STUDENT SUMMIT 2025

SUMMIT PROGRAM AND ABSTRACT

Bridging Young Researchers with SDGs

February 14th ~ 20th 2025

Organized by the student organizing committee for UU-A Summit 2025 in conjuction with the 7 partner universities

Bridging Young Researchers with the SDGs

UU-A STUDENT SUMMIT 2025

- Proceedings-

February 14th-20th, 2025

Organized by the Organizing Committee for UU-A Student Summit 2025 in Conjunction with 7 Partner Universities

- Utsunomiya University (Japan): UU
- Jomo Kenyatta University of Agriculture and Technology (Kenya): JKUAT
- Meru University of Science and Technology (Kenya): MUST
- Addis Ababa University (Ethiopia): AAU
- University of Dar es Salaam (Tanzania): UDSM
- Nelson Mandela Africa Institution of Science and Technology (Tanzania): NM-AIST
- University of Ghana (Ghana): UG

Inter-University Exchange Project

Support for the Formation of Collaborative Programs with African Universities

Programme for Developing Human Resource to Contribute to SDGs by Merging African Potential and Japanese Scientific Technology

Printed in Japan.

Inter-University Exchange Project Promotion
Center for International Exchange
Utsunomiya University
350 Mine-machi, Utsunomiya 321-8505, JAPAN

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PREFACE

The 2025 UU-A Student Summit was held from14th to 20th February 2025. The summit brought together 7 partner universities, that is; Jomo Kenyatta University of Agriculture and Technology, Kenya, Meru University of Science and Technology (Kenya), Addis Ababa University (Ethiopia), University of Dar es Salaam (Tanzania), Nelson Mandela African Institution of Science and Technology (Tanzania), University of Ghana (Ghana), and Utsunomiya University (Japan). Due to differences in time zones, the summit was held virtually in on-demand time, which was complemented by online interactions for comments and Q&A sessions.

The theme of this summit was "Bridging Young Researchers with Sustainable Development Goals (SDGs)." The summit had a total of 57 presenters from 7 different fields of study which included; Agriculture & Environmental Science (9), Food Science & Nutrition (12), Microbiology & Biotechnology (12), Health & Medical Sciences (4), Social Sciences & Humanities (10) and Engineering & Technology (10).

The summit concluded on a very exciting note with the best presenters recognized. We hope that the summit was not only informative but also inspiring. It was a wonderful showcase of the ways science, technology, innovation and collaboration contribute towards attaining the 17 SDGS.

We greatly appreciate all the participants for making the event vibrant and interactive.

Student Organizing Committee

Message from the President of Utsunomiya University

On behalf of Utsunomiya University, I am very delighted to welcome you to participate to this Student Summit.

This Student Summit is a part of Utsunomiya University Inter-Exchange Project, named “Developing Human Resource to Contribute to SDGs by Merging African Potential and Japanese Scientific Technology”, funded by Ministry of Education, Culture, Sports, Science and Technology of Japan.

In Japan, the original project, Inter-University Exchange Project, was started in 2011 with the aim of supporting efforts for international educational cooperation with universities in the target countries and regions. Utsunomiya University was adopted in 2020 with the six universities of Jomo Kenyatta University of Agriculture and Technology and Meru University of Science and Technology in Kenya, Addis Ababa University in Ethiopia, University of Dar es Salaam and Nelson Mandela African Institution of Science and Technology in Tanzania, and University of Ghana.

Our program is aimed to develop human resource who can promote sustainable development based on the potential and social structure of local communities in Japan and Africa. They can contribute to the sustainable development of Africa and Japan.

This is the fourth year of the program, and all programs have been expanded in scale from the previous year. We have offered online intensive courses for over 300 students of seven universities last September and undertook five international symposiums for around 300 researchers, students, and the public. We sent 7 students of Utsunomiya University to Jomo Kenyatta University of Agriculture and Technology and Meru University of Science and Technology in February. In addition, three faculty members and 6 graduate students from six African universities were accepted to Utsunomiya University in March.

This Student Summit is the conference where overseas master's students gather and make presentations about their research in relation to the perspective of SDGs. By February 3rd, 26 students from seven universities submitted presentation videos online. Between Feb 14th and 20th, the uploaded presentation videos were checked and evaluated by the researchers of seven universities, and, the evaluated presentations were honored.

I would like to congratulate each and every one of the students who worked hard and presented their research. The project will end this year, but plans are currently underway to continue the project into next fiscal year and beyond. I hope that partnerships between universities in African countries and Japan will continue to be strengthened.

Thank you very much again for joining and collaborating in this program.

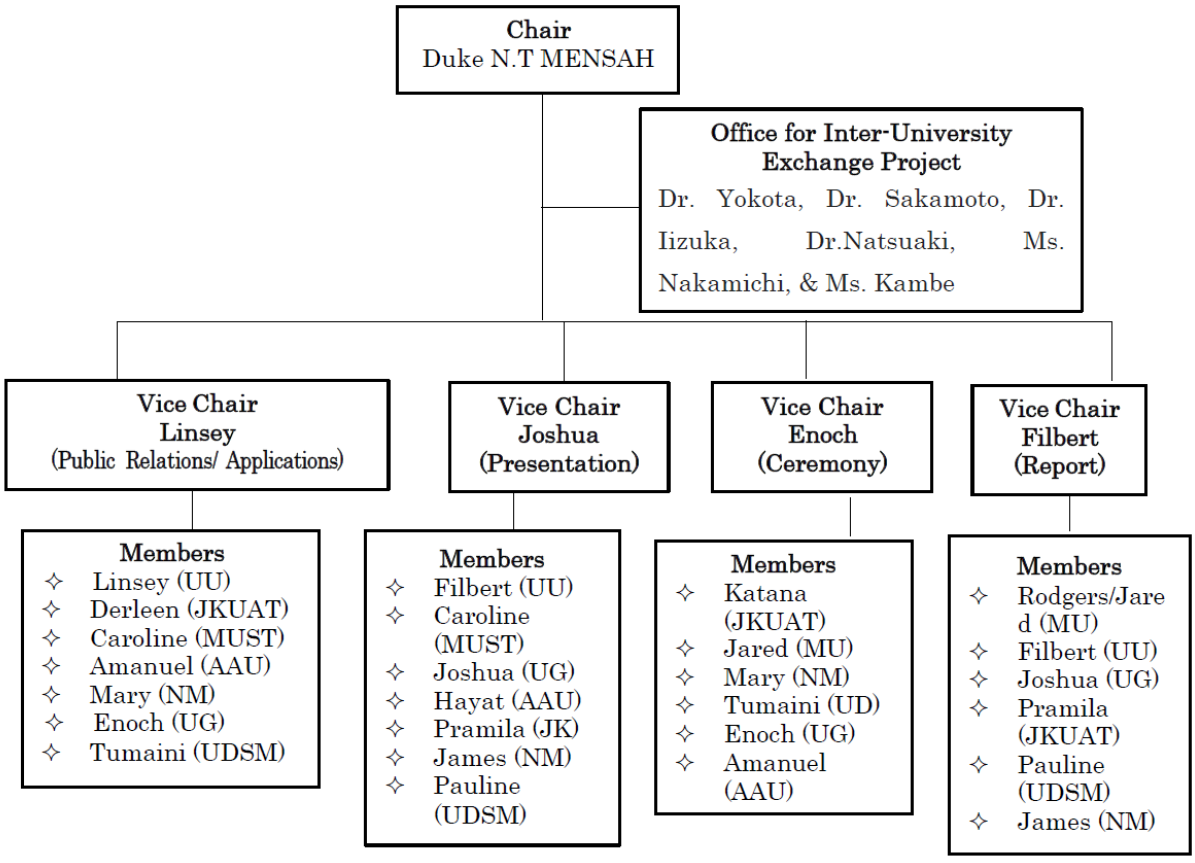
March 19th, 2025

Ikeda Tsukasa, PhD
President of Utsunomiya University

Student Organizing Committee Members

UU	Linsey Gatwiri Murerwa, Duke Nii Tettey Mensah, Filbert Thobias Meela
UG	Enoch Sam Sakyi Asiedu, Joshua Edem Atinyo
AAU	Amanuel Shawel
JKUAT	Pramila Mwibanda, Derleen Bosibori Mogire, Stephen Katana Cosmus
MUST	Rodgers Bosire, Caroline Kinya, Jared Gisore
UDSM	Paulina Victor Bilahama, Tumaini Job Sanga
NM-AIST	James Mwajombe

Chart of Organizing Committee 2025



Acknowledgement

This booklet is the result of dedicated collaboration, perseverance, and a shared commitment to knowledge exchange. Its completion would not have been possible without the invaluable support of the seven (7) UU-A Universities and the individuals who contributed their time and expertise.

Our sincere appreciation goes to Prof. Ikeda Tsukasa, President of Utsunomiya University, we are especially grateful to Prof. Tomohide Natsuaki, Prof. Shinso Yokota, Prof. Kumiko Sakamoto, and Dr. Yutaro Neriya, Miss Nakamichi from the Utsunomiya University Inter-Exchange Project, Utsunomiya University-Japan, for their invaluable guidance and dedication. Much thanks to the Ministry of Education, Culture, Sports, Science, and Technology of Japan, for their commitment to fostering international academic collaboration.

Additionally, we extend our heartfelt thanks to our esteemed faculty members from African Universities: Dr. Raphael Ayizanga (Lecturer, University of Ghana), Prof. Romanus Odhiambo (Vice Chancellor, Meru University of Science and Technology-Kenya), Dr. Cynthia Mugo (Technical Coordinator, Meru University of Science and Technology-Kenya), Prof. Lilian D. Kaale (Head, Department of Food Science and Technology, University of Dar es Salaam-Tanzania), Prof. Nelson K. Ojijo (Jomo Kenyatta University of Agriculture and Technology-Kenya), Prof. Linus Munishi (Nelson Mandela African Institution of Science and Technology-Tanzania), Prof. Bezawork Afework (Avian Ecology and Behavior, Department of Zoological Sciences, Addis Ababa University-Ethiopia), Prof. Emana Getu (Entomology, Zoological Department, Addis Ababa University-Ethiopia), Prof. Masele Yihune (Animal Ecology and Systematics, Department of Zoological Sciences, Addis Ababa University-Ethiopia), and Prof. Tadesse Fetahi (Addis Ababa University-Ethiopia). Your expertise and contributions have been instrumental in the success of the UU-A Summit Program, strengthening research collaborations and expanding networks among young researchers globally.

We also express our sincere appreciation to the evaluators of presentations for their dedication, time, and efforts in upholding the highest standards of excellence throughout the summit. Your commitment has played a crucial role in making this event a success.

Finally, to all participants—including reviewers, presenters, participants of the Global Management course, and audience members—who actively engaged in the summit, we extend our heartfelt gratitude. Your enthusiasm, dedication, and willingness to share knowledge and ideas have made this gathering a truly impactful and memorable experience. We deeply appreciate your contributions and unwavering support.

Student Organizing Committee

Summit program (Student Video Presentations)

UU-A Student Summit (Video On – Demand)
February 14th -20th, 2025

- CONTENTS
  - Abstracts
  - Presentations
  - Comments and discussions
  - Questions and Answers Sessions

Number of Presenters 2025

UU	NMA-IST	JKUAT	AAU	UDSM	MUST	UG	**Total**
14	**2**	**6**	**15**	**4**	**6**	**10**	**57**

Categories of Presentations

Agriculture & Environmental Science	9
Food Science & Nutrition	12
Microbiology & Biotechnology	12
Health & Medical Sciences	4
Social Sciences & Humanities	10
Engineering & Technology	10

Opening Ceremony

- ✓ Opening remarks (Prof. Sakamoto)
- ✓ Introduction of Organizing Committee Members (Chair. Duke)
- ✓ Explanation of UU-A (Dr. Iizuka)
- ✓ Introduction of UU-A inbound students and invited faculty members and introduction of SSP inbound students and accompanying faculty members
- ✓ Advertising the summit by (Vice-chair: Linsey)
- ✓ Closing remarks (Vice-chair: Enoch)
- ✓ Video Message from the President of Utsunomiya University
  (Introduced by Professor Shinso Yokota Leader of UU-A Program of Utsunomiya University)

SAKURA SCIENCE PROGRAM INVITED STUDENTS

1. Oketch Rossel Awuor **(JKUAT)**
2. Mwibanda Pramila Nekesa **(JKUAT)**
3. Wanyaga Elizabeth Nyambura **(JKUAT)**
4. Mogire Derleen Bosibori **(JKUAT)**
5. Chepngeno Faith **(MUST)**
6. Makena Faith **(MUST)**
7. Mbeche Jared Gisore **(MUST)**
8. Hailegiorgies Yeabsira Tegene **(AAU)**
9. Feleke Zenamarkos Zinabie **(AAU)**
10. Audifas Gaspar Shirima **(UDSM)**
11. Gladness Wanda Mwikwabe **(UDSM)**
12. Mariam Reuben Ndosi **(UDSM)**
13. Paulina Victor Bilahama **(UDSM)**
14. Odongo George Charles **(NM-AIST)**
15. Mwajombe James Beatus **(NM-AIST)**
16. Odwar Seth Ochieng **(NM-AIST)**
17. Adorliyah Cephas **(UG)**
18. Appiah Charlotte Serwaa Opoku **(UG)**
19. Ampoe Michael Kwasi **(UG)**

Table of Presentations (A)

~Agriculture & Environmental Science~

Table of Presentations (B)

~ Food Science & Nutrition~

Table of Presentations (C)

~ Microbiology & Biotechnology ~

Table of Presentations (D)

~Health & Medical Sciences~

Table of Presentations (E)

~Social Sciences & Humanities ~

Table of Presentations (F)

~Engineering & Technology~

UU-A STUDENT SUMMIT 2025
Summit Abstracts (A)

~Agriculture and Environmental Science~
A01 ~ A10

A01 (E0006)

Assessing Swales and Berms for Optimizing Rainwater Harvesting to Improve Maize Yield in Semi-Arid Regions of Babati District

WANJIRU KANYIRU Mary
Nelson Mandela African Institution of Science and Technology

BACKGROUND

Maize production in Babati's semi-arid areas faces challenges from climate change, with erratic rainfall and drought causing soil moisture shortages. Traditional methods like contour terracing reduce erosion but inadequately address rainwater harvesting. Innovative approaches such as swales and berms are essential to improve infiltration, soil moisture retention, yields, food security, and resilience. This study evaluates swales and berms for rainwater harvesting, focusing on maize yield and soil moisture. The objectives include comparing methods, analyzing soil/rainfall, and assessing impacts of swales and berms on moisture, infiltration, and yield.

METHODS

A combination of descriptive, correlational, and experimental research designs will be used. Purposive sampling will select 42 participants, including small-scale farmers, community leaders, and agricultural extensionists from Magugu and Sarame villages, to assess current rainwater harvesting and soil moisture conservation techniques (Objective 1). Thirty-six soil samples will be collected from six field points at three depths (surface, mid, and root-zone) to analyze physical properties, while rainfall data will come from tipping bucket rain gauges and meteorological stations (Objective 2). A maize field experiment will include three treatments: swales and berms, farmer's practice (positive control), and no intervention (negative control) which will follow a randomized complete block design with three replicates containing 13 rows and 40 maize plants per row, totaling nine plots (Objective 3). Data analysis will involve descriptive statistics, ANOVA, and thematic analysis using SPSS, R, Excel, and MAXQDA.

RESULTS

The study will highlight diverse RWH practices, soil characteristics' role in moisture retention, and swales and berms' significant impact on maize yields in semi-arid agriculture.

CONCLUSION

Integrating swales and berms enhances soil moisture retention, boosting maize yields and supporting **SDGs 2, 6,** and **13** respectively by improving food security, sustainable water uses and climate resilience.

Supervisors: Dr. MEYA Akida and Dr. MKINDI Angela

A02 (E0009)

Exploring Genomic Variation of Wild Strawberry '*Fragaria vesca*'

MEELA Filbert Thobias[1,2] and FUKASAWA Yoshinori[1]

[1] Utsunomiya University, [2]Nelson Mandela African Institution of Science and Technology

BACKGROUND

Despite the wealth of genomic data available through the National Center for Biotechnology Information (NCBI), analyses of genetic variation in non-model organisms like *Fragaria vesca* remain underexplored. This study aims to fill this gap by investigating the genetic diversity among 20 genomes of the wild strawberry, a relative of the cultivated strawberry, *Fragaria ×ananassa*.

METHODOLOGY

We systematically retrieved genomic datasets from the NCBI, employing the Sarek pipeline and GATK4 for data analysis and variant calling. The latest reference genome of Fragaria vesca was utilized to ensure accuracy. Genomic distances were calculated using PLINK, followed by Principal Component Analysis (PCA) to evaluate genetic variation. Pairwise single nucleotide polymorphism (SNP) frequencies were computed for all genome pairs.

RESULTS

PCA identified distinct subgroups within the dataset, revealing significant genetic divergence among individuals. Genomic distance calculations corroborated this finding, particularly highlighting substantial dissimilarity between the SRR866156 genome and others. SNP frequency analysis indicated low sequence diversity within subgroups (~0.02%), contrasting with higher overall genetic diversity (~0.2-0.4%).

CONCLUSION

The genomic data from the USA, Germany, and China revealed notable subgroups within *F. vesca*, showcasing significant individual divergence. This genetic variation offers valuable opportunities for future research aimed at developing cultivars with desirable traits. Our findings contribute to Sustainable Development Goals (SDGs) 13 and 15 by promoting biodiversity and sustainable agricultural practices

Supervisor: FUKASAWA Yoshinori

A03 (E0012)

Landslide Hazard Mapping Around Gimbi Town, West Wallaga, Ethiopia

EFREM Amanuel
Addis Ababa University

BACKGROUND

Landslides are one of the most destructive natural disasters, causing significant economic and human losses. Mountainous areas and highly populated areas are prone to landslides. Utilizing geospatial data to make informed decision will contribute to **SDG 11 and 15**.

METHOD

This study aims to identify areas susceptible to landslides in Gimbi Town using Multicriteria Decision Making and Frequency Ratio in GIS environment. The causative and triggering factors cause landslides. The factors that cause landslides in the area considered for the study are listed as elevation, slope, NDVI, slope material, geology, stream, distance to road, plain curvature, aspect and Land use land cover. The factors are generated from existing maps, digital elevation model and satellite imagery.

RESULTS

After combining the causative factor in GIS environment, the Multicriteria Decision making result classified the overall susceptibility as very low – 33.93%, low – 33.75%, medium – 19.34%, highly susceptible – 9.95% and very highly susceptible – 3.03%. Whereas the frequency ratio result classified the area with the use of previous landslide inventory into five susceptibility classes as very low – 24.98%, low – 21.87%, medium – 21.82%, highly susceptible – 18.22% and very highly susceptible – 13.11%. The variation in the predictive model shows the consideration taken in calculating and combining factors.

CONCLUSION

The study gives insights on using GIS based models to understand and mitigate geohazard processes for better preparedness by implementing scientific urban planning practices. Different machine learning algorithms will better improve the robustness of models to predict areas susceptible for large scale analysis. Anthropogenic activities must consider the mapped areas in selecting site for projects and settlement.

Supervisor: Dr. TESFAW Binyam

A04 (E0081)

Assessing the Sustainability of Food Systems: A Case Study of Maize Production Among Smallholder Farmers in Busoro Sector, Nyanza District, Rwanda

KAYISHEMA Jean Leonard
Utsunomiya University

BACKGROUND

The sustainability of food systems is crucial in addressing global food security challenges, particularly in regions like Rwanda, where smallholder farmers dominate agricultural production, 70% of the population are smallholder farmers (farm to market alliance Rwanda country brief December 2022). This study focuses on maize production in BUSORO Sector, Nyanza District, to evaluate the challenges faced by smallholder farmers and their implications for sustainable agriculture. Despite its significance as a staple crop, maize production in Rwanda faces challenges such as soil fertility depletion, inadequate access to fertilizers, and inefficient farming practices, threatening the livelihoods of farmers and the region's food security.

METHOD

The study adopts a qualitative approach, combining a literature review of existing research and secondary data analysis to explore factors influencing maize production, including soil moisture levels, fertilizer use, and the potential integration of modern technologies.

RESULTS

Expected findings will highlight critical barriers to sustainable maize production, such as limited access to agricultural inputs and environmental stressors. Discussions will focus on actionable insights to overcome these challenges, fostering resilience among smallholder farmers. The study's conclusions will provide strategic recommendations for policymakers and stakeholders to enhance agricultural sustainability.

CONCLUSION

This research contributes to **Sustainable Development Goals (SDGs) 2 (Zero Hunger improved nutrition and sustainable agriculture), 12 (Responsible Consumption and Production), and 13 (Climate Action)** by promoting sustainable agricultural practices and improving food security in Rwanda.

Supervisor: SCHRAGER Benjamin

A05 (E0082)

Exploring the Role of Social Capital in Climate Adaptation and Community Resilience in Coastal Accra

ADORLIYAH Cephas
University of Ghana

BACKGROUND
Climate change poses significant risks to coastal communities, particularly in Accra, Ghana, where rising sea levels, flooding, and erosion threaten infrastructure and livelihoods. Jamestown, a historic coastal community, exemplifies these vulnerabilities, necessitating a focus on resilience-building strategies. This study investigates the role of social capital–bonding, bridging, and linking–in facilitating climate adaptation and enhancing community resilience in Jamestown. By examining social networks and their contributions to adaptive capacity, this research aligns with several Sustainable Development Goals (SDGs): SDG 10, 11 and 13.

METHODS
A qualitative ethnographic approach was employed, utilizing semi-structured interviews, focus group discussions, and participant observation. These methods enabled an in-depth exploration of social relationships, community networks, and their transformation into social capital. Thematic analysis was conducted to identify patterns, and social network analysis was used to map relationships and resilience mechanisms.

RESULTS
The findings reveal that bonding social capital, rooted in family and local community ties, provides immediate support during crises. Bridging social capital fosters collaboration across diverse groups, while linking social capital connects the community to external resources and institutional support. Despite these strengths, gaps in formal disaster preparedness and external collaboration were identified, limiting the community's capacity for sustained adaptation.

CONCLUSIONS
Social capital is a critical driver of resilience in Jamestown, with immediate and long-term implications for climate adaptation. However, integrating community-based networks with formal disaster preparedness systems is essential to enhance adaptive capacity. Recommendations include formalizing mutual aid networks, fostering partnerships with external organizations, and promoting climate-resilient livelihoods to ensure sustainable and inclusive resilience strategies.

Supervisor: Dr MANTEAW Bob Offei

A06 (E0085)

Integrating Climate Action with Sustainable Development: Strategies for a Resilient Future

DEMESEW Henok
Addis Ababa University

BACKGROUND

Climate change poses significant risks to sustainable development, impacting economic growth, social equity, and environmental stability. Integrating climate action with sustainable development strategies is essential to address these challenges and foster resilience.

METHOD

This study employs a mixed-methods approach, combining quantitative data analysis and qualitative research. Data is collected through surveys, interviews, and case studies of successful climate initiatives. Advanced machine learning algorithms are used to analyze climate data and predict future trends. Digital platforms are leveraged to model sustainable business practices.

RESULTS

Preliminary findings indicate that integrating climate action with sustainable development enhances resilience and promotes socio-economic stability. Implementing sustainable business models and innovative financial strategies, supported by digital technologies, can effectively address climate challenges. Stakeholder engagement and collaborative efforts are critical for the success of these initiatives.

CONCLUSION AND SIGNIFICANCE TOWARDS ACHIEVING THE SDGs

The research highlights the importance of integrating climate action with sustainable development strategies to achieve the Sustainable Development Goals (SDGs), particularly **Goal 13** (Climate Action), **Goal 7** (Affordable and Clean Energy), and **Goal 9** (Industry, Innovation, and Infrastructure). These efforts are essential for fostering a sustainable and resilient future for all.

Supervisor: Dr. KEBEDE Temesegen

A07 (E0092)

Strategies to Improve Rice Post-Harvest Technologies Among Smallholder Farmers in Kura, Kano, Nigeria: From Harvesting to Paddy Storage

AHMADU Zakariya
Utsunomiya University

BACKGROUND

Rice is one of the most important staple foods in Nigeria. Kura, a Local Government Area in Kano State, Nigeria, is the top rice-producing region in the state. However, the adoption of improved rice post-harvest technologies among smallholder farmers is low due to knowledge and resource gaps. This leads to low yields, high post-harvest losses, and an inability to meet Nigeria's growing rice demand. This research aims to identify the constraints hindering the adoption of improved rice post-harvest technologies and propose strategies to address them to contribute to **SDGs 1,2,4and 5.**

METHODOLOGY

A multi-stage sampling procedure will be employed. In the first stage, three communities were selected from the target area. At the second stage, simple random samplings will be used to select 90 farmers from these communities. Data on households and rice post-harvest practices will be collected using questionnaires. Scheduled interviews will be conducted with experts from agricultural institutes to gather information on strategies for improving the adoption of improved rice post-harvest technologies. Observations of rice post-harvest practices among the farmers will be made to determine the adoption level of these technologies. Additionally, three focus group discussions will be conducted to validate findings from the questionnaires and observations. Data analysis will involve descriptive statistics and regression analysis

RESULTS

Findings from previous research indicate that inadequate capital, poor extension services, and limited credit facilities are major **constraints** hindering the adoption of improved rice post-harvest technologies. Future research on data collection will be conducted soon.

CONCLUSION

Enhancing rice post-harvest technologies among smallholder farmers is not only vital for increasing productivity but also aligns with **SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 4 (Quality Education),** and **SDG 5 (Gender Equality)** by increasing farmers' incomes, reducing post-harvest losses, educating both male and female farmers through training, and empowering women in agriculture.

Supervisor: SCHRAGER Benjamin

A08 (E0104)

Effects of Changes in Pesticide Practices on Efficacy of Commercialized Neoseiulus Californicus in Spider Mite Control

MUNKHTUMUR Mungunzaya[1], MIKAWA Yuya[2], SONODA Shoji[2]
[1] Tokyo University of Agriculture & Technology, [2] Utsunomiya University

BACKGROUND
Tetranychus urticae is a cosmopolitan pest that causes significant damage to economically important crops, including Japanese pears. Known for its high capacity to develop pesticide resistance, there is an urgent need for alternative control methods. Phytoseiid mites, which are natural predators of spider mites, have recently emerged as sustainable alternatives to pesticides. Neoseiulus californicus, which has a high predatory capacity against T. urticae, is commercially available for use in Japanese pear orchards. This study aims to evaluate how changes in pesticide use affect phytoseiid mite species composition and the effectiveness of commercialized N. californicus in controlling spider mites in the Japanese pear orchards. Our research will contribute to achieving SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land) by promoting sustainable agricultural practices that reduce reliance on chemical pesticides and protect biodiversity.

METHOD
Commercialized N. californicus release materials were installed at Site A in 2019 and Site B in 2022–2023. At Site B, plots with and without N. californicus release materials were compared. Phytoseiid mite species composition was assessed using quantitative sequencing, and the persistence of N. californicus was monitored using microsatellite marker analysis.

RESULTS
A shift in the dominant species from N. californicus to Amblyseius eharai (Amitai et Swirski) was observed, with a decline in the presence of N. californicus over time. No significant differences in spider mite densities were found between trees with and without N. californicus release materials, indicating limited effectiveness of the releases.

CONCLUSION
This study highlights challenges in achieving effective spider mite control with N. californicus, which are influenced by factors such as suboptimal release timing, dispersal limitations, and competition with A. eharai. The findings underscore the need to optimize release strategies, considering timing, predator compatibility, and pesticide impacts. Future studies should explore intraguild predation dynamics and the potential of integrating multiple predator species for sustainable pest management.

Supervisor: Prof. SONODA Shoji

A10 (E0116)

Morphological Characterization and Sustainable Utilization of Bugleweed (*Ajuga remota*)

WANYAGA Elizabeth, MUNGAI Grace, and KIDAHA Mercy
Jomo Kenyatta University of Agriculture and Technology

BACKGROUND
Bugleweed (*Ajuga remota*), a medicinal plant distributed in East Africa, Europe, and Asia, is integral to traditional malaria treatment in Kenya. Despite its medicinal importance, limited research exists on its morphological characteristics. This gap impedes efforts to sustainably manage biodiversity and explore its potential for plant-based health solutions.

METHOD
Morphological characterization was conducted using descriptors adapted from *Ajuga iva*. Plant traits, including height, stem length, flower structures, and root number, were analyzed across four locations. R software was employed to assess trait variability and clustering patterns among the samples.

RESULTS
Significant variation in key morphological traits was observed across the locations, reflecting the plant's adaptability to diverse environmental conditions. Clustering analysis highlighted similarities among some samples, while others exhibited distinct traits, suggesting localized adaptation. These findings emphasize the plant's potential for pharmaceutical application, alongside its role in supporting traditional medicine.

CONCLUSION
The study underscores the importance of conserving medicinal plants like *Ajuga remota* to ensure sustainable utilization. This research aligns with Sustainable Development Goals (SDGs) by promoting health innovations (**SDG 3**), sustainable consumption (**SDG 12**), biodiversity conservation (**SDG 15**), and fostering local innovations (SDG 9). By integrating traditional knowledge and modern practices, the findings highlight innovative approaches to biodiversity.

Supervisor: Dr. MUNGAI Grace & Dr. KIDAHA Mercy

UU-A STUDENT SUMMIT 2025
Summit Abstracts (B)

~Food Science and Nutrition~
B01 ~ B12

B01 (E0003)

Processing and Physicochemical Characterization of Camel Milk Butter

MBECHE Jared Gisore
Meru University of Science and Technologyy

BACKGROUND
Camels, primarily raised in Kenya's arid and semi-arid lands (ASALs), are a key source of milk, meat, and transport. Camel milk is rich in unsaturated fatty acids, offering nutritional benefits. However, despite Kenya being the world's largest producer of camel milk, camel milk butter (CMB) is not commercially available. This is due to the milk's distinct fat properties—such as small fat globules and long-chain fatty acids—which complicate butter production. Additionally, the high melting point (41-44°C) of camel milk poses challenges for processing. This research aligns with **SDG 2** and **SDG 12**. The study aimed to process camel milk butter and analyze its physicochemical properties to determine the optimal production conditions.

METHOD
Camel milk was sourced from Isiolo and Laikipia counties, and butter was prepared by churning aged cream at temperatures of 21°C, 23°C, 25°C, and 27°C. Butter formation time was monitored, and the resulting butter was analyzed for fat, moisture, protein, ash, solid-non-fat content, iodine, peroxide, saponification, and acid values.

RESULTS
Butter churned at 23°C formed within 10 minutes and yielded the highest output. Its composition was 86.5% fat, 11.6% moisture, 0.86% protein, 0.64% ash, and 1.55% solid-non-fat. Iodine, peroxide, saponification, and acid values were 46.6 μmol/L, 0.15 meq/Kg, 201 mg KOH/g, and 5.4 mg KOH/g, respectively. Increased acid and peroxide values indicated higher rancidity.

CONCLUSION
Churning camel milk cream at 23°C for 10 minutes is the optimal condition for producing camel milk butter with better physicochemical properties.

Supervisors: ARIMI Joshua Mbaabu & MARIGA Alfred Mugambi

B02 (E0004)

Extraction and Characterization of Protein from Edible Seaweed Grown in Tanzania

SANGA Tumaini Job
University of Dar es Salaam

BACKGROUND

Protein has become an interested food nutrient in recent years, especially one derived from plant sources than animal sources due to health-related issues associated with animal protein. Seaweeds contains significant amount of protein, but it has not well utilized as a protein sources. Furthermore, the extraction of protein is challenging due to the complex extracellular matrix, so a cost-effective method for protein extraction has to be adapted. This study focuses on extracting and characterizing protein from cultivated and natural grown seaweed, and it contributes to **SDG 2, 3** and **8.**

METHOD

Cultivated (2 species) and natural grown (16 species) Seaweeds were collected from three region in Tanzania. Eighteen amino acids were analyzed by HPLC and Protein were quantified by Kjeldahl method. Two methods will be used to extract protein from the seaweed which are Solid-Liquid Extraction and Enzyme assisted extraction.

RESULTS

For non-essential amino acids analyzed the dominants ones were Aspartic acid, Glutamic acid, serine, Glycine and cysteine. And for essential amino acid the dominant amino acids were Phenylalanine, Methionine and Threonine. But in all amino acid, aspartic acid was the most dominant one. Three natural grown seaweed species *Enteromorpha spp, Sarconema filiforme* and *Ulva reticulata* contained highest amount of protein which are 17.45%, 15.33% and 13.41% (DW) respectively and *Eucheuma denticulatum* contained smallest amount of protein which is 3.4% DW. Enzyme assisted extraction will give high amount of protein than Solid-liquid extraction.

CONCLUSION

Starting cultivating the natural grown seaweed with high protein as a protein source, will increase the food security in the country, providing people with more healthier food choices, increasing the income of the local farmers and contributing to nations GDP.

Supervisor: Prof. KAALE Lilian

B03 (E0020)

A Nutritive Evaluation and CNCPS Protein and Carbohydrate Fractionation of Kenyan Commercial Dairy Feeds and Ingredients

KIMANI Martin K., OSUGA Isaac M., GICHEHA Mathew G.
Jomo Kenyatta University of Agriculture and Technology

BACKGROUND

Nutrition is vital in dairy farming and feed selection through accurate determination of their nutritional properties is crucial. This study aimed to characterize the nutritive properties of feed ingredients and dairy concentrate feeds commonly used in dairy cattle nutrition. The Cornell Net Carbohydrate and Protein System (CNCPS) model was used to document their carbohydrate and protein fractions. These analytical methods are currently lacking in Kenyan dairy ration preparation despite their potential

METHOD

We randomly sampled ingredients Maize-Germ (MG), Maize Bran (MB), Rice Polish (RP), Wheat Bran (WB), Wheat Pollard (WP), Soybean meal (SBM), Sunflower seed cake (SF), Cotton seed cake (CSC), Copra (COP), and Fishmeal (FM); and dairy feed samples A, B, C, D, and E & F. The names of the miller brands were intentionally omitted for confidentiality. Approximately 2 kg of each feed sample was collected and packed in plastic bags for further analysis. Laboratory analysis was done in the Animal Nutrition Laboratory of Jomo Kenyatta University of Agriculture and Technology.

RESULTS

The results confirmed standard proximate values for the ingredients with several variations. The sampled dairy feeds proximate values had significant variations ($p<0.05$) within the key nutritional elements. Within the CNCPS fractions, the PA, PB1, PB3 and C values were higher in the protein ingredients. The PB2 fraction was higher in the energy ingredients. Energy providing ingredients generally had higher CB1 values while CA, CB2 and CC values trended higher in protein ingredients.

CONCLUSION

We consider that the overall findings highlighted the importance of nutritional evaluation of available feed ingredients as well as dairy feed for assured provision of quality diets to the dairy cows. It also demonstrated the potential of the CNCPS model as an improved analytical technique for efficient selection of feed ingredients in the Kenya and by extension the tropics.

RELATED SDGs — 1, 2, and 3

Supervisor: Dr. OSUGA Isaac M.

B04 (E0025)

Feasibility of Silver Cyprinid Fish with Starch Binders in Extrusion-Based 3D Food Printing

MURERWA Linsey Gatwiri[1*], TAKAHIRO Saito[2], MASATSUGU Tamura[2]
[1, 2] Utsunomiya University

BACKGROUND

3D printing is a raw material deposition process, based on a pre-designed file. The ability of 3D Food Printing (3DFP) to provide personalized nutrition designs, shape fabrication, and utilize food waste, allows it to achieve some of the Sustainable Development Goals (SDGs). Silver cyprinid fish majorly located in Lake Victoria, Kenya, is a readily available, cheap, high protein fish. However, 70% of catch is utilized as animal feed. Therefore, it could benefit from the inclusion of this technology, to offer a wider consumer appeal. Consequently, the main objective of this research was to study the feasibility of silver cyprinid fish, in extrusion-based 3DFP with wheat and corn flour as binders.

METHOD

The fish was oven-dried and milled into a fine powder, and printed with 10, 20 and 30 % of the starch binders, mixed with water at various ratios, using a Foodini 3D printer. The optimum water to print each sample was determined through evaluating the printing precision, ease of extrudability, stability and the layering of the printed product. Water holding capacity, colour, and texture were also evaluated.

RESULTS

Results revealed that optimal water quantities for printing increased with increasing binder quantities, with wheat samples exhibiting higher printing precisions, higher hardness, adhesion, cohesion, elasticity, and a slightly lighter brownish colour. However, the water holding capacity of corn flour samples was higher.

CONCLUSION

In conclusion, results showed that silver cyprinid fish can be applicable in 3D-Extrusion Printing in combination with starch binders. The significance of this study on sustainability, majorly lies on **SDGs 2, 3, 8, 12, 13 and 14,** by offering healthy and nutritious foods produced through an eco-friendly process with minimal waste production and pollution of the environment. It also creates new marketing opportunities and increases the economic benefits of small islands in developing countries from the sustainable use of marine resources.

Supervisors: MASATSUGU Tamura & TAKAHIRO Saito

B05 (E0077)

Adherence to Global Dietary Recommendations of School Children in Two Districts in the Greater Accra Region

TWUM Sarah
University of Ghana

BACKGROUND
School children facing malnutrition are susceptible to long-term health complications including non-communicable diseases (NCDs). One pathway is through lifestyles that predispose the children to an increased risk of these diseases. This study assessed adherence to global dietary recommendations (GDR) associated with NCDs and the nutritional status of school children in two districts in the Greater Accra Region.

METHODS
This cross-sectional study included 219 children (ages 9-15 years) from Tema West and Ningo-Prampram. Socio-demographic characteristics, diet quality, physical activity, and anthropometric measurements were assessed using standardized procedures. BMI-for-age z-scores determined nutritional status.

RESULTS
Among the participants, 118 were females (53.9%), while 101 were males (46.1%). The mean age was 11.6 ± 1.8 years. Participants exhibited low physical activity levels (PAQ-C score: 2.2 ± 0.7). The GDR score was 9.3 ± 2.2, ranging from 0-18, indicating that the children were largely not meeting WHO dietary recommendations that seek to protect them against NCDs. Notably, 14.2% of the children were overweight, and 6.8% were obese.

CONCLUSIONS
The study revealed a combination of high prevalence of overweight/obesity (21%), low physical activity level, and suboptimal adherence to WHO dietary recommendations for protection against NCDs among school children. To enhance children's dietary patterns and overall health, it is imperative to implement school-based nutrition education programs that prioritize healthy choices, portion control, and increased opportunities for physical activity. This study thus significantly contributes to **SGD 2: Zero Hunger and SDG 3: Good Health and Wellbeing.**

Supervisors: OHEMENG Agartha & OWUSU Justina Serwaah

B06 (E0083)

Development of Canned Octopus in Pepper Sauce and in Sunflower Oil

AMISSAH Aba Winnifred, ALLOTEY Rachael Joy, and AGBODZAH Campbell Kelvin
University of Ghana

BACKGROUND
Octopuses, intelligent and adaptable marine creatures, hold ecological and economic significance worldwide. Traditionally consumed in various cultures, octopuses are a source of lean protein and essential nutrients. This study aimed to develop canned octopus in pepper sauce and in sunflower oil to enhance its accessibility and availability while preserving its nutritional value. The study's significance lies in creating a procedure for producing canned octopus, contributing to all-year-round availability and potential entrepreneurship opportunities.

METHOD
Fresh octopus (Octopus vulgaris) was cleaned, cut into portions, marinated, and subjected to two processing methods: frying or simmering. The prepared octopus was packed into sterilized cans in pepper sauce or sunflower oil, respectively, and sealed. Canning was conducted using a pressure canner at temperatures and durations optimized to ensure microbial safety while minimizing nutrient loss. Sensory attributes were assessed for consumer acceptability.

RESULTS
Both products exhibited acceptable pH levels, indicating safety for extended storage while microbial analysis confirmed the absence of pathogenic bacteria. Sensory evaluation by trained panelists indicated high overall acceptability, with slight preference for the pepper sauce variant due to its enhanced flavor profile. Proximate analysis revealed that vital nutrients were significantly retained.

CONCLUSION
Canning octopus in pepper sauce and in sunflower oil is a viable method for preserving its nutritional and sensory qualities, making it accessible to consumers in non-coastal regions. This approach has potential for commercialization, contributing to dietary diversity and convenience for consumers while addressing seafood accessibility challenges in Ghana. Therefore, our research contributes to SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 12: (Responsible Consumption and Production).

Supervisor: AMISSAH Niilante Gerald Joris

B07 (E0086)

The Relationship between Snacking and Blood Sugar, Blood Pressure and Nutritional Status of Adults (18 years and above) Living in Lashibi in the Tema Metropolis.

DJUMPAH Samuel, VUVOR Frederick and STEINER-ASIEDU Matilda
University of Ghana

BACKGROUND
Snacking has become an integral part of the eating habits of young adults as they often spend most of their productive time away from home having to juggle between their education, career, and social life which increases the tendency of snacking. This study aimed to determine the relationship between snacking and blood sugar, blood pressure, and nutritional status of adults (18 years and above) living in Lashibi in the Tema Metropolis.

METHOD
The study was cross-sectional with 370 participants. A structured questionnaire was used to obtain data on participants' socio-demographic characteristics and dietary intakes to determine the types of snacks consumed and frequencies. Statistical Package for Social Sciences (SPSS) version 27 was used for data analysis. Principal Component Analysis was conducted to extract the types of snacks consumed based on the factor loading of snack items. The chi-square test was employed to check for associations between types of snacks, background characteristics, and outcomes (blood sugar, blood pressure, and overweight/obesity) individually.

RESULTS
Types of snacks were not significantly associated with outcomes although a majority (53.2%) consumed unhealthy snacks. However, time of snack consumption, marital status, and occupation were significantly associated with elevated blood sugar, blood pressure, and overweight/obesity respectively.

CONCLUSION
The high proportion of unhealthy snack consumption found in this study warrants the call for immediate action to intensify nutrition education/interventions, advocacy for healthy dietary habits, and overall lifestyle modifications in urban communities including Lashibi. This is critical as it is directly linked with achieving Sustainable Development Goals 2 and 3 which are focused on eliminating hunger and promoting good health and well-being.

Supervisors: VUVOR Frederick and STEINER-ASIEDU Matilda

B08 (E0095)

Food Choices of Mothers with Socio-Economic Advantage and Eating Behaviour of Pre-schoolers on Child's Diet Quality

ANNOH Lydia, AINUSON-QUAMPAH Joana
University of Ghana

BACKGROUND
Poor diets can cause malnutrition and chronic health issues later in life. In Sub-Saharan Africa, both undernutrition and rising obesity are major concerns. A diverse diet is crucial for adequate nutrient intake and preventing malnutrition. Children's eating behaviours, shaped by genetics, environment, and caregivers, affect their dietary quality and health outcomes. Socio-economic factors like income and education also play a significant role in developing healthy eating habits. Maternal food choices, combined with these socio-economic factors, greatly influence the diet quality of preschool children.

METHOD
This cross-sectional study involved 221 respondents from six schools in La Dade Kotopon Municipal. A semi-structured questionnaire collected socio-demographic data and factors influencing maternal dietary choices for their children. Dietary diversity in pre-schoolers was assessed using a 24-hour recall, while child eating behaviour was evaluated with the Children's Eating Behaviour Questionnaire. Height and weight were measured using a stadiometer and bioimpedance analysis device. Data analysis was performed with STATA version 14MP, considering p-values under 0.05 as statistically significant.

RESULTS
Most pre-schoolers had a moderate dietary diversity (56.56%), followed by a high dietary diversity (41.18%). Income was significantly associated with a better diet quality ($p=0.002$), as was mothers that were concerned about the nutritional content of their child's meals ($p=0.001$). Mothers who prioritized feeding nutritious meals as well as easy-to-cook foods often encountered food avoidance behaviours in their children ($p=0.04$ and $p=0.039$, respectively). Children who enjoyed food ($p=0.021$) and those who ate more when emotional ($p=0.019$) were also associated with better diet quality.

CONCLUSION
Higher maternal income and a focus on nutritional content in food selection were linked to better diet quality. Children who enjoyed their meals and ate well regardless of their emotions also exhibited improved diet quality. This research contributes to SDG 3: Good Health and Well-Being.

Supervisor: AINUSON-QUAMPAH Joana

B09 (E0096)

Ready-to-Drink (RTD) Pearl Millet Porridge: Comparison of Physico-Chemical and Nutritional Profile Between Controlled and Conventionally Fermented Porridges

FAITH Chepngeno, MARIGA Alfred, ARIMI Joshua
Meru University of Science and Technology

BACKGROUND
The pearl millet is a major crop in the semi-Arid areas of Africa, especially in the Sahelian where food and nutrition insecurity is a constant threat. It is nutritionally superior in fat, fibre and minerals compared to other major cereals such as wheat, maize, sorghum and rice. Despite its important role in food security, it is under-utilized. The pearl millet is mainly used traditionally for the preparation of thin porridge. This study aimed to determine the effect of fermentation (both conventional and controlled) on the physico-chemical and nutritional composition and to package the ready-to-drink porridge.

METHODS
The pearl millet was wet-milled, inoculated with the selected starter cultures and allowed to ferment at 30ºC for 24 hours. Another batch of millet grains was wet-milled using a quern mill, left to ferment naturally at room temperature, and then cooked into thin porridge. The physicochemical properties (pH and TTA) were monitored hourly during controlled fermentation (0-10th, 23rd, and 24th hour).

RESULTS
The study found that the pH of controlled fermented porridge decreased from 6.92 to 4.34, while its Titratable acidity increased from 0.07 to 0.223%. The moisture, fat, and ash content of the controlled-fermented porridge were 91.62, 0.15, and 0.43% respectively. In comparison, traditionally milled porridge had moisture and ash contents of 87.5 and 0.47%, while industrially milled porridge had 88.85% moisture and 0.51% ash.

CONCLUSIONS
In conclusion, the quality, physico-chemical and nutritional quality of controlled and conventionally fermented porridge are comparable. The study addresses the nutritional quality and accessibility of pearl millet porridges, contributing to **SDG 2**. It also identifies the best fermentation methods to enhance nutritional profiles, supporting **SDG 3**. Finally, it promotes sustainable production practices and responsible consumption patterns, aligning with **SDG 12**.

Supervisor: Prof. ARIMI Joshua

B10 (E0098)

Influence of Freeze Drying on the Proximate Composition, Physico-Chemical Properties, Fatty Acid Profile, and Shelf-Life of Avocado Pulp Powder

CHEPTOO Annet
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BACKGROUND

Avocado application as a functional ingredient in food, pharmaceutical and cosmetic industries has indicated a remarkable increase mainly due to association of the fruit with high concentrations of bioactive compounds. The Kenyan agribusiness chain currently lacks value-added diversified avocado products with avocado oil being the only premium product. Industrially, drying processes have proven to be efficient and practical for food preservation. The dried products indicate long shelf life in addition to transport and storage advantages. Freeze-dying process removes water by sublimation, protecting the heat-sensitive components and preserving the product's quality. However, there's a significant gap in research regarding the effects of freeze-drying on the properties of avocado pulp powder. The study will evaluate the effect of freeze-drying on the proximate composition, physico-chemical properties, fatty acid profile, and shelf-life of avocado pulp powder.

METHODOLOGY

Hass avocado variety will be used and the pulp dried using vacuum freeze-drying method. The proximate composition, physico-chemical properties, fatty acid profile, and shelf-life analysis of the freeze-dried pulp powder will be carried out. Preliminary results indicate that there’s no significant difference between the fresh avocado pulp and that of freeze-dried pulp powder at 95% confidence level ($P \leq 0.05$).

CONCLUSION

The results of this study are expected to influence the diversification of avocado products by exploring freeze-drying technique as a method of producing high quality avocado powder with extended shelf-life. The research seeks to contribute to the sustainable development of the avocado industry in Kenya, aligning with **SDG 2,** Zero hunger and **SDG 12** on Responsible Consumption and Production advocating for sustainable food processing techniques, reducing waste and improving resource efficiency.

Supervisor: PROF. ARIMI Joshua

B11 (E0114)

Adherence to Complementary Feeding Guidelines is not the Sole Determinant of Improved Nutritional Status Among Malnourished Infants

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University of Ghana

BACKGROUND
Adequate complementary feeding practices are critical for ensuring healthy growth and development during early childhood. This prevents malnutrition, which remains a leading cause of mortality among children under five. Complementary feeding must be carried out appropriately to contribute to **SDG 2 and 3.**

OBJECTIVE
This study assessed the adherence to complementary feeding guidelines among caregivers and the nutritional status of infants attending the nutrition rehabilitation center at the children's hospital, Accra.

METHOD
A cross-sectional study involving 150 caregivers with their infants aged 6-23 months who attend the NRC. Semi-structured questionnaires, 24-hour dietary recall, and weight and height measurements were carried out. Data was analyzed with SPSS version 26.0. Chi-square test was employed to examine the association between adherence to complementary feeding guidelines and the nutritional status of the infants.

RESULTS
The study found high adherence to the WHO complementary feeding indicators: Nutritional status of infants also improved, with the rate of severe undernutrition significantly reducing from 72.7% to 43.3% wasting, 72% to 44% Underweight, and from 36% to 28% stunting. No significant associations were found between all the complementary feeding indicators and the nutritional status of the infants.

CONCLUSION
Provision of nutrition care at the NRC resulted in high adherence to appropriate complementary feeding practices and improved nutritional status of the infants. However, no association was found between adherence to complementary feeding indicators and the nutritional status of the infants. While the complementary feeding indicators are valuable in assessing diet quality, they are not a sole determinant of improved nutritional status among malnourished infants. **Therefore, this research contributes to SDG 2 to attain Zero Hunger and also advocates for SDG 3; to maintain Good health and Well-being that will improve infant's nutritional status in addition to practicing good feeding practices.**

Supervisor: Dr. AINUSON-QUAMPAH Joana

B12 (E0117)

The Effect of Processing and Preservation Methods on Nutrient Composition of Cassava (*Manihot esculenta*), Long-Horned Grasshoppers (*Ruspolia differens*) and Kitarasa (*Musa spp*)

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University of Dar es Salaam

INTRODUCTION

The utilization of the food value added products employ a number of processing steps which may alter the nutrient composition available in the consumed food. Thermo processing is among the critical step towards achieving a shelf stable product. However, it may have a notable influence on the level of nutrients available in the materials therefore necessitates the establishment of the suitable temperature and drying time suitable for retaining high amount of nutrient for healthy products.

METHODOLOGY

The current study employed the collection of cassava, long-horned grasshoppers and Kitarasa (banana) from Coast, Western (Kagera) and Northern (Kilimanjaro) regions respectively. The sample were subjected into different drying methods (low temperature long time drying, high temperature short time drying, solar and sun drying). The samples were then analyzed for proximate, minerals, vitamin and functional properties using standard AOAC methods.

RESULTS

The results shows that there is significance difference in nutrient composition between the different drying methods. High retention of nutritional composition was observed in the products dried using solar method followed by the oven drying between 50-80^{o}C. Furthermore, the solar drying method retained the color properties of the dried materials in addition to its nutrient retention.

CONCLUSION

It is therefore concluded that solar drying method can be adopted by the processor for processing of healthy value-added products for consumption in the households. This, in turn, contribute to the realization of the sustainable development goals (SDG 2 (2.2, 2.3& 2.4), SDG 3 (3.1&3.2), SDG 12 (12.1)).

Supervisor: Dr. KAALE Lilian Daniel

UU-A STUDENT SUMMIT 2025
Summit Abstracts (C)

~Microbiology and Biotechnology~
C01 ~ C12

C01 (E0008)

Molecular Microbial Profiling of Ameru Traditional Fermented Porridge

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BACKGROUND

Food fermentation is one of the oldest food preservation methods that utilizes cultural norms and practices. Ameru porridge is an indigenous fermented porridge which is highly valued and given to lactating mothers and during special occasions. It provides 85% of energy compared to stable diets. This porridge holds a variety of beneficial microorganisms that need to be studied more. Molecular microbial profiling of Ameru porridge has not been done. It is crucial to link fermentation of Ameru porridge with scientific approaches in order to preserve the knowledge and increase the porridge acceptability.

METHOD

Ameru porridge will be prepared using pearl millet and maize utilizing traditional techniques. Microbial strains will be isolated and identified using biochemical, morphological and molecular techniques.16S rRNA bacteria gene will be sequenced using universal primers. Sequence alignment will be carried out and phylogenetic trees will be constructed using MEGA X by aligning to MUSCLE and CLUSTAL W. Maximum likelihood and genetic distances will be performed by SeaView using PhyML V3.1 program.

EXPECTED OUTCOME

Various microbial strains will be identified from the Ameru porridge. Lactic acid bacteria are the most dominant microorganism based on various studies that have been conducted on fermented cereal-based products. Other microorganism such as yeast and molds have also been identified.

CONCLUSION

Traditional fermented porridge contains various microorganisms particularly lactic acid bacteria a potential probiotic that are beneficial to humans. This microorganism gives the porridge its organoleptic characteristics hence can act as a starter culture for the production of the porridge. This research contributes to **SDG 2** and **SDG 3** by enhancing food security and providing good health.

Supervisor: MUGO Cynthia

C02 (E0011)

Assessment of Antimicrobial Resistance on Fresh Vegetables, Insights from Dar es Salaam, Tanzania

BILAHAMA Paulina
University of Dar es Salaam

BACKGROUND
In the bustling urban landscape, an invisible threat is quietly infiltrating the food chain—antimicrobial resistance (AMR). This global health crisis, ranked by the World Health Organization (WHO) as one of humanity's top ten public health threats, claimed 1.27 million lives in 2019 and could cause 10 million deaths annually by 2050 if unaddressed. Antimicrobial resistance is the ability of bacteria to adapt to withstand antibiotics. In Dar es Salaam's urban settings, the overuse of antibiotics in agriculture and livestock keeping as well, and poor sanitation allow resistant bacteria to contaminate fresh produce, compromising food safety and endangering public health. The spread of these bacteria in the environment makes AMR a critical issue demanding urgent attention.

METHOD
Samples were collected from vegetable farms found along selected water sources in Dar es Salaam to investigate antimicrobial resistance. Fresh vegetables, water, organic manure, and soil, were randomly collected. Enterobacteriaceae species were isolated and identified using culture-based methods and biochemical tests. Antimicrobial susceptibility testing (AST) was performed using the Kirby-Bauer disk diffusion method on Mueller-Hinton agar. Isolates were tested against six antibiotics, and inhibition zones were measured to determine resistance profiles. E. coli ATCC 25922 served as a quality control strain throughout the study.

RESULTS
Findings reveal that 94 out of 114(82.5%) isolates exhibited significant resistance rates, with amikacin, the aminoglycoside antibiotic (68.09%), and ceftazidime, a third-generation cephalosporin (58.51%) showing the highest levels of resistance. Out of the 94 isolates that exhibited resistance 49(52.13%) were resistant to at least three different classes of antibiotics. These resistant strains pose a serious threat to public health, especially for immunocompromised individuals, as they can easily enter the food chain and are a threat to the environment.

CONCLUSION
Urgent and collaborative action is needed for enhanced awareness, surveillance, and control measures to combat antimicrobial resistance in urban environments like Dar es Salaam to safeguard public health and this will contribute to SDG 3: Good health and well-being.

Supervisors: Prof. TIBUHWA Donatha & Dr. HUSSEIN Juma

C03 (E0023)

N-Hydroxypipecolic Acid Is the Key Molecule in Disease Responses to Powdery Mildew in Wheat

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BACKGROUND

Wheat (*Triticum aestivum*) is the most widely cultivated crop on Earth and fundamental to world food security. It is an urgent issue to improve wheat productivity towards achieving food security. However, there are a lot of factors, abiotic and biotic stresses that reduce wheat productivity. So, we focused on wheat powdery mildew (*Blumeria graminis* f. sp. *tritici*), one of the most serious wheat diseases and studies about temporal dynamics of hormonal disease response by salicylic acid (SA) and *N*-hydroxypipecolic acid (NHP), and then we considered the contribution to food security and **SDG2: Zero Hunger**.

METHODS AND RESULTS

Wheat (cv. Fielder) is cultivated in pots for both the uninfected group and the wheat powdery mildew-infected group sampled every 2 days. We analyzed the endogenous SA and NHP levels by LC-MS/MS and gene expression levels by qRT-PCR. Statistical analyses for all bar graphs were performed using RStudio, and p values were determined by one-way ANOVA with Tukey's multiple comparison test.

As a result, the endogenous levels of SA, NHP, and its precursor pipecolic acid (Pip) increased significantly in the infected group after infection. Notably, the rate of increase in Pip and NHP was much higher than that of SA. In addition, the expression of several enzymes for both SA and NHP biosynthesis increased significantly in the infected group.

CONCLUSION

Our results suggest that NHP is the key molecule in disease responses to wheat powdery mildew. Then, our findings will lead to the development of agrochemicals and molecular breeding and then be able to contribute to increasing wheat productivity.

DISCUSSION TOWARDS ACHIEVING THE SDGs

Firstly, our study will be able to contribute to **SDG2** in terms of high yield wheat production. Moreover, in our presentation, we are going to discuss the advantages and disadvantages of improving wheat productivity related to food security and SDGs using "**SDGs Wedding Cake Model**".

Supervisor: Prof. OKAMOTO Masanori

C04 (E0050)

Developing an Anti-CD47 Nano formulation for Effective Delivery of Quinine to Malaria-Infected Red Blood Cells

AMOS Yohana
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BACKGROUND

Malaria remains a critical public health issue in Sub-Saharan Africa, accounting for over 90% of global cases and nearly half a million deaths annually. While quinine is an effective treatment, its systemic distribution often leads to significant adverse effects. This research proposes targeted drug delivery systems, specifically nanoparticles, to enhance quinine's efficacy while minimizing side effects by directing the drug to malaria-infected red blood cells. This approach aligns with Sustainable Development Goals (SDGs) 3 and 9.

METHODS

The study will develop quinine-loaded Solid Lipid Nanoparticles (SLNs) functionalized with Anti-CD47 antibodies. Characterization will include assessments of size, surface properties, and drug content, alongside evaluations of encapsulation efficiency and drug loading. In vitro drug release studies will be conducted, followed by cellular uptake, cytotoxicity, and hemolysis tests to evaluate safety and efficacy. Antimalarial efficacy will also be tested.

EXPECTED RESULTS

We anticipate to synthesis SLNs with high encapsulation efficiency and optimal drug loading. The functionalization is expected to enable targeted delivery to infected cells, reducing side effects.

CONCLUSION

This innovative nano formulation represents a promising advancement in malaria treatment, aiming to provide a safer and more effective alternative to conventional quinine therapies. By addressing significant healthcare challenges, this research reinforces our commitment to achieving SDG 3 and SDG 9.

Supervisor: HULDA Swai

C05 (E0051)

Evaluation of Antibacterial Activity of Millettia Ferruginea Leaf and Seed Extract on Selected Pathogenic Bacteria

LEBENU Tewodros Abebe
Addis Ababa University

BACKGROUND

The progressive increase in antimicrobial resistance was the major attribute among human pathogens that has given rise to the need to investigate other sources of therapy from various sources such as medicinal plants for the contribution to SDG 3. The aim of this study was to assess the antibacterial activity of crude extract of leaf and seed of Millettia ferruginea against human pathogenic bacteria.

METHODS

Extraction leaf and seed of the plant was performed using ethanol and methanol solvents respectively. Antibacterial activities of each crude extract were evaluated at a concentration of 100 and 200 mg/ml via agar well diffusion assay. The standard drugs (Ciprofloxacine) of 5 µg/ml and DMSO or water were used as positive and negative control respectively.

RESULTS

The result of the study indicated that leaf and seed extract of M. ferruginea show antibacterial activity for S. epidermidis and S. aureus. Minimum inhibitory concentration (MIC) values of the seed extracts tested against all six standard strains. Seed extract had the highest activity with the lowest MIC of 16 mg/ml. against S. epidermidis and lowest activity with the highest MIC of 64mg/ml against E. coli and P. aeruginosa. The other three strains (K. pneumonia, S. aureus and S. agalactiae) showed equal MIC with 32mg/ml. The leaf Extract also performed against all six standard bacteria strains. Leaf extract had the highest activity with the lowest MIC of 8 mg/ml against K. pneumoniae and lowest activity with the highest MIC of 64mg/ml against E. coli. S. epidermidis, P.aeruginosa and S. agalactiae showed equal MIC with 16 mg/ml.
S. aureus exhibited MIC of 32mg/ml.

CONCLUSION

The plant has an inhibitory in the growth of some of the tested pathogens could become a promising natural antimicrobial agent with the potential applications in pharmaceutical industries for controlling the pathogenic bacteria.

Supervisors: JABASINGH S. Anuradha & SCHRAGER Benjamin

C07 (E0074)

Statistical Optimization of Ball Milling Parameters for Sugar Recovery from *Lantana Camara* Invasive Biomass

GEBREWBET Gebrihans Haile
Addis Ababa University

BACKGROUND
Lantana camara is an invasive species that disrupts ecosystems by outcompeting native plants, leading to biodiversity loss. However, utilizing this biomass for sugar recovery presents a valuable opportunity for resource generation. Optimizing ball milling parameters is crucial for enhancing sugar extraction efficiency and maximizing its potential as a renewable resource.

METHOD
Dry *Lantana camara* (0.75 mm size) was processed in a tubular ball mill, with variations in milling time (30-80 min), speed (245-560 rpm), and ball-to-biomass ratio (1:10 to 1:30). Enzymatic hydrolysis using cellulase enzymes converted cellulose into reducing sugars, measured by the DNS method. Cellulose recovery and the removal of hemicellulose and lignin were calculated according to NREL standards. The impact of milling parameters on sugar yields was statistically analyzed using the RSM-Box Behnken design, with optimal conditions validated through replicate experiments.

RESULTS
The treated biomass showed a composition of 49.13 ± 0.30% cellulose, 18.28 ± 0.24% hemicellulose, and 21.203 ± 0.31% lignin, indicating significant changes due to pre-treatment that enhanced cellulose accessibility for enzymatic hydrolysis. Under optimized milling conditions (560 rpm, 55 min, 1:30 biomass-to-ball ratio), a sugar yield of 111.52 mg/g was achieved, seven times higher than that of untreated biomass.

CONCLUSION
Optimizing milling parameters significantly enhances sugar recovery from Lantana camara, highlighting its potential as a sustainable biomass for bioenergy production. This research advances the utilization of invasive species and contributes to **SDGs 7, 12, 13, and 15**, emphasizing its importance for sustainable development.

Supervisors: KEBEDE Shimelies & GYOHANS Mulugeta

C08 (E0107)

Evaluation of Lactic Acid Produced by Fermentation of Selected Vegetable Waste as Treatment in Fecal Sludge

MWEBIA MWIMATHIRI Tyson
Meru University of Science and Technology

BACKGROUND
Fecal sludge management faces significant challenges in developing countries due to the presence of harmful microorganisms and the lack of cost-effective treatment options. This study investigated the potential use of lactic acid derived from vegetable waste as an affordable and efficient treatment for fecal sludge from On-Site Sanitation facilities to contribute towards achieving **SDG 6.**

METHOD
Fresh tomato, cabbage, and carrot wastes were fermented for six days at 37 °C to produce lactic acid. pH and lactic acid concentration were monitored daily using a pH meter and UV-Vis spectrophotometer. Thin Layer Chromatography confirmed the presence of lactic acid. Cabbage-derived lactic acid, with the highest Retention Factor (0.54), was selected for fecal sludge treatment. Four reactors were tested with varying fecal sludge to lactic acid ratios (1:1, 1:0.5, 1:0.35, and a control) using *Escherichia coli* as the pathogen indicator.

RESULTS
Lactic acid concentrations post-fermentation were 1.61±0.34 mg/mL for carrot, 1.39±0.09 mg/mL for cabbage, and 1.17±0.13 mg/mL for tomato. The 1:1 reactor eliminated E. coli within four days (0 cfu/mL) outperforming the other ratios (1.6×10^7, 1.1×10^7, and 1.9×10^3 cfu/mL for 1:0.5, 1:0.35, and control, respectively). Odor levels also significantly reduced in the 1:1 reactor (7.3 TON compared to 25, 26.6, and 42.6 TON for control, 1:0.35, and 1:0.5, respectively).

CONCLUSION
Lactic acid from vegetable waste is an effective, sustainable, and affordable treatment for fecal sludge. The 1:1 treatment ratio achieved significant pathogen and odor reduction, offering a promising solution for sanitation challenges in developing countries.

Supervisors: Dr. MUGO-MWENDA Cynthia N & Dr. GAKII MUTHURI Grace

C09 (E0115)

Inhibitory effect of *Solanum melongena* on β-glucuronidase activity

ISHII Yuma
Utsunomiya University

BACKGROUND

Eggplants (*Solanum melongena*) are rich in polyphenols and exhibit potential functional properties, such as antioxidant effects. However, eggplants have limited applications, resulting in the disposal of approximately 90,000 tons of non-standard eggplants annually in Japan. To address this issue and contribute to **SDG 12.5**, which targets reducing food loss and waste, I am exploring the novel functionalities of eggplants for effective industrial waste utilization.

This research focuses on β-glucuronidase (GUS), an enzyme linked to colorectal cancer risk. Fat-soluble carcinogens are conjugated with glucuronic acid in the liver, making them water-soluble for elimination. However, GUS, produced by intestinal bacteria, breaks these conjugates, hindering excretion and increasing carcinogenic risk. So, GUS inhibition is expected to reduce carcinogenesis. This study evaluates the GUS inhibitory effect of eggplants and aims to isolate inhibitory components stably.

METHOD

Commercial eggplants were freeze-dried, powdered, and dissolved in phosphate buffer. After centrifugation, the supernatant was incubated with GUS from *Escherichia coli*. The substrate, 4-nitrophenyl β-D-glucuronide, was added, and the absorbance of *p*-nitrophenol, a decomposition product of substrate, was measured to determine GUS activity. The inhibition rate was calculated relative to the control.

RESULTS

The freeze-dried sample exhibited a 98% inhibition rate at 0.2 mgFD/mL, but the effect decreased to 34% after 1 hour, suggesting that the inhibitory active substance was unstable. Enzymatic browning was suggested to be responsible for the inhibitory effect, and the results of HPLC analysis and other experiments suggested that the inhibitory compound was chlorogenic acid quinone, formed by the enzymatic oxidation of chlorogenic acid. This compound was decreased with long-term incubation and weakened the inhibitory effect.

CONCLUSION

While the inhibitory components have been suggested, they are unstable and have yet to be isolated. Continued research aims to stabilize these compounds and expand their applications, contributing to sustainable development through the effective use of industrial eggplant waste.

Supervisor: Prof. HASHIMOTO Kei

C10 (E0122)

Discovery of Extremophilic Bacteria from L. Simbi Nyaima with Biocontrol Potential Against *Fusarium Oxysporum F. Sp. Lycopersici*

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Jomo Kenyatta University of Agriculture and Technology

BACKGROUND
This study aimed to discover extremophilic bacteria from Lake Simbi Nyaima with biocontrol potential against *Fusarium oxysporum f. sp. lycopersici* which causes *Fusarium* wilt in tomatoes. *Fusarium* wilt is a major fungal disease affecting tomato production in Kenya and the use of chemical fungicides to control it has proven ineffective and environmentally unsustainable.

METHOD
Purposive sample collection was done around Lake Simbi Nyaima where soil, water and sediment samples were collected. Bacteria was then isolated from the soil, water and sediment samples. An antibiosis assay was then conducted using co-culturing technique to validate the biocontrol potential of bacterial isolates against *Fusarium oxysporum f. sp. lycopersici*. Biochemical analysis was them performed followed by a molecular identification using 16S rRNA gene sequencing to determine the taxonomic classification and phylogenetic relationships of the isolates.

RESULTS
A total of 100 bacteria were isolated out of which 10 isolates had varied mycelium inhibition rates (27.77% - 69.87%). Based on the partial sequences, Basic Local Alignment Search Tool (BLAST) analysis revealed that the 10 isolates showed similarity to either members of the *Brevibacteriaceae*, *Plano-coccaceae*, or *Bacillaceae* families. Isolates with strongest inhibition rates were D5-4 with a mycelium inhibition rate of 69.84% and a 98.80% sequence similarity to *Bacillus subtilis* strain BSu_MA_14 (ON878268.1) and S3-1 with a mycelium inhibition rate of 63.07% and 97.66%sequence similarity to *Bacillus subtilis* strain SYH9 (HQ202557.1). Enzymatic assay done on the ten bioactive isolates showed that both D5-4 and S3-1 produced protease and chitinase whereas isolate S3-1 was positive for siderophore production.

CONCLUSION
Our study discovered potential biocontrol bacteria from Lake Simbi Nyaima with enzymatic activity and antagonistic properties against *Fusarium oxysporum f. sp. lycopersici*, contributing to SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) by promoting sustainable agriculture and reducing chemical fungicide use.

Supervisors: Prof. JUSTUS Onguso M. & Dr. WEKESA Vitalis W.

C11 (E0125)

Microbial and Viral Diversity in the Tomato Rhizosphere: Implications for Sustainable Agriculture

MOGIRE Derleen[1], NEONDO Johnstone[1], MUHONJA Christabel[2], AWUOR Consolate[2], MUREITHI Daniel[2], OGADA Stephen[1], WEKESA Tofick Barasa[1,3]

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BACKGROUND

Microbial and viral communities in the rhizosphere are critical to plant health, soil fertility, and sustainable agriculture. These communities influence nutrient cycling, disease suppression, and stress tolerance, making them pivotal for crop productivity. However, the diversity and functional roles of these organisms in the tomato rhizosphere remain underexplored, particularly in African agricultural systems. Understanding these interactions can address challenges like declining soil health, increasing pathogen pressure, and the overuse of chemical inputs.

METHOD

Rhizosphere soil samples were collected from three counties in Kenya (Kirinyaga, Kiambu, and Laikipia) using purposive random sampling during the dry season. DNA was extracted using a modified phenol-chloroform method and sequenced with Illumina NovaSeq technology. Microbial composition and functional potential were analyzed using bioinformatics tools including FastQC, MEGAHIT, and functional annotation databases (SEED, eggNOG, and InterPro2GO). Viral diversity was assessed by characterizing phages and their roles in microbial dynamics.

RESULTS

The microbial community was dominated by Actinobacteria (47.84%) and Proteobacteria (33.12%), which are critical for nutrient cycling and plant growth promotion. Significant populations of decomposer phyla, including Acidobacteriota, Chloroflexi, and Bacteroidota, were identified. Viral analysis revealed the predominance of Siphoviridae phages, particularly Woodruffvirus and Samistivirus, which regulate bacterial populations and exhibit potential for biocontrol.

CONCLUSION

This study demonstrates the roles of microbial and viral communities in promoting plant health and sustainable soil management. The findings emphasize the potential of using these communities for biocontrol and biofertilization. This research contributes to **SDG2** (Zero Hunger) by promoting sustainable food production systems and **SDG15** (Life on Land) through improved soil ecosystem management. Future research should focus on characterizing unclassified taxa and developing practical applications for identified beneficial microorganisms.

Supervisors: NEONDO Johnstone, MUHONJA Christabel, MUREITHI Daniel

C12 (E0126)

Assessing Heavy Metal-Resistant Microorganisms and Health Risks in Landfill Leachate and Soil: A Review

TAMENE Mulugeta
Addis Ababa University

INTRODUCTION

Improper municipal waste management leads to the accumulation of toxic heavy metals, fostering the growth of heavy metal-resistant microorganisms and posing risks to the environment and human health.

AIM

This systematic review aimed to assess heavy metal-resistant microorganisms in unengineered landfill leachate and soil while assessing the associated human health risks.

SIGNIFICANCE

This review is significant for isolating, identifying, and characterizing microbes with heavy metal tolerance and emphasizing the critical role of biological remediation in mitigating heavy metal toxicity in open landfill leachate and soil environments. This research aligns to SDG 3 and 6 directly, as well as 11, 12 and 15.

METHOD

A systematic review methodology was employed, and articles from January 2012 to September 2022 were screened from databases PubMed and Scopus. Sixteen articles meeting the inclusion criteria were analyzed.

CONCLUSION

Microbial communities in both leachate and soil ecosystems play pivotal roles in combatting heavy metal threats. Landfill leachate contains resilient bacteria such as *Escherichia coli,* Pseudomonas, and *Klebsiella pneumoniae*, raising concerns about health and environmental impacts. Similarly, the soil hosts *Bacillus subtilis, Escherichia coli*, and other species, provide insights into metal contamination sources and potential bioremediation strategies.

RECOMMENDATION

We recommendation the utilization of microbial capabilities and sustainable waste practices while monitoring antibiotic resistance to mitigate heavy metal pollution in landfill leachate and soil, safeguarding ecosystems and human health.

Supervisors: Prof. MEKONEN Seblework & Prof. ADMASU Tesfaye

C13 (E0139)

Biosynthesis of Biodegradable Polymers Phas by Bacteria Isolated from Soda Lakes of Kenya

MUIGANO Martin Nganga
Jomo Kenyatta University of Agriculture and Technology

BACKGROUND

Plastic pollution is a major challenge facing the world today with adverse effects on marine life, natural landscapes, human health, and climate change. The production of biodegradable biopolymers is a promising strategy for resolving the plastic pollution crisis. Polyhydroxyalkanoates (PHAs) are a category of polymeric materials synthesized by bacteria, archaea, and fungi under constrained nutritional conditions. However, commercial production of PHAs remain constrained due to low yields and high costs. Therefore, in this study, I conducted a bioprospection of soda lakes in Kenya for identification of high yielding strains. Fruit peels residues were used as a carbon source in order to lower the cost of PHA production.

METHODS

Samples of water, soil, and sediments were obtained from hypersaline lakes namely Lake Magadi and Lake Simbi. Bacteria were isolated from the samples and screened for PHA production. Fermentation was conducted with various sources of carbon resources, including fruit peels. PHA granules were recovered from the bacteria cells, purified, and quantified.

RESULTS

After screening more than 200 isolates, one strain identified as *Halomonas alkalicola* emerged as a superior PHA producer with yields of 1.42 g/L. The strain successfully utilized fruit pels as a sole carbon source for PHA production. The findings show that soda lakes are potent sources of high-yielding strains for production of biopolymers at low cost.

CONCLUSION

The findings of this study indicates that bacteria isolated from the Kenyan soda lakes can be harnessed for biopolymer production with low-cost substrates. Consequently, the study has prospects for reducing plastic pollution in Kenya and potential contribution to climate action by lowering the greenhouse gas emissions from the use of synthetic plastics. Commercialization of PHAs further point to the potential for reducing urban plastic waste pollution. Thus, the study portends to contribute to SDG 3 (Good Health and Well-being), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

Supervisor: Dr. ANAMI Sylvester

UU-A STUDENT SUMMIT 2025
Summit Abstracts (D)

~Health and Medical Sciences~
D01 ~ D07

D01 (E0005)

β- glucuronidase Inhibition using *Mucuna pruiens* Beans

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Utsunomiya University

BACKGROUND

Daily exposure to xenobiotics through food additives, drugs, and pollutants, poses potential health risks, including carcinogenic effects. The liver plays a crucial role in detoxifying these compounds through glucuronide conjugation, aiding their excretion. However, certain gut microorganisms secrete the beta-glucuronidase (beta-GUS) enzyme, which catalyzes the removal of glucuronic acids, hindering excretion and leading to the accumulation of carcinogenic compounds in the colon, thereby increasing the risk of colon cancer.

Research has indicated that heat-treated L-DOPA, a precursor to dopamine, can inhibit beta-GUS activity. Mucuna pruriens, a tropical legume rich in L-DOPA, offers potential as a natural beta-GUS inhibitor due to its diverse pharmacological properties. This study evaluated Mucuna pruriens extracts for their beta-GUS inhibitory effects, aiming to explore their therapeutic potential.

METHOD

The extracts were prepared using rotary evaporation with methanol, ultrasound and heat treatments to retain bioactive compounds. The total phenolic content of the extracts was quantified using the Folin-Ciocalteu method at concentrations of 3 mg/ml and 0.3 mg/ml, with gallic acid as the standard. Beta-GUS inhibition assays were conducted using *p*-nitrophenyl-D-glucuronide (PNP) as the substrate.

RESULTS

Spectrophotometric analysis revealed that methanol extracts, especially when heat-treated at 100°C for 15 minutes, significantly (80%) inhibited beta-GUS activity. The higher concentration (1 mg/ml) exhibited a more pronounced inhibitory effect compared to the lower concentration (0.02 mg/ml). In contrast, the unheated extract showed no inhibitory effect. The highest polyphenol content was observed in the heat-treated methanol extract, while the unheated raw form had the lowest.

CONCLUSION

These findings suggest that Mucuna pruriens could serve as a natural source of beta-GUS inhibitors, warranting further research into its potential for managing conditions linked to elevated beta-GUS levels. This research aligns with SDG 3.

Supervisor: Prof. HASHIMOTO Kei

D02 (E0068)

Evaluating Cervical Cancer Screening Uptake: Facilitators and Barriers in Southeast Oromia Primary Health Care Facilities

AMBERBIR Melat
Addis Ababa University

BACKGROUND

Cervical cancer is the second most common cancer among women in Ethiopia, with challenges in opportunistic screening significantly hindering participation. This leads to missed opportunities for early detection and adverse health outcomes. This study aims to assess the uptake of cervical cancer screening and identify health facility-related facilitators and barriers among eligible women in southeast Oromia, Ethiopia, in 2024.

METHODS

A mixed-methods approach was employed, comprising qualitative interviews (n=16) and a cross-sectional study involving 629 women conducted from January to September 2024 across six health care facilities in southeast Oromia. Multivariable logistic regression was utilized to identify factors influencing screening uptake, while qualitative data were analyzed thematically.

RESULTS

Cervical cancer screening uptake was found to be 15.6%. Key facilitators included being aged 40-44 years (AOR=3.34), having a college education (AOR=4.14), a higher income (>7800, AOR=8.3), receiving counseling (AOR=6.52), and possessing good knowledge (AOR=6.53). Barriers identified included feeling healthy, embarrassment, lack of provider recommendations, service interruptions, and reliance on traditional treatments. Facilitators comprised trained health care providers, available equipment, mass media information, spousal support, and female providers.

CONCLUSIONS

The low uptake of cervical cancer screening is concerning, with age, education, knowledge, income, and counseling availability being significant influencing factors. Barriers such as insufficient provider recommendations highlight the need for targeted health education and awareness programs in primary health care. This research aligns with Sustainable Development Goal 3, emphasizing the importance of counseling for women accessing health services.

Supervisors: GIZAW Muluken & KIFLE Awegichew

C05 (E0089)

Advanced Biomechanical Measurement Using MRI or CT

ADELEKE Olaolu
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BACKGROUND OF RESEARCH

Baseball sport is associated with pitching, which has many stages, and as fast-pitch softball grows [Oliver, Friesen, Barfield, et.al.2019], there has been an increase in the awareness of pain and injuries coming from the acceleration stage of pitching where there is the maximum rotation of Glenohumeral joint muscle or cuff muscles, [Yamaura, Mifune, Inui, et.al. 2021] confirm that 28% of all injuries sustained by professional baseball pitches occur at the shoulder joint, Biomechanical studies on throwing motion have evaluated joint angles, forces, and torques using an optical motion capture system and have indicated correlations to injuries. However, Outdated equipment and Ethical constraints may have hindered accurate measurements or prevented radiographic assessments.

OBJECTIVES

To investigate the differences in muscle activation patterns and performance of the rotator cuff during shadow pitching and real pitching under both normal and fatigued muscle conditions using EMG (electromyography). And before shadow pitching under both normal and fatigued muscle conditions using magnetic resonance imaging (MRI).

METHODOLOGY

1. Subjects: 15-20 healthy males' baseball pitchers are expected to participate in the study. 2. Instrumentation: A single-board computer, notebook PC, and electromyography (EMG) sensor will be used to collect data, MRI machine, and software.

RESULTS

The researcher is expecting significant muscle fatigue in the infraspinatus, deltoid, and trapezius muscles after pitching which will suggest that muscle fatigue is a significant concern for baseball pitchers, particularly as the number of pitches thrown increases.

CONCLUSION

By employing advanced imaging techniques, this research provides critical insights that could enhance pitcher rehabilitation strategies and reduce injury incidence, which is the third SDG goal.

Supervisor: Professor SHIMAWAKI Satoshi

Is Lipid Metabolism Regulated by Light, Dark and Circadian Clock in Fish?

Yuki SAITO, Reika TAKEUCHI, Misato KISHI and Masayuki IIGO
Utsunomiya University

BACKGROUND

Lipids are one of the most important determinants of food quality. Highly unsaturated fatty acids (FUFAs) such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) have attracted attention as being beneficial to human health. Bonefish are particularly important sources of FUFAs for human consumption. Just as there is "the best season for the best taste" (so called "syun" in Japanese) for various foods, does the nutritional and commercial values of fish change with the time of day? To address this question, we examined whether the mRNA levels of fatty acid synthesis-related genes in the liver of a teleost fish, ayu (*Plecoglossus altivelis*), are regulated by light, dark and and circadian clock. If this is true, we can apply this technology to maximize the nutritional and commercial values of fish in aquaculture farms.

MATERIALS AND METHODS

Livers collected every 4-h from ayu reared under light-dark (LD), constant dark (DD), and constant light (LL) conditions were used for total RNA extraction. cDNA was synthezed and real-time PCR analyses for fatty acid elongases and desaturases were performed. The mRNA levels of each gene were normalized to the levels of β-actin, and further normalization was performed as the peak value set to 100%. One-way and two-way analysis of variance were used to examine the mRNA levels under LD, DD and LL.

RESULTS

mRNA levels of many genes involved in lipid metabolism in ayu showed significant daily variations under LD conditions. mRNA levels of some genes exhibited circadian variations under DD and LL. Higher mRNA levels under DD and LL were also noted in several genes. We are trying to comprehensively quantify fatty acids such as EPA and DHA in the muscle by GC-MS to test whether fatty acid levels exhibit daily and circadian variations.

CONCLUSIONS

By artificial control of lighting condition, the lipid metabolism of ayu can be manipulated. Thus, we can determine the best time of a day to harvest ayu from the aquaculture ponds and ship them with higher nutritional values. This technology can be applied to upgrade commercial values of fish in near future. Our research will contribute to SDGs Goals 3, 9 and 14.

Supervisor: IIGO Masayuki

UU-A STUDENT SUMMIT 2025
Summit Abstracts (E)

~Social Sciences and Humanities~
E01 ~ E13

E01 (E0016)

Weight Perception and Its Influencing Factors Among Women Living in the Accra Metropolis

ASIEDU Enoch, OTOO Gloria, and OHEMENG Agartha
University of Ghana

BACKGROUND

Inaccurate weight perception can lead to poor dietary choices, inadequate physical activity, and other poor weight management decisions, which in turn increases the risk of obesity and its related health conditions. This study investigated weight perception and its associated factors among women living in the Accra metropolis.

METHOD

A cross-sectional survey was conducted with 378 female participants aged 18 to 65 in Accra Metropolis. Weight perception was evaluated using the Feel-weight-status minus Actual-weight-status Index (FAI), comparing self-reported weight categories with measured BMI according to WHO standards. Sociodemographic data were collected via a semi- structured questionnaire, and logistic regression analysis was used to explore the associations between weight perception and its influencing factors

RESULTS

The majority (67.7%) underestimated their weight. The prevalence of overweight and obesity was 38.1% and 29.9% respectively. The average age of the respondents was 42.1 years (± 13.2). Increasing age was significantly associated with inaccurate weight perception (AOR= 1.025, 95% CI: 1.006-1.044).

CONCLUSION

Public health education on accurate weight perception should be promoted among women. This will potentially enhance weight management behaviours and reduce the risk of metabolic disorders among women in the study population. Thereby contributing to achieving SDG 3, which emphasizes the importance of reducing the burden of NCDs and promoting "Good health and well-being" for all.

Supervisor: OHEMENG Agartha

E02 (E0018)

The Effect of Leader-Member Exchange Leadership on Organizational Change: The Case of Ethiopian Roads Administration

TADESSE Eyuel Bogale
Addis Ababa University

BACKGROUND AND PROBLEM STATEMENT

Leader-Member Exchange (LMX) theory, which examines the quality of leader-subordinate relationships, plays a critical role in fostering organizational outcomes. Public institutions like the Ethiopian Roads Administration (ERA) frequently face challenges in implementing organizational changes due to employee resistance and structural complexity. There is a knowledge gap in understanding how LMX impacts change implementation, particularly in enhancing equitable and resilient infrastructure and promoting inclusive and productive employment.

OBJECTIVES

This study investigates the existence, impact, and extent of LMX leadership influence on the success of organizational change within ERA.

METHODOLOGY

A quantitative approach was employed, using surveys directed at a stratified random sample of ERA employees (n=178). The LMX-MDM scale and organizational change success metrics were used to assess the relationship between LMX dimensions and organizational change outcomes. Data were analyzed using descriptive statistics, correlation, and regression analyses.

RESULTS/FINDINGS/DISCUSSIONS

Results indicate a strong positive correlation between high-quality LMX relationships and successful organizational change implementation. LMX dimensions such as professional respect and loyalty significantly influence employee readiness for change and overall change outcomes. Enhanced LMX relationships predict improved operational performance and the creation of equitable opportunities, contributing to more resilient infrastructure and inclusive employment practices.

CONCLUSION AND SIGNIFICANCE TOWARDS ACHIEVING THE SDGs

The study underscores the importance of leveraging LMX leadership to advance SDG 8 (Decent Work and Economic Growth) by fostering full and productive employment, and SDG 9 (Industry, Innovation, and Infrastructure) by supporting equitable and resilient infrastructure development. ERA leadership is advised to integrate LMX strategies into change management practices to ensure sustainable progress aligned with these global goals.

Supervisor: FISSEHA Assefa

E03 (E0026)

Children's Participation Right: Implementation Practices of Educators in Public and Private Preschools Within the Accra Metropolis

EYISON Yirenkyiwa Gyebi, MAHAMA Sheriffa, and TACKIE-OFOSU Vivan
University of Ghana

BACKGROUND

Recent research highlights the importance of children's participation rights (CPR) in early childhood education (ECE), emphasizing their right to express their views in decision-making. Implementing CPR is associated with improved cognitive and socioemotional outcomes for children. In Ghana, a third of preschoolers are missing these benefits, underscoring the need to explore CPR implementation in ECE. However, documentation on this topic is lacking in the country, making it essential to examine early childhood educators' practices, as they are crucial for implementing these rights.

METHODS

This study adopted a cross-sectional design with a quantitative approach, utilising a semi-structured questionnaire to collect data from 172 preschool educators across public and private basic schools (86 public, 86 private) within the Accra Metropolis. The questionnaire was designed around the four elements of Lundy's Model of Child Participation: space, voice, audience, and influence. Data collected was analysed using both descriptive and inferential analysis.

RESULTS

The findings revealed a notable difference between the professional qualifications of public and private school educators, where about 38% of public school educators held a professional qualification whereas 71% of private school educators had no professional qualifications ($p=0.00$). Educators acknowledged the importance of giving children space and a voice to express their views. However, making sure that the children's opinions are heard and acted upon was inconsistent, revealing gaps in achieving full participation.

CONCLUSION

To improve children's participation rights in the country, there should be policy improvement, provision of adequate resources, and regular training of educators. These will facilitate children's participation practices and help them achieve quality education **(SDG 4).**

Supervisor: TACKIE-OFOSU Vivan

E05 (E0035)

The Contribution of Proximate and Distal Determinants to Reduce Fertility During the Past Two Decades in Ethiopia: Analysis of Edhs 2000-2016

GELILA Samuel
Addis Ababa University

BACKGROUND
TFR is the number of births anticipated from women of reproductive age who are married, don't use contraception, who don't breast feed and don't have abortion. TFR declined from 6.4 in 1990 to 4.6 in 2016 in Ethiopia. There is a national paucity of available evidence regarding the trend in the influence of proximate and distal determinants over fertility decline. Such evidence is crucial to evaluating family planning programs to achieve **SDG 3 and 1**.

METHODS
We used data sets of Ethiopian Demographic and Health Survey 2000-2016. John Bongaart's fertility model have been employed to calculate the indices of proximate determinants. Besides, distal determinants affecting fertility were identified by employing multi-level zero-inflated negative binomial regression.

RESULTS
Delayed marriage inhibited fertility with increasing trend in Tigray and a declining trend in Oromia and Harari regions, women with no education and women in age group 20-24. Contraception reduced fertility with increasing trend in both urban and rural areas, Tigray, Amhara and Oromia regions, women with no and primary education and women across all reproductive age groups. Postpartum- infecundity inhibited fertility with decline in Rural areas, Amhara region, women with higher education and women in age group 30-49. Induced abortion inhibited fertility by 0.61% and 0.73% in 2011 and 2016. Rural residence (IRR= 1.22 95% CI: 1.13, 1.32), Somali (IRR= 1.55 95% CI: 1.41, 1.71), Muslim (IRR=1.12 95% CI: 1.06, 1.19), women with no education (IRR=2.1 95% CI: 1.92, 2.31) had higher fertility. Fertility is higher for each year increase in age (IRR= 1.057 95% CI: 1.055, 1.059) while employment (IRR= 0.96 95% CI: 0.93, 0.99) is negatively associated with it.

CONCLUSION
Inhibition effect of contraception has been increasing over the four survey years. Fertility is higher among women in rural areas, Somali region, women with no education, and Muslim women while it is lower among employed women.

Supervisor: Dr. MEKONNEN Wubegzier

E06 (E0041)

Knowledge and Associated Factors of Autism Among Parents with Autistic Children at Selected Autism Centers, Addis Ababa, Ethiopia, 2022

TILAHUN Kalkidan
Addis Ababa University

BACKGROUND

Owing to parents being the primary caregivers in most situations, their ability to recognize the signs and symptoms of autism and respond appropriately is of paramount importance in aiming to provide the best healthcare to autistic individuals. This study was conducted with the aim of ascertaining the parent's knowledge and awareness of autism among parents with autistic children at autistic centers of Addis Ababa, Ethiopia.

METHODS

Institutional based cross-sectional study was conducted in three autistic hospitals/centers. The final sample size was 422 which were proportionally allocated to each of the institutions and systematic random sampling was used to select study units that are part of the study. Data was checked, cleaned and entered in to Epidata 3.1 software, then was imported to SPSS version 26.0 software for analysis. The results of the descriptive statistics were expressed. Associations between knowledge about autism, sex and stress were analyzed using bivariate and multivariate analysis to identify factors which are significantly associated with knowledge among parents of autistic children, in one of autistic centers.

RESULTS

Participants displayed poor knowledge scores of 66% in the section concerning correct etiology of autism and that of 56% in the section testing knowledge of signs and symptoms. Sex and stress were significant factors for the section of etiology of autism {(p=0.030, AOR (95%CI), 6.609(1.196-36.57)} and {(p<0.001, AOR (95%CI), 0.008(0.002-0.041)}. In addition p value of stress {(p<0.001, AOR (95%CI), 0.067(0.021-0.216)} seen with the knowledge about signs and symptoms.

CONCLUSION

Findings of this study confirmed knowledge was more problematic. To fill this gap, awareness programs should be conducted to promote parent's knowledge regarding autism, so as to allow for early diagnoses and an appropriate treatment plan/therapy. General practitioners are needed to play a key role in counseling parents about autism (SDG 3).

Supervisor: DR.FIKIRTE WOLDESILASSIE

E08 (E0061)

Food Insecurity Situation among Female Headed Households: The Case of Akaki Woreda Oromia, Special Zone, Ethiopia, 2023

ADDISALEM Berhanmeskel
Addis Ababa University

BACKGROUND

Food insecurity is one of the dominant problems in Ethiopia. Especially, a female-headed household is the one that has been seriously hit by the problem. The severity of the problem was a driving force that instigated the researcher to conduct this research.

METHODOLOGY

The research mixed research approach was carefully followed. Hence surveys, Observation, Focus Group Discussions, key informant interviews were used. Case study was also used as the strategic inquiry of qualitative research. Qualitative data were analyzed by using the thematic analysis technique whereas quantitative data is analyzed by using descriptive statistics and logistic regression.

RESULTS

Based on nationally recommended calorie requirement (2200 kcal/ adult/ day) using a cut-off point between food secure and insecure. Based on this, about 61.2% (1623 kcal/ adult/ day) of the sample FHHs were found to be food insecure, and 38.8 % (2813 kcal/ adult/ day).

CONCLUSION

It is concluded that, Policymakers, institutions' and women must work together, helping women to help themselves and ensure their food security situation is the recommendation of this research.

RELATED SDGs: 2,4,1

Supervisor. HAILU Emezat

E09 (E0090)

Entrepreneurial Orientation (Eo) In Micro-Enterprise (Mes) Firm Performance (Fp) In Sri Lanka: A Developing Country Context

SANJEEWA Polgahagedara Don Pubudu
Utsunomiya University

INTRODUCTION

The study examines the relationship of EO and its three dimensions, innovativeness (IN), pro-activeness (PA), and risk-taking (RT) with FP of MEs in Sri Lanka to bridge the methodological and empirical gaps regarding EO-related studies on MEs.

METHOD

An eleven-point EO score card and a subjective FP measurement scale for MEs in Sri Lanka, were tested for reliability and consistency through factor analysis and Cronbach's Alpha coefficient. Hypotheses were formulated based on the body of existing literature and tested with simple and multiple linear regressions on SPSS version 23 on the measurements of 104 MEs selected through multiple stage sampling.

RESULTS

The FP scale and three dimensional EO scorecard were found to be valid and reliable based on the results. Out of the three EO dimensions, PA showed a significant positive impact on MEs' FP, whereas IN and RT resulted to have no discernible effect. Additionally, the FP of MEs is significantly impacted by EO, which is the collective effect of the three aforementioned dimensions.

CONCLUSION

OMs of MEs are significantly proactive, but they are innovators to a considerable extent and are not good risk takers. EO of MEs is significantly impacting the FP of MEs in Sri Lanka.

The findings of the research contributes to the Sustainable Development Goals, **SDG 8**: Decent work and economic growth and **SDG 9**: Industry, innovation and infrastructure.

Supervisor: Prof. SAKAMOTO Kumiko

E10 (E0097)

Investigating the Effect of Communicative Grammar Teaching on Students' Speaking Performance

WELO TESFAYE Hambissa
Addis Ababa University

BACKGROUND

Students show poor speaking performance in English language. They know the form of verbs, but they cannot use the verbs to speak meaningfully. So, we have to improve students' English-speaking performance, and grammatical knowledge contribute to **SDG 4, 9** and **17**.

METHODS

A quasi-experimental design with an explanatory sequential mixed method was used for the study. Therefore, tests, focus group discussions, and a questionnaire were used for the data collection. The participants were grade 11 students and English as a Foreign Language teachers. An experimental and a controlled group were selected using a simple random sampling technique. The reliability of the written tests was analyzed to check the discrimination index and difficulty level. Chrombach's Alpha was used to check the reliability of the questionnaire. The tests were analyzed in the Paired Samples test by using SPSS version 22. Regression and ANOVA were used to analyze the data of the questionnaire. The Pearson Correlation was used to test the relationship between variables in the questionnaire. Content analysis, thematic analysis and narrative analysis were used in analyzing the focus group discussion result.

RESULTS

The study revealed that communicative grammar teaching has a positive impact on students' speaking performance. Communicative grammar teaching also improves grammatical knowledge. It was also found that students have a positive attitude towards communicative grammar teaching as they got it improving their speaking skills and grammatical knowledge.

CONCLUSION

I consider that if grammar is taught communicatively, students' speaking performance and knowledge will be improved, and this will add value to improving education quality in the context where English is used as a medium of instruction

Supervisor: KITILA Tamene (PhD)

E12 (E0103)

The Penetration of Money/Market and Mutual Assistance in Africa: Focusing on Ghana

HITOMI Toshiki
Utsunomiya University

BACKGROUND

Mutual assistance based on strong human-relationships has contributed to people's survival in African societies which face food shortages and famine, but it has been pointed out that the penetration of money and market economy have weakened the human-relationships. It is also indicated that focusing on the cultural and social aspects of Africa and analyzing their impact is necessary. Therefore, this research analyzes and discusses the impact of money and market on mutual assistance in a village that is caught between the need of money and the continuance of the traditional social system.

METHOD

Semi-structured interview was conducted to 13 people (6 men; 7 women) of various ages in a village in northeastern Ghana. By contextualizing the results with chronology and previous research, this research analyzed the period when the need for money started to increase, and the impact of the penetration of money/market on mutual assistance.

RESULTS AND CONCLUSION

The interviews and their chronological analysis indicated that the need for money started to increase 30-40 years back due to the spread of the market economy following structural adjustments in the 1980s. Compared to the mutual assistance in the past, the villagers have faced significant changes up to today. Although the need for money is increasing, mutual assistance was firmly confirmed with a social norm where “people” are perceived as the wealth. There was also a clear difference between mutual assistance with food and money: By using them differently, the people in O village guarantee survival and confirm social ties through food assistance; they also maintain the basis of the community such as funerals through monetary assistance. It indicated that people in O village prioritize social relations over the pursuit of individual benefit.

SDGs

The findings of this research contribute to the SDGs, 1: No Poverty, 8: Decent Work and Economic Growth, 11: Sustainable Cities and Communities.

Supervisor: SAKAMOTO Kumiko

E13 (E0108)

Postures and Selection of Supports Used by Yakushima Macaques During Climbing and Descending Movements

SATAKE Madoka
Utsunomiya University

BACKGROUND
Primates, including humans, exhibit diverse locomotion types such as bipedalism, quadrupedalism, leaping, and brachiation. These locomotion patterns are thought to be adaptations to their habitats, whether terrestrial or arboreal. To maximize the efficiency of these locomotion types, the musculoskeletal system is presumed to adapt to the environment as well. While Japanese macaques tend to be more terrestrial compared to other primates, they also frequently utilize arboreal habitats. However, studies on the locomotion of wild Japanese macaques remain limited, particularly regarding their movements in natural environments.

METHOD
This study focused on Yakushima macaques, using continuous focal sampling to record their behavior in detail. Movements during locomotion were recorded on video, and the angles and DBH (diameter at breast height) of the supports they used were measured. Both wild and captive individuals were studied to compare their locomotion patterns and support use characteristics.

RESULTS
The observations revealed that wild Yakushima macaques utilized supports of various sizes, ranging from approximately 60 cm to 2 cm in diameter. They also used to support with a wide range of angles, from nearly vertical (about 90°) to almost horizontal (about 5°). Regarding posture types during locomotion, six types were identified in the wild, while seven types were observed in captivity. Notably, certain posture types were only observed in captive macaques.

CONCLUSION
These findings suggest that Yakushima macaques flexibly adapt their use of supports and employ various posture types to suit their habitat. This flexibility enables them to adapt to a wide range of environmental conditions.

Supervisor: MASATO Aoyama

UU-A STUDENT SUMMIT 2025
Summit Abstracts (F)

~Engineering and Technology~
F01 ~ F11

F01 (E0021)

Machine Learning-Based Predictive Modeling for Viral Load Suppression Among HIV AIDS Patients on Antiretroviral Therapy in Sub-Saharan Africa

WORKU Amanuel Shawul
Addis Ababa university

BACKGROUND
Achieving viral load suppression is a critical component of HIV management, significantly reducing disease progression and transmission. Despite global efforts, Sub-Saharan Africa faces challenges in meeting Viral Load suppression targets due to socio-economic disparities, poor adherence to antiretroviral therapy, and limited healthcare infrastructure. Machine learning offers innovative approaches to address these challenges by predicting Viral Load suppression and optimizing HIV care. Objective: To develop and validate machine learning-based predictive models for HIV viral load suppression using socio-demographic, behavioral, and biomarker data from 12 Sub-Saharan African countries.

METHODS
A prospective data analysis approach will be employed using the Population HIV Impact Assessment dataset collected between 2016 and 2023 from 14 Sub-Saharan African Countries. Data preprocessing steps include handling missing values, feature selection, and class balancing. Machine Learning algorithms and Neural Networks will be applied to develop predictive models. Model performance will be assessed using metrics of accuracy, sensitivity, and specificity. The findings will identify key predictors and provide actionable insights to improve ART adherence and increase the health and life length of HIV patient individual.

EXPECTED OUTCOME
This study aims to identify the most predictive sociodemographic, clinical, and biomarker features associated with virological suppression in HIV-positive individuals receiving antiretroviral therapy (ART). Furthermore, the research will evaluate and select optimal machine learning algorithms for accurately predicting virological suppression status.
Contribution to **SDG 3**: The findings of this study will contribute to Sustainable Development Goal 3 by informing strategies to improve the health and treatment outcomes of individuals living with HIV/AIDS. Ultimately, this will contribute to an increased treatment effectiveness, and improved overall health status of HIV-positive patients on ART.

Supervisors: AWGICHEW Kifle & MICHALE Melese

F02 (E0027)

Performance Analysis of Battery Energy Storage Systems in Microgrids

MOGES Eden
Addis Ababa University

BACKGROUND

Microgrids (MGs) play a crucial role in rural electrification, yet they encounter challenges such as energy capture losses and suboptimal battery performance. This study evaluates lithium iron phosphate (LiFePO4) battery technology in phase one of the “Light for All Project” across 12 microgrid sites in Ethiopia, aiming to enhance battery efficiency and life span.

METHODOLOGY

We identified root causes of poor performance and designed efficient Battery Energy Storage Systems (BESS). Modeling was conducted using MATLAB Simulink, while optimization utilized HOMER software. Key interventions included active cell balancing at the Ungoge site, integrating a generator for startup and backup, and implementing load shedding strategies at the Omorate microgrid. Critical factors such as depth of discharge, temperature, and charging currents were analyzed through equivalent circuit modeling, and an advanced battery management system was developed for monitoring state of charge (SOC) and state of health (SOH).

RESULTS

Active cell balancing markedly improved efficiency and extended battery life across 16 cells, generating economic benefits, including $12,075 in savings from reduced early battery damage despite higher initial costs. In Omorate, load shedding effectively prioritized critical loads, shedding 27,748,875 watt-hours per day of noncritical loads to sustain 419,685.5 watt-hours per day for critical needs.

CONCLUSION

This study addresses key issues in microgrid battery performance, demonstrating that active cell balancing and strategic load shedding enhance battery longevity, system autonomy, and economic sustainability and contribute significantly to Sustainable Development Goals (SDGs) **7** and **9**.

Supervisor: HABTU Dawit

F03 (E0042)

Predicting Water Quality Using Machine Learning: A Comparison of Different Methods

AWUKU-BOATENG Kelvin
University of Ghana

BACKGROUND

The quality of water in coastal regions is critical for ecosystem health and human safety but is increasingly threatened by pollution, climate change, and human activities. This study investigates the use of machine learning to predict water quality in coastal areas, comparing algorithms like Support Vector Machines, Random Forest, Logistic Regression, and Artificial Neural Networks. Again, the study contributes to **SDG 3, 6 and 14.**

METHODOLOGY

Using secondary data from sources such as the University of Ghana Water Quality Project, the study employs data processing techniques like feature engineering, normalization, and data cleaning. Key water quality indicators include calcium ions, conductivity, dissolved oxygen, pH, and fluoride were used in the training of the developed models.

RESULTS

The study evaluates models based on F1-score, recall, accuracy, precision, mean squared error, rooted mean squared error and coefficient of determination revealing that Random Forest achieved the highest accuracy, while Support Vector Machines exhibited the best precision. However, the models also showed signs of overfitting, prompting the use of regularization techniques like Lasso and Ridge to improve generalizability. Regression models were also examined, and the study identified the need for continuous model updates and data quality improvements. Ensemble techniques were suggested to further enhance prediction accuracy.

CONCLUSION

The research contributes to understanding how machine learning can be applied to water quality prediction and emphasizes integrating advanced models into environmental management to improve sustainability. It recommends regular updates to the models and region-specific customizations to ensure their effectiveness in protecting ecosystems and human health.

Supervisor: Prof. SARPONG Kofi Adu-Manu

F04 (E0053)

Aqueous Processed All-Polymer Solar Cells with High Open-Circuit Voltage Based on Low-Cost Thiophene-Quinoxaline Donor Polymers

FILATE Tadele T.
Addis Ababa University

BACKGROUND

Eco-friendly solution processing and low-cost synthesis of photoactive materials are important requirements for the commercialization of organic solar cells (OSCs). Hence, we have synthesized low-cost and aqueous-soluble materials to contribute for **SDG 7**, **SDG 11**, and **SDG 13**.

METHOD

To develop aqueous-processable donor material, polar solubilizing groups such as oligo(ethylene glycol) (OEG) should be grafted over conjugated polymer backbone. To achieve high open circuit voltage (V_{OC}), a low-lying HOMO level can be achieved using simple electron-deficient quinoxaline-based acceptors. Consequently, we designed and synthesized two water/alcohol-processable polymer donors, poly[(thiophene-2,5-diyl)-*alt*-(2-((13-(2,5,8,11-tetraoxadodecyl)-2,5,8,11-tetraoxatetradecan-14-yl)oxy)-6,7-difluoroquinoxaline-5,8-diyl)] (**P(Qx8O-T)**) and poly [(selenophene-2,5-diyl)-*alt*-(2-((13-(2,5,8,11-tetraoxadodecyl)-2,5,8,11-tetraoxatetradecan-14-yl)oxy)-6,7-difluoroquinoxaline-5,8-diyl)] (**P(Qx8O-Se)**).

RESULTS

The synthesis of the polymers is achieved in a few synthetic and purification steps at reduced cost. Notably, the aqueous-processed all-polymer solar cells (aq-APSCs) based on **P(Qx8O-T)** and **P(NDIDEG-T)** active layer exhibit a PCE of 2.27% and V_{OC} approaching 0.8 V. These values are among the highest values for aq-APSCs reported to date.

CONCLUSION

This study offers valuable insights for designing low-cost, aqueous-processable polymer donors and fabricating of aqueous-processable OSCs with high V_{OC}.

Supervisor: Prof. WENDIMAGEGN Mammo

F05 (E0064)

Improving Customer Churn Predictability in the Telecommunication Industry Using Bellwethers

ATINYO Joshua Edem
University of Ghana

BACKGROUND

In the information age, data is considered the new oil and has accordingly fuelled the development of Machine Learning (ML) based applications used in everyday life. In the telecommunication(telco) industry, such applications have comprised churn prediction. Albeit data is increasingly generated with speed, in volume and variety, computational capacity of systems have not similarly advanced. On the other hand, some empirical studies on software development predictive models have shown that training models on exemplary data can yield competing accuracy results compared to training on entire dataset.

METHOD

Known as bellwethers, we extract exemplary data from the telco customer churn (11.1.3+) pre-processed dataset. This is done by applying a clustering-based approach to undersampling that reduces majority class labels without introducing redundant synthetic samples. We then train and finetune a gradient based classifier on the exemplary data, as against a synthetic minority oversampled data.

RESULTS

Experimental results on hold-out set show that the model trained on the exemplary data achieves over 10% higher accuracy compared to the model trained on oversampled dataset. This suggests the existence of bellwethers in customer churn datasets in the telco industry and supports its contribution to improved prediction results.

CONCLUSION

This study contributes to the theoretical understanding of the feasibility and applicability of bellwethers in predicting churn and provides a leverage for businesses in the telco industry to improve their competitive advantages by designing personalized marketing campaigns that will maintain revenue stability (SDG 9). Thereby providing tailored services to customers irrespective of income differences (SDG 10).

Supervisor: Prof. MENSAH Solomon

F06 (E0088)

Optimal Deployment of Smart Charging Stations for Electric Buses in Addis Ababa

BELACHEW Melkye Yifru
Addis Ababa University

BACKGROUND

The rapid adoption of electric buses (EB) in Addis Ababa underscores the urgent need for strategically located smart charging stations to enhance operational efficiency, customer satisfaction, and utility benefits. The existing infrastructures are insufficient and poorly integrated with renewable energy, posing significant challenges to scalability and sustainability. This study aims to assess current EB usage and charging habits, develop a framework for optimal smart charging station deployment by 2030, propose strategies for renewable energy integration, and evaluate the economic, technical, and environmental impacts of these strategies.

METHODOLOGY

Employing a mixed-methods approach, the study integrates GIS-based optimization models (EV-PV and EV-Fleet-SIM) with qualitative insights from transportation and energy stakeholders. Key data will include geospatial mapping of charging demand, EB fleet size, and renewable energy potential. Simulations will explore scenarios such as current infrastructure analysis, projected EB growth, and full fleet electrification.

RESULTS

The research anticipates identifying significant gaps in the current charging infrastructure and emphasizing the necessity for renewable energy integration. Scenario analyses will inform strategic site selection for charging stations, balancing user convenience with grid efficiency. Increased renewable energy deployment is expected to reduce costs and emissions.

CONCLUSION

This study highlights the essential role of strategically deploying smart charging stations for electric buses in Addis Ababa, directly contributing to Sustainable Development Goals (SDGs) **7** and **11**. By integrating renewable energy into the charging infrastructure, it promotes sustainability while reducing costs and emissions.

Supervisors: HABTU Dawit & DUMOULIN Jeremy

F07 (E0091)

Surface Chloride Estimation in Mortar: A Machine Learning Approach Using Near-Infrared and Electrical Impedance Spectroscopy

WEREDE Selihom, FUJIMOTO Satoshi
Utsunomiya University

BACKGROUND

Coastal concrete structures degrade due to chloride exposure. Marine aerosols deposit salt particles on surfaces, which infiltrate and cause deterioration. Rainfall worsens this by dissolving salts, aiding penetration. This study estimates surface chloride concentration to identify remedial targets. It explores handheld NIR and EIS spectroscopy on mortar samples with premixed chloride. NIR spectra have overlapping peaks and subtle variations, complicating interpretation. Similarly, EIS-based chloride estimation uses equivalent circuits, ranging from simple to complex, with unclear elements. To address these challenges, Lasso regression is employed to select features relevant to chloride concentration.

METHODS

Mortar samples with varying chloride concentrations, water-to-cement ratios, sand-to-cement ratios, and AE water reducer-to-cement ratios were fabricated into two different formworks: one for NIR and the other for EIS. Since NIR is a surface measurement, a frustum-shaped formwork with a thickness of 2 cm was used. For EIS, an acrylic cap was designed and fabricated to hold the electrodes in place. Lasso regression was used to estimate the results for both measurements.

RESULTS

A total of 360 samples were fabricated, with 180 designated for NIR and EIS measurements each. The selected wavelengths for NIR were 2100–2150 nm, 2250–2300 nm, and 2300–2350 nm, which are associated with chloride (Cl) as confirmed by previous studies. For EIS, the selected frequency range for the phase angle was 10^4–10^5 Hz, where an increasing trend was observed with rising Cl concentrations in the Bode plot. Lasso regression successfully estimated the Cl concentration.

CONCLUSION

NIR and EIS were used to measure the surface chloride concentration, which was then estimated using Lasso regression by individually analyzing EIS and NIR data, as well as their merged data. This research addresses SDG 9: Industry, Innovation, and Infrastructure and SDG11: Sustainable Cities and Communities.

Supervisor: Ass. Prof, Eng. FUJIMOTO Satoshi

F08 (E0105)

Enhancing Stockpile Measurement Precision Using Slam Lidar Technology in Surface and Underground Mines

AKHONYA Jared Etaba
Taita Taveta University

BACKGROUND

Efficient stockpile quantity monitoring is critical for industries like mining, where accurate volumetric assessments are essential for inventory management, cost control, and compliance. Traditional methods, such as manual measurement, satellite imagery, and truckload counting, are often inaccurate and unsuitable for irregular stockpiles or challenging conditions. This study addresses these challenges and aligns with **SDG 8, 9, 12, 13, and 15**.

METHODOLOGY

A 3D SLAM LiDAR scanner was used to collect high-resolution volumetric data in a mining environment. The raw point cloud data was processed using Cloud Compare software for volume calculations. Truck loading data obtained from the company's records was used for comparison. The performance of SLAM LiDAR was analyzed in terms of precision, efficiency, and labor savings.

RESULTS

SLAM LiDAR measured a stockpile volume of 176,429.056 tonnes with a minimal percentage error of 0.2838% compared to the truck loading result of 175,929.6 tonnes. It delivered highly accurate volumetric data with minimal human intervention and functioned effectively in GNSS-denied environments.

CONCLUSION

SLAM LiDAR technology offers a transformative approach to stockpile volume estimation, enhancing accuracy and efficiency while reducing labor reliance and errors**.** This innovation aligns with Sustainable Development Goal 9 by promoting sustainable industrialization and fostering innovation in mining and manufacturing operations. Integration with IoT technologies could further optimize stockpile monitoring processes.

Supervisor: ADERO Nashi

F10 (E0124)

EFFECTS OF LAND ACQUISITION ON LIVELIHOOD OF COASTAL COMMUNITIES: A CASE OF LIQUEFIED NATURAL GAS (LNG) PROJECT IN LINDI REGION, TANZANIA.

Author; NDOSI
Institution; University of Dar es Salaam

Background

Land acquisition for development projects affects community livelihoods depending on how the process is conducted. In developing countries, where farming is a primary livelihood, land acquisition often impacts food security. The LNG project in the Lindi region requires a substantial amount of land, significantly affecting the community. It is crucial to reassess the process to safeguard food security (SDG 2) while pursuing sustainable development goals.

Methodology

This mixed-method research integrates both quantitative and qualitative approaches. Data were collected through interviews, focus group discussions, and field observations, while secondary information was obtained from document reviews. Data analysis was performed using SPSS and Excel for inferential and descriptive statistics.

Results

Delays in compensation and LNG project construction have led to more negative than positive outcomes. Farmers experienced reduced productivity, affecting food availability and consumption. The loss of arable land, rising living costs, and family separations were also reported. Nonetheless, some positive effects emerged. Many project-affected people (PAP), even those not physically displaced, renovated their homes using compensation money, while a few built new houses.

Conclusion

While clean energy initiatives are vital for achieving SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action), community livelihoods must remain a priority for project sustainability. Achieving SDG 1 (No Poverty) and SDG 2 (Zero Hunger) requires fair land acquisition processes and timely compensation to support affected communities and ensure food security.

Name of supervisor: Dr. James Lyimo

F11 (E0137)

AN APPLICATION OF MACHINE LEARNING MODELS FOR ESTIMATION OF SPATIAL DISTRIBUTION OF PARTICULATE MATTER POLLUTANT IN AIR

ALEX MWOLOLO KIMUYA: Meru University of Science and Technology, Kenya.

SUPERVISORS:
DR. DICKSON MWENDA KINYUA
Meru University of Science and Technology, Kenya.
Kirinyaga University, Kenya.

DR. DANIEL MAITETHIA MEMEU: Meru University of Science and Technology, Kenya.

Abstract
Air pollution, particularly particulate matter, poses significant health and environmental risks. Conventional particulate matter measurement systems provide only single-point instantaneous readings, limiting their ability to generate spatial distribution maps. This study applies machine learning techniques to estimate particulate matter distribution using data from a limited number of sensor nodes. The system collected data on PM1.0, PM2.5, and PM10 concentrations, alongside weather parameters (wind speed, temperature, humidity) and spatial information (longitude, latitude). Various machine learning models, including Artificial Neural Networks, Support Vector Regression, Long Short-Term Memory, and Random Forest, were assessed for their effectiveness in predicting particulate matter distribution. The results indicate that Artificial Neural Networks consistently outperformed other models across different feature configurations for particulate matter prediction. When using only geometric features (Euclidean distance and orientation), the ANN model achieved training R^2 scores ranging from 0.9746 to 0.9790 for PM1.0 prediction. Similar trends were observed for PM2.5 and PM10, with training R^2 scores between 0.9766 (geometric features only) and 0.9805 (humidity, geometric features) for PM2.5, and 0.9792 (geometric features only) to 0.9798 (wind speed, temperature, geometric features) for PM10. Validation R^2 scores remained high, ranging from 0.9711 to 0.9756 (PM1.0), 0.9692 to 0.9789 (PM2.5), and 0.9775 to 0.9793 (PM10) under respective feature combinations. Artificial Neural Networks demonstrated strong generalization, consistently achieving over 75% prediction accuracy across all feature combinations for PM1.0, PM2.5, and PM10 concentrations within a 160-meter radius from a central sensor. Additionally, integrating weather parameters significantly improved model performance by reducing both RMSE and MAE. Specifically, PM1.0 RMSE decreased from 1.8719 $\mu g/m^3$ to 1.7201 $\mu g/m^3$, and MAE from 0.8125 $\mu g/m^3$ to 0.7952 $\mu g/m^3$. For PM2.5, RMSE reduced from 2.5260 $\mu g/m^3$ to 2.2139 $\mu g/m^3$, and MAE from 1.1488 $\mu g/m^3$ to 1.0012 $\mu g/m^3$. Lastly, PM10 RMSE decreased from 2.231 $\mu g/m^3$ to 2.143 $\mu g/m^3$, and MAE from 1.1120 $\mu g/m^3$ to 1.0037 $\mu g/m^3$. This study highlights the potential of machine learning in overcoming the limitations of single-point particulate matter sensors and estimating particulate matter distribution across a region. The findings underscore the effectiveness of Artificial Neural Networks and emphasize the importance of incorporating meteorological data to enhance model performance for spatial distribution estimation. The results offer insights for improving particulate matter monitoring strategies and advancing the design of sensor networks for more comprehensive air quality assessments.

List of Eleven Best Presentations (Presenters)

Gold Award

A02	E0009	MEELA Filbert Thobias (UU)	Exploring Genomic Variation of Wild Strawberry Fragaria Vesca
B05	E0077	TWUM Sarah (UG)	Adherence to Global Dietary Recommendations of School-Aged Children in Two Districts in the Greater Accra Region
D01	E0005	MENSAH Duke (UU)	ß-glucuronidase inhibition using Mucuna Pruriens Beans
E01	E0016	ASIEDU Enoch Sam Sakyi (UG)	Weight Perception and Its Influencing Factors Among Women Living in the Accra Metropolis

Silver Award

B04	E0025	MURERWA Linsey Gatwiri (UU)	Feasibility of Silver Cyprinid Fish with Starch Binders in Extrusion-Based 3D Food Printing
C03	E0023	SATO Yuki (UU)	N-Hydroxypipecolic Acid is the Key Molecule in Disease Response to Powdery Mildew in Wheat

Bronze Award

A08	E0104	MUNKHTUMUR Mungunzaya (UU)	Effects of changes in pesticide practices on efficacy of commercialized Neoseiulus californicus in spider mite control
B11	E0114	ALHASSAN Jamilatu (UG)	Adherence to Complementary Feeding Guidelines and SDGs
C09	E0115	ISHII Yuma (UU)	Inhibitory effect of Solanum Melongena on ß-glucuronidase Activity
E03	E0026	EYISON Yirenkyiwa Gyebi (UG)	Children's Participation Rights: Implementation Practices of Educators in Public and Private Preschools within the Accra Metropolis
F05	E0064	ATINYO Joshua Edem (UG)	Improving Customer Churn Predictability in the Telecommunication Industry Using Bellwethers

❖ STUDENT SUMMIT 2025 - SYMPOSIUM SERIES

Student Summit 2025 Symposium Series

"Reducing Food Loss and Waste: A Pathway to Sustainable Food Systems in SSA

Speaker: Dr. Josiah Mwangi Ateka
Jomo Kenyatta University of Agriculture and Technology, Kenya

Commentator: Prof. Yamane
Utsunomiya University, Japan

Date: 17/02/2025 **Time: 17:00-17:30** **Venue: 4B55**
Online: https://uso2web.zoom.us/j/83888317495?pwd=Dhws8Ww9POjZrCdboW3hsobPCSGCmb.1
Meeting ID: 838 8831 7495 **Passcode**: 345847

Student Summit 2025 Symposium Series

"Aflatoxin contamination in animal feeds and milk in Tanzania: Risk factors, food safety concerns and health implications."

Speaker: Mr. Steven Julius Kitigwa
University of Dar es Salaam, Tanzania

Commentator: Prof. Yamane
Utsunomiya University, Japan

Date: 17/02/2025 **Time: 17:00-17:30** **Venue: 4B55**
Online: https://uso2web.zoom.us/j/83888317495?pwd=Dhws8Ww9POjZrCdboW3hsobPCSGCmb.1
Meeting ID: 838 8831 7495 **Passcode**: 345847

Student Summit 2025 Symposium Series

"Machine Learning In Agriculture"

Speaker: Dr. Neema Mduma
Nelson Mandela African Institution of Science and Technology, Tanzania

Commentator: Prof. Yokota
Utsunomiya University, Japan

Date: 17/02/2025 **Time: 17:00-17:30** **Venue: 4B55**

Online: https://uso2web.zoom.us/j/83888317495?pwd=Dhws8Ww9POjZrCdboW3hsobPCSGCmb.1
Meeting ID: 838 8831 7495 **Passcode**: 345847

Student Summit 2025 Symposium Series

"Overview on biodiversity dynamics, ecosystems, National Herbarium and Ethno-medicinal Studies in the Context of Ethiopia."

Speaker: Dr. Shambel Alemu
Addis Ababa University, Ethiopia

Commentator: Prof. Yokota
Utsunomiya University, Japan

Date: 17/02/2025 **Time: 17:00-17:30** **Venue: 4B55**

Online: https://uso2web.zoom.us/j/83888317495?pwd=Dhws8Ww9POjZrCdboW3hsobPCSGCmb.1
Meeting ID: 838 8831 7495 **Passcode**: 345847

Student Summit 2025 Symposium Series

"Formal-Informal Linkages, Agrarian Transformation and Labour Casualisation: A Case Study of Ghana's Oil Palm Sector."

Speaker: Dr. Solomon Kofi Amoah
University of Ghana

Commentator: Prof. Sakamoto
Utsunomiya University, Japan

Date: 17/02/2025 **Time: 17:00-17:30** **Venue: 4B55**

Online: https://uso2web.zoom.us/j/83888317495?pwd=Dhws8Ww9POjZrCdboW3hsobPCSGCmb.1

Meeting ID: 838 8831 7495 **Passcode**: 345847

Student Summit 2025 Symposium Series

"Assessing the sustainability of sand rivers to support smallholder irrigation development in arid and semi-arid areas of Kenya"

Speaker: Mr. Benson Mutuma Karimba
Meru University of Science and Technology

Commentator: Prof. Sakamoto
Utsunomiya University, Japan

Date: 17/02/2025 **Time: 17:00-17:30** **Venue: 4B55**

Online: https://uso2web.zoom.us/j/83888317495?pwd=Dhws8Ww9POjZrCdboW3hsobPCSGCmb.1

Meeting ID: 838 8831 7495 **Passcode**: 345847

Abstracts

Reducing Food Loss and Waste: A Pathway to Sustainable Food Systems in SSA FLW

The context

According to the State of Food Security and Nutrition in the world report of 2023, hunger affected an estimated of 864 million people globally in 2023. Out of this, 284.2 million were in sub-Saharan Africa SSA (equivalent to 23.8% of the population). Even more alarming is the fact that rather than decline, the number of hungry people has been increasing since 2015 when the sustainable development goals (SDGs) were adopted. The number and proportion of people affected by hunger has been consistently high in the region in the last few years, 23.3% (258.2 million) in 2020, 24% (722.8 million) in 2021 and 23.8% (277.9 million) in 2022. The situation of food insecurity is exacerbated by the high levels of food losses and waste[1].

The problem

Food Loss and Waste (FLW) is critical component of the food system in Sub Saharan Africa (Over 37% of the food produced is lost or wasted)[2]. FLW impacts both food security and nutrition and the sustainability of food systems through different pathways including reduction in food availability, economic and income losses for those facing FLW, tightening the food markets and unsustainable use of natural resources on which the future production of food depends. Despite this recognition, FLW data and knowledge (causes, critical points of loss, magnitude etc.) is not well documented. This partly because the distribution of FLW along the food chain varies greatly by region and value chain. Equally, the possible causes of FLW are many, which makes it complex to document the magnitude at different stages of the value chain (Luo et al., 2022[3]). The other challenge is that there are different definitions, metrics, measurement protocols and the lack of standards for data collection adapted to different countries and products. This makes it difficult to compare studies, systems and countries. This situation is a huge bottleneck to understanding the causes and extent of FLW, solutions and priorities in reducing FLW.

Structure of the lecture:

The lecture will discuss the following key components or key questions that will be explored will include;

- Contextualize FLW in SSA in terms of definitions and conceptual issues on boundaries
- The relevant international and regional policy framework for addressing FLW in the context of SSA
- The business case for measuring and reducing FLW
- Explore some of the tools and methods for estimating FLW including details on critical points and causes
- Results from some of the ongoing FLW assessments for selected value chain
- Innovations most suited for addressing FLW in selected value chains

[1] https://openknowledge.fao.org/server/api/core/bitstreams/39dbc6d1-58eb-4aac-bd8a-47a8a2c07c67/content/state-food-security-and-nutrition-2024/ending-hunger-food-security.html#gsc.tab=0

[2] FAO (2018). Food Loss and Waste and the Right to Adequate Food: Making the Connection; FAO: Rome, Italy.

[3] Luo, N.; Olsen, T.L.; Liu, Y. A Conceptual Framework to Analyze Food Loss and Waste within Food Supply Chains: An Operations Management Perspective. *Sustainability* **2021**, *13*, 927. https://doi.org/10.3390/su13020927

Learning Outcomes:

By the end of this lecture, participants will be able to:

- Understand and define FLW in the context of SSA, including the key conceptual issues and boundaries related to food loss and waste.
- Identify with relevant international and regional policy frameworks addressing FLW in SSA, and understand their implications for local and global food systems.
- Build a business case for measuring and reducing FLW, recognizing the economic, environmental, and social benefits of tackling food loss and waste in the region.
- Understand the status of FLW in selected value chains, gaining insights from case studies and understanding the real-world challenges and solutions.
- Measure FLW effectively across stages of value chains, recognizing the different stages where food loss and waste occur and the best methods for quantification and intervention.
- Identify and assess innovations most suited for addressing FLW in selected value chains, and propose practical solutions for reducing food loss and waste in SSA.

Dr. Josiah Mwangi Ateka, PhD
Department of Agricultural and Resource Economics,
Jomo Kenyatta University of Agriculture and Technology
Kenya

Aflatoxin contamination in animal feeds and milk in Tanzania: Risk factors, food safety concerns and health implications.

Abstract.

Aflatoxins (AFs), toxic secondary metabolites produced by certain Aspergillus fungi, pose significant risks to animal and human health through contamination in animal feeds and milk. This study explores the occurrence of aflatoxin B_1 (AFB_1) in animal feeds and aflatoxin M_1 (AFM_1) in raw cow milk across three agroecological zones in Tanzania, examining associated risk factors and food safety concerns.

Aflatoxin B_1 (AFB_1) was detected in 88.5% of agrovet-supplied feeds and 86.2% of smallholder dairy farmer feeds, with 15% and 22%, respectively, exceeding regulatory limits. Aflatoxin M_1 (AFM_1) was found in 30.7% of milk samples, with 27.9% surpassing EU limits (0.05 µg/L) and 19.9% exceeding Tanzania and East Africa standards (0.5 µg/L).

Key risk factors identified included feeding systems, zero-grazing and mixed feeding, poor feed handling, storage practices, and limited awareness among smallholder dairy farmers.

The study underscores the critical need for improved aflatoxin awareness, proper feed management, and routine inspection and monitoring along the dairy value chain to mitigate health risks. The findings highlight the urgent need for targeted interventions to enhance food safety and public health.

Keywords: aflatoxin B_1, aflatoxin M_1, dairy value chain, animal feeds, milk, food safety.

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Overview on biodiversity dynamics, ecosystems, National Herbarium and Ethno-medicinal Studies in the Context of Ethiopia

Abstract

Ethiopia, a country in the Horn of Africa, is endowed with rich biodiversity stretched on extensive plateaux, plains, and even river gorges. The rich biodiversity in Ethiopia could be accounted to the varied climate, topography and geology. Ethiopia has the whole range of climate in which higher plants can grow from dry to moist and from hot to cold. The altitude ranges from 116 metres below sea level at the Danakil depression to mountains up to 4532 m asl at Ras-Dashen. Rainfall also varies from sporadic showers bringing less than 100 mm a year to a few places with almost 12 months of rain and an annual precipitation of over 2,000 mm. Ethiopia has the largest block of highlands over 2,000 metres in Africa. This plateau is divided by the Rift Valley into two blocks that are also dissected by deep and wide river valleys.

Ethiopia is one of the 12 major centers of crop genetic diversity in the world. These are also known as Vavilov Centers, named after the Russian scientist who collected and studied crops from around the world and visited Ethiopia in the 1920s. Over 100 species of cultivated crops and their wild relatives are found in Ethiopia. Some of these crops, e.g. coffee (*Coffea arabica*), teff (*Eragrostis tef*), Enset (*Ensete ventricosum*) and anchote (*Cocinea abyssinica*). The country is also the sole centre of genetic diversity because these crops are either grown only in Ethiopia, or if grown outside, e.g. *Coffee arabica*, it is within the last few hundred years. Ethiopia is also one of the main centres for a number of major crops, e.g. sorghum (*Sorghum bicolor*), finger millet (*Eleusine coracana*), field pea (*Pisum sativum*), lentil (*Lens culinaris*), chick pea (*Cicer arietinum*), perennial cotton (*Gossypium arboreum*), safflower (*Carthamus tinctorius*), castor oil bean (*Ricinus communis*) and sesame (*Sesamum indicum*), because it is either their centre of domestication, or else they came a very long time ago and have thus developed distinctive variation found nowhere else. The country is mentioned as the most important centre for the major crops, linseed (*Linum usitatissimum*), durum wheat (*Triticum durum*), and barley (*Hordeum vulgare*), though these crops were domesticated elsewhere, the modernization of agriculture in their centres of origin has seriously eroded their genetic base in those countries leaving Ethiopia with the main extant gene pool. It also has some very promising potential crops; important examples are *Cordeuxia edulis* (the Yeheb nut) and *Vernonia galamensis*. Though Ethiopia is rich in plant biodiversity, it is neither looking after this resource effectively nor making use of its potential to benefit many sectors of the economy.

Less than 2% of the country still has high natural forest, and as much as half of the cultivable land is eroded to varying degrees of severity. And yet indigenous trees are not planted, nor forage for domestic animals cultivated. The environmental degradation seen throughout the country is endangering many species. It is very likely that a number of them have already gone extinct. There has not been enough investigation to say this for certain, but it has been found that in the families so far studied many species are rare and endangered. The volumes of the Flora already published contain records of plants found in the last century, which have not been found again despite searches for them. No area of Ethiopia, even Addis Ababa, has its plants are all documented and well known. Some of the least known areas are as follows. The plants that survive in the desert of the Afar with the Awash River and its associated lakes and the Dallol Depression going to 116 metres below sea level. Although considered one of the hottest places on the earth's surface, drought resistant woody plants including the dum palm (*Hyphaene thebaica*) grow there. The lowlands on the western border with Sudan and the south and southeast borders with Kenya and Somalia have mosaics of woodland and grassland, and are also traversed by large river valleys. These areas are all poorly known biologically, but enough has been documented to show that they are rich in natural resources, particularly plants which support the pastoralist peoples and their herds that have lived long in these areas. These areas also supply the gums and resins, which Ethiopia has been exporting since pre-Christian times. The

Borana lowlands of Oromiya and the Ogaden of Somali Regions have been found particularly rich in plants and birds unique to Ethiopia. Although heavily utilized by agricultural man for centuries, the indigenous plant resources of the plateau, particularly the wetlands and areas away from main highways and tracks, although heavily exploited, are still mostly unexplored.

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MACHINE LEARNING IN AGRICULTURE

Abstract

Maize and Common beans are among the important food and cash crops to most smallholder farmers in Tanzania. Despite their importance in the household economy and food security, yields are generally low due to several reasons, diseases included specifically Maize Lethal Necrosis and Maize Streak Virus for Maize; Bean rust and Bean anthracnose for Common beans. The current management of these four diseases includes the removal of the affected leaves and plants to reduce their spread, signifying that early detection is the key to successful management. This presentation will highlight the projects conducted in Tanzania to develop a Machine Learning tools for early detection of diseases based on leaf imagery data and enable farmers to make the appropriate decision for managing the spread of the diseases.

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Formal-Informal Linkages, Agrarian Transformation and Labour Casualisation: A Case Study of Ghana's Oil Palm Sector

Abstract

In Ghana, various initiatives aimed at transforming the oil palm sector have led to policy reforms, increased production and enhanced support for agribusiness. The government is prioritising greater productivity and sustainability by shifting small-scale operations towards more commercial practices and linking smallholder farmers with industrial processors. This creates a complex web of formal and informal economic relations in the agricultural sector, presenting numerous challenges that have yet to be thoroughly explored. This lecture delves into the intricate connection between the formal and informal economies emphasising their complexities and the impact on work and employment in Ghana's oil palm sector. Using qualitative data gathered from semi-structured interviews and focus group discussions, I examine how new management approaches and rationalisation efforts – driven by neoliberal policies in agro-processing companies – affect workforce dynamics and employment relations. I contend that the embrace of neoliberal ideals for the market-driven development of agricultural commodities is resulting in increased privatisation of Ghana's agriculture sector. This shift, accompanied by intensified rationalisation and the implementation of managerialist policies, is contributing to a growing surplus labour population and casualisation. I highlight the rise of temporal and precarious work arrangements within formal organizations, arguing that the growing precarity and existing work relations stem from the flawed dichotomous representation of the formal and informal economies.

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Assessing the sustainability of sand rivers to support smallholder irrigation development in arid and semi-arid areas of Kenya

Abstract

Irrigation development is a key factor towards securing food production and improving rural livelihoods in Sub-Saharan Africa, especially among smallholder farmers who make up to 80% of the farming systems. Majority of crop production systems in the region are however rain-fed and face challenges such as droughts and rainfall variability which have been worsened by climate change. Therefore, the achievement of SDG 1 of ensuring zero poverty and SDG 2 of ensuring there is food security can be accelerated by safeguarding rural food production through irrigation.
Sand rivers seasonal rivers commonly found in arid and semi-arid areas where annual rainfall is low and water accessibility is highly unreliable. These rivers are characterized by layers of alluvial material carried from the catchment area by flood water during rainy periods and deposited on the river bed. With the right conditions, these rivers may form nature-based water storage areas where water is stored at shallow depths within alluvium pore spaces and protected from evaporation. This water is commonly accessed by digging shallow wells into the sand layers on the river bed or near the banks and water abstracted by a variety of manual or water pumping technologies.

Figure 1: Shallow Well (scoop hole) on a sand river bed

Figure 2: Diesel pumping abstraccting water from the sand river

Recent research has shown that smallholder farmers are actively developing and expanding irrigation in these ASAL areas, mainly along sand rivers. This is mainly because the shallow water storage system allows for multiple uptake points along the stretch of a river, ideal for irrigating farm plots near the river banks where water can be accessed easily. Such irrigation developments have come to be known as 'farmer-led irrigation' due to the fact that many of these smallholder farmers rely on minimal external support in starting irrigation and mainly grow high value crops for selling to local and regional markets.

Figure 3: Irrigation near the banks of a sand river

Despite the availability of such opportunities, studies have shown that farmer-led irrigation in ASALs also faces risks and challenges such as knowledge gaps and inequality among farmers, market price fluctuations and inadequate support networks. Additionally, there is concern about the sustainability of such rapidly expanding irrigation development as water abstraction is unregulated and there is potential of conflict arising with other resource users.

This research focuses on two case study areas in the southern part of Kenya; Kajiado and Makueni Counties. Both are semi-arid areas with a number of sand rivers within their boundaries which have been used to support irrigation development by smallholder farmers. This expansion has been driven by the availability of land and water resources as well as the demand for food produce from nearby urban areas. The objective of

this research is to explore the characteristics of farming systems in both areas, the local knowledge and knowledge flows among farmers and the policy frameworks that support or hinder the sustainable use of sand rivers to support smallholder irrigation development.
Among the findings are that in Kajiado, farmers have come up with innovative farming systems that allows them access capital through informal arrangements while using their knowledge and the leverage. This is the *'tajiri'* farming system where an 'investor' or *'tajiri'* provides the farmer with all the capital needed while the farmer uses their knowledge to grow crops fit for market selling and at the end of the season the two parties split profits on a 50/50 basis. This farming system if highly mobile and dynamic as land is usually leased seasonally and farmers may move from one part of the river to the other seeking the best farm lands.

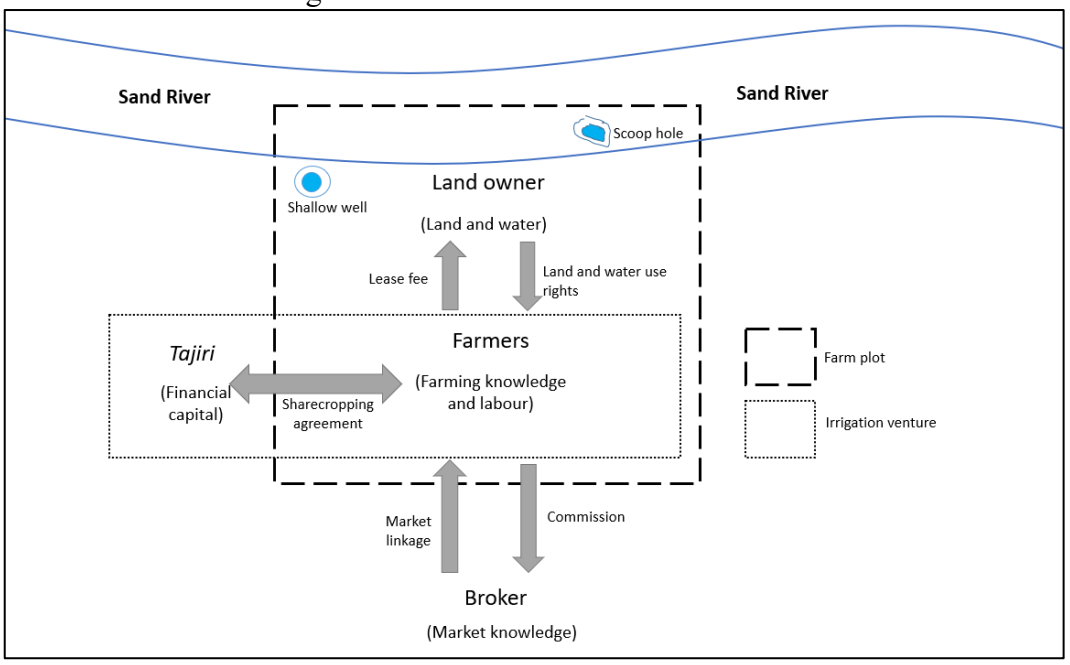

Figure 4: Tajiri farming system common in Kajiado

The ongoing research seeks to explore what types of knowledge do smallholder farmers have access to, which knowledge networks do farmers use to access knowledge and how is the acquired knowledge accessed translated into farming practice.

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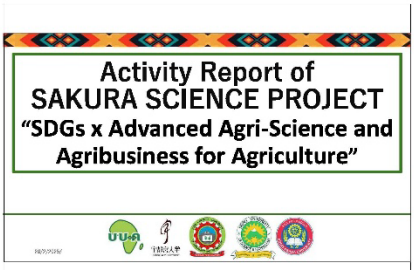

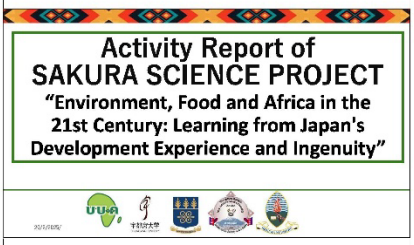

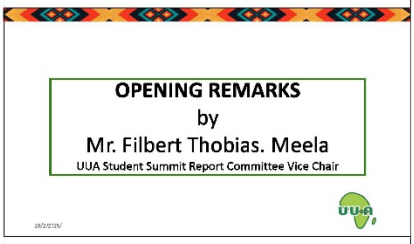

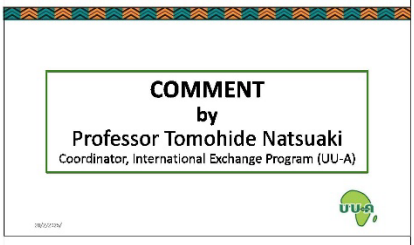

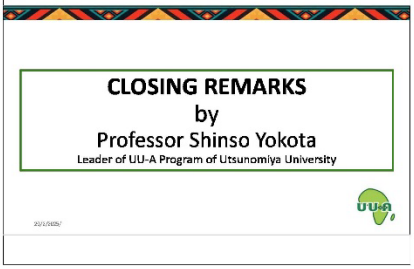

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