA) |
| 32 | Kampala International University in Tanzania (KIUT) |
| 33 | United African University of Tanzania (UAUT) |
| 34 | Mwanza University (MzU) |
| 35 | Catholic University of Mbeya (CUoM) |
| 36 | Tumaini University Dar es Salaam College (DarTU) |
| 37 | Abdulrahman Al-Sumait University (SUMAIT) |
| 38 | National Institute of Transport |
| 39 | Dar es Salaam Institute of Technology |
| 40 | College of Business Education |
| 41 | Tanzania Institute of Accounts |
| 42 | Institute of Accountancy Arusha-IAA |
| 43 | IFM |
| 44 | ATC - Arusha Technical College |
| 45 | Zanzibar Livestock Research Institute |
| 46 | Tanzania Agricultural Research Institute |

| | |
|---|---|
| 47 | TEMDO |
| 48 | Tanzania Automative Technology Centre |
| 49 | CARMATEC |
| 50 | TAFORI |
| 51 | TIRDO |
| 52 | ZAFIRI |
| 53 | ZAHRI |
| 54 | TALIRI |
| 55 | ZARI |
| 56 | TAFIRI |

## PROFESSIONAL ASSOCIATIONS

### Table 11: Professional Associations

| NO | NAME |
|---|---|
| 1 | Biotechnology Society of Tanzania (BST) |
| 2 | Entomological Society of Tanzania (TES) |
| 3 | Crop Science Association of Tanzania (CROSAT) |
| 4 | Tanzania Academy of Science (TAAS) |

## REGULATORY AUTHORITIES

### Table 11: Regulatory Authorities

| NO | NAME |
|---|---|
| 1 | Bank of Tanzania (BOT), Tanzania Revenue Authority (TRA) |
| 2 | Fair Competition Commission (FCC), |
| 3 | Tanzania Communications Regulatory Authority (TCRA), |
| 4 | Energy and Water Utilities Regulatory Authority (EWURA), |
| 5 | Tanzania Civil Aviation Authority (TCAA), |
| 6 | Tanzania Food and Drugs Authority (TFDA), |
| 7 | Occupational Safety and Health Authority (OSHA) |
| 8 | National Environment Management Council (NEMC) |
| 9 | Capital Markets and Securities Authority (CMSA) |
| 10 | Tanzania Bureau of Standards (TBS), |
| 11 | Tanzania Insurance Regulatory Authority (TIRA), |
| 12 | Surface and Marine Transport Regulatory Authority (SUMATRA), |
| 13 | Tanzania Medicine and Medical Devices Authority (TMDA), |
| 14 | Business Registrations and Licensing Agency (BRELA), |

| | |
|---|---|
| 15 | Tanzania Atomic Energy Commission (TAEC), |
| 16 | National Construction Council (NCC), |
| 17 | Tanzania Commission for Universities (TCU), |
| 18 | Tanzania Institute of Education (TIE), |
| 19 | National Examination Council of Tanzania (NECTA), |
| 20 | Higher Education Students' Loans Board (HESLB), |
| 21 | Vocational Education and Training Authority (VETA), |
| 22 | Information Communication Technology Commission (ICTC), |
| 23 | National Bureau of Statistics (NBS), |
| 24 | Government Chemist Laboratory Authority (GCLA), |
| 25 | National Council for Vocational Education and Training (NACTVET), |
| 26 | National Identification Authority (NIDA), |
| 27 | Registration, Insolvency, and Trusteeship Agency (RITA), |
| 28 | e-Government Authority (eGA), |
| 29 | Tanzania Forest Services (TFS), |
| 30 | Tanzania Wildlife Authority (TAWA), |
| 31 | National Social Security Fund (NSSF), |

| | |
|---|---|
| 32 | Tanzania Ports Authority (TPA), |
| 33 | Public Service Social Security Fund (PSSSF), |
| 34 | Workers' Compensation Fund (WCF), |
| 35 | Tanzania Social Action Fund (TASAF), |
| 36 | National Health Insurance Fund (NHIF), |
| 37 | Tanzania Employment Services Agency, |
| 38 | Rural Energy Agency (REA), |
| 39 | Tanzania Petroleum Development Corporation (TPDC), |
| 40 | Renewable Energy Association (TAREA), |
| 41 | Tanzania Electrical, Mechanical and Services Agency (TEMESA), |
| 42 | Tanzania Meteorogical Authority (TMA) |
| 43 | Tanzania Meteorogical Authority (TMA) |

**EXHIBITORS**

**Table 12: Exhibitors**

| NO | NAME | INNOVATION PROJECT |
|---|---|---|
| 1 | Mohamed Salim Suleiman & Tawiell Daniel Mchome | AKILI HUB Project at SADG Co. LTD ARUSHA<br>Learning Tools for Primary and Secondary School Students |

| | | |
|---|---|---|
| 2 | Patrick Chacha | Elimunity is an educational program designed to enhance school academic activities through collaboration between parents, teachers, and students |
| 3 | Maria Mabugo | Convert kitchen waste into protein feed for chickens and fertilizer through black soldier flies and larvae farming |
| 4 | Dauson Malela | Rafiki Planter is a simple motorized planter designed to help smallholder farmers in sowing cotton, maize and sunflower seeds in recommended space. |
| 5 | Rafia Ally Rajab | Marketing information system designed to carter SMEs business management services particularly on sales and marketing. |
| 6 | Wilbroad Nyirenda | Prepaid Water Meters are smart digital-based water meters that bridged the gap of information between service providers and users (customers). This creates an accountability for all hence imrpovement of infrastructures and revvenue collection. |
| 7 | Patrick Kitosi | Developing the Bee Venom Sensor machine to support beekeepers on harvesting bee venom for pharmaceutical market |
| 8 | Aginiwe Kusiluka | SmartDarasa is a next-generation learning platform helping students understand the reality and practicality of things they learn in STEM subjects using the smartDarasa 9app and website utilising 3D & AR technology. |

| | | |
|---|---|---|
| 9 | Willium Elia | Shuleyetu.com is a digital education platform created a room of partnership between parents and teachers in nurturing their children with a top desire to narrow the education gap in Africa by improving the quality of education of boys and girls living in vulnerable backgrounds. |
| 10 | Festo Mwangungulu | Safi Technologies: - Providing a system for pre-paid payment for water meters in society, allowing users to have access to water 24/7 by adding funds through mobile money. |
| 11 | Paschal Kija | Mkanda Salama, refers to the 'Safe Wrap', it is a belt-like garment designed to be wrapped around the abdomen, below the umbilicus, to compress the uterus and possibly provide minimal compression to the abdominal aorta. The Mkanda Salama solution is designed to arrest active bleeding in cases of postpartum hemorrhage (PPH), |
| 12 | David Kazuguri | Climate Smart Crop Nutrition Solutions: HALISI - Bio NPK Fertilizer and NURU - Bio NPK Liquid Booster, cost-effective and eco-friendly agro-inputs derived from waste and eco-formulations. |
| 13 | Asaad Aziz Mohamed | Go-Safe Water Purifier is a System that helps households, institutions and companies to access safe drinking water. |
| 14 | David Dennis | A method of Manufacturing Amino Acid and liquid fertilizer from human hair waste |

| | | |
|---|---|---|
| 15 | Sussack Mbulu | A JET SPRINKLER IRRIGATION DEVICE |
| 16 | Alfred Ngullo | Formulation of Mosquito Repellent and Air freshener and Manufacturing method |
| 17 | Eng. Patrick Kivanda | Solar-heated Air System |
| 18 | Eng. Honest Lyaruu | Optimized Oil Refinery Process |
| 19 | George Nyahende | Combined Slicing and drying machine |
| 20 | Lucas Mgassa | Poultry Brain System for poultry farming |
| 21 | Said Abeid | Manufacturing Process Of Paving Tiles From Recycled Abandoned Industrial And Municipal Solid Wastes |
| 22 | Antonio Bairo | Honey Growth And Ripeness Monitoring System |
| 23 | Florence Sakaya | 3D printing machine for learning |
| 24 | Mr. Mtanga | Polymachinery |
| 25 | George Buchafwe | Palm Oil Processing and Value Addition Machines |
| 26 | TIRDO | Clean cooking energy sources |
| 27 | Prof. Manji - MUHAS | Prominent Scientist showcasing awards and his research works |
| 28 | Prof. Misinzo - SUA | Prominent Scientist showcasing awards and his research works |

| | | |
|---|---|---|
| 29 | BRELLA | Services offered |
| 30 | eGA | Services offered |
| 31 | Sahara Venture | Services offered |
| 32 | TCRA | Services offered |
| 33 | TPA | Services offered |

**INDUSTRIAL PARTNERS**

**Table 12: Industrial Partners**

| **NO** | **NAME** |
|---|---|
| 1 | CRDB |
| 2 | TPA |
| 3 | TTCL |
| 4 | BAKHRESA GROUP OF COMPANIES |
| 5 | eGA |
| 6 | TPA |
| 7 | TCRA |