Bridging Young Researchers with SDGs

UU-A Student Summit 2024

Summit Program & Abstracts

March 4th～8th, 2024

Organized by the Organizing Committee for UU-A Student Summit 2024
in Conjunction with 7 Partner Universities

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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
Utsunomiya University Center for International Exchange
350 Mine-machi, Utsunomiya, Tochigi, 321-8505, JAPAN

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Preface

Welcome to the Third UU-A Students Summit, taking place from March 4th to 8th, 2024. UU-A Student Summit is an online international student academic conference in which students from Utsunomiya University and African partner universities present their own research regarding Sustainable Development Goals (SDGs) online and develop strategies for human resources to contribute to SDGs. As the Organizing Committee for UU-A Student Summit 2024, we extend our heartfelt greetings to each one of you as we continue on an incredible journey towards sustainable development while pursuing our academic goals. We are grateful that we, young researchers from 7 partner universities, can consider and discuss world issues from the perspective of SDGs together.

We formed the Organizing Committee in September 2023 with 17 highly motivated students from 7 partner universities. We also launched 5 boards—the public relations board, applications board, presentation board, ceremony board, and report board— and continued to prepare the summit for approximately half a year. We are proud to be able to hold the UU-A Student Summit 2024 this year.

Back in September 2015, global leaders met at a United Nations summit and pledged to realize the Sustainable Development Goals by 2030 with a guiding principle of "Leave no one behind". However, according to "*The Sustainable Development Goals Report 2023*", more than halfway to the deadline for the 2030 Agenda, we are leaving more than half the world behind. Therefore, we should act immediately towards meetings the Sustainable Development Goals.

In this UU-A Student Summit, 60 students, the largest number of presenters ever, from 7 partner universities introduce their various researches in related to SDGs, with "Interdisciplinary" as a core theme. We have three sessions, agriculture and environmental sciences, health sciences and social sciences, and then engineering and telecommunications. In addition, more than 100 students and faculty members have registered this summit as participants. Through this summit, we aim to learn from new viewpoints and consider the meaning of "Interdisciplinary" by sharing Japanese and African students' research. Moreover, as we gather to exchange ideas, share experiences and forge partnerships, we aim to harness the potential of both African and Japanese scientific technology to address the pressing challenges facing our world today. Through innovative solutions and collaborative efforts, we will be able to create a brighter and more sustainable future for all.

We have also planned some hybrid events during the summit, including a SDGs workshop along with three symposiums held by faculty from partner universities. I hope that you will be able to learn more by participating in these events.

Lastly, we deeply appreciative to all presenters and participants, and faculty staff who cooperate with this summit. We hope that this summit will be a wonderful and insightful opportunity for everyone and you will have a chance to consider world issues in related to SDGs. Let's seize this chance to inspire, learn, and grow, shaping our destiny and charting a course towards a brighter tomorrow.

March 4th, 2024

Organizing Committee for UU-A Student Summit 2024

Message from the President of Utsunomiya University

On behalf of Utsunomiya University, I am very delighted to welcome you to participate to this UU-A 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 third 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 June and July, and undertook five international symposiums for around 300 researchers, students, and the public. We sent 5 graduate students of Utsunomiya University to Jomo Kenyatta University of Agriculture and Technology and Meru University of Science and Technology in February. In addition, 3 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 students gather and make presentations about their research in relation to the perspective of SDGs. Finally, 60 students from seven universities submitted presentation videos online. Between March 4th and 8th, the uploaded presentation videos will be 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. I sincerely hope that this Student Summit will be a wonderful opportunity for students to study and present their research results from an international and interdisciplinary perspective. I hope that the continuous development of this program with the cooperation of six African universities and Utsunomiya University will eventually further strengthen the partnership between African countries and Japan.

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

March 4th, 2024

IKEDA Tsukasa
President of Utsunomiya University

The Organizing Committee for UU-A Student Summit 2024

【Organizing Committee Members】

Utsunomiya University (Japan)

Mr. SATO Yuki　Mr. SUGIMORI Kanju　Ms. NAKAZAWA Yuki

Jomo Kenyatta University of Agriculture and Technology (Kenya)

Mr. MUSYOKA N. James　Mr. ONYANGO O. Kevin　Ms. OMAR M. Fatma

Meru University of Science and Technology (Kenya)

Mr. MANYARA Kennedy　Mr. ODOYO O. Vincent　Ms. JEBET Mercy

Addis Ababa University (Ethiopia)

Ms. TEMECHEW E. Hiwot　Ms. TADESSE M. Mary

University of Dar es Salaam (Tanzania)

Mr. DIONICE N. Crispin　Ms. NDOSSI R. Mariam

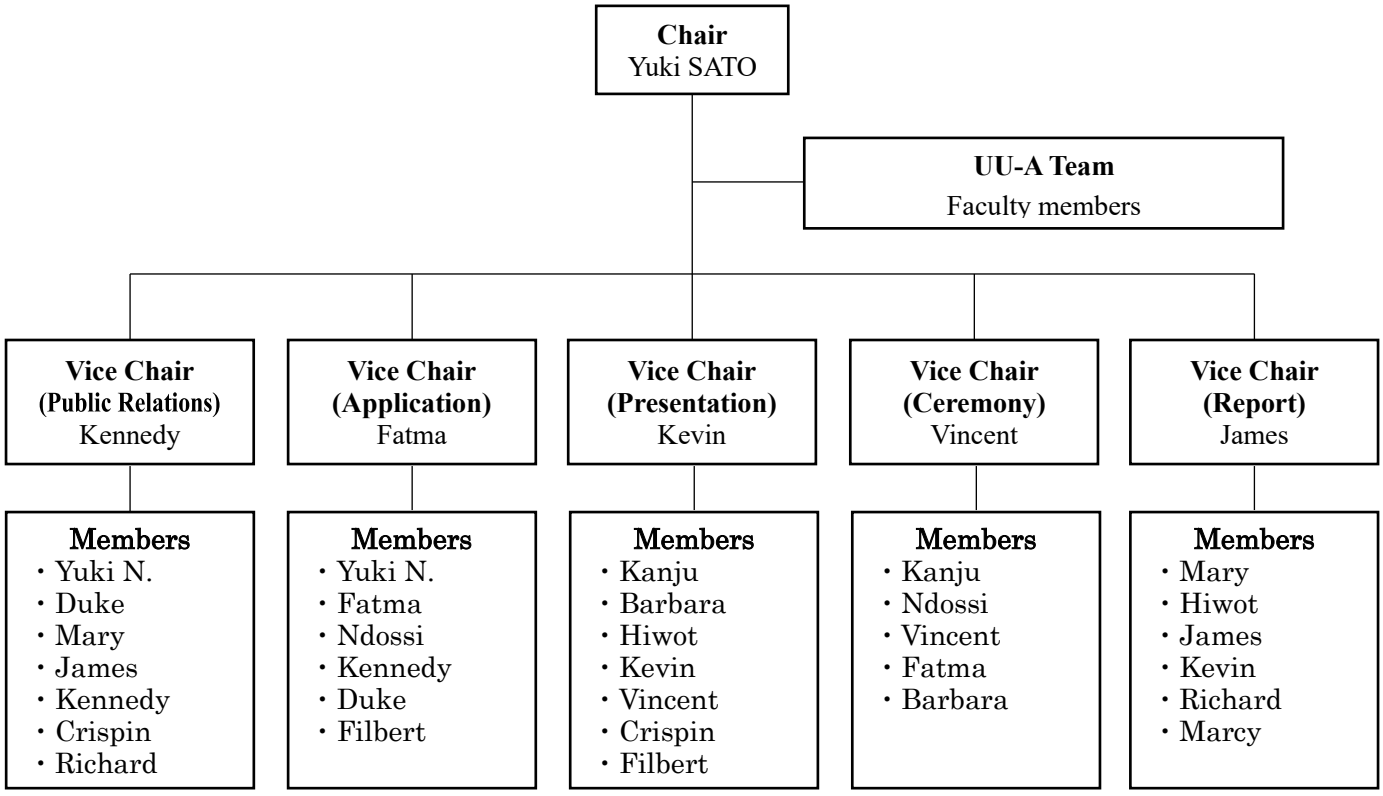
Nelson Mandela Africa Institution of Science and Technology (Tanzania)

Mr. MEELA T. Filbert　Mr. KOMBA S. Richard

University of Ghana (Ghana)

Mr. MENSAH Nii Duke　Ms. BLANKSON K. Barbara

【Organization Chart of UU-A Student Summit 2024】



Acknowledgement

We sincerely express our gratitude to be able to hold UU-A Student Summit 2024 magnificently. We have received many supports and collaboration.

At first, we would like to express our deepest appreciation to the President of Utsunomiya University, Dr. IKEDA Tsukasa for his support and commitment towards the success of the UU-A Student Summit 2024. We also would like to express our warm gratitude to the leader of UU-A Team, Dr. YOKOTA Shinso (Utsunomiya University), the sub-leader of UU-A Team, Dr. SAKAMOTO Kumiko (Utsunomiya University), and the coordinators of UU-A Team, Dr. NATSUAKI Tomohide (Utsunomiya University), Dr. ATOBRAH Deborah (University of Ghana), Dr. AFEWORK Bezawork (Addis Ababa University), Ms. Ketter C. Naomi (Jomo Kenyatta University of Agriculture and Technology), Dr. MUGO Cynthia (Meru University of Science and Technology), Dr. KAALE D. Lilian (University of Dar es Salaam), and Dr. MUNISHI Linus (Nelson Mandela African Institution of Science and Technology). We cannot hereby indicate all members of UU-A Team, but definitely, we appreciate to all supports and collaboration by all members.

Next, we would like to introduce and express our gratitude to collaborators of hybrid events for their commitment, sacrifice, and efforts. Prof. YUMOTO Hiroyuki (Utsunomiya University) lectured on SDGs. Dr. IIZUKA Akiko (Utsunomiya University), Dr. MARWA Janeth (Nelson Mandela African Institution of Science and Technology), Dr. KAALE D. Lilian, Dr. AOYAMA Masato (Utsunomiya University), Dr. AKAKPO B. Daniel (University of Ghana), and Ms. Ketter C. Naomi cooperated in symposiums as lecturers. Dr. YOKOTA Shinso and Dr. SAKAMOTO Kumiko cooperated in symposiums as host organizers. Many UU-A Team members cooperated in evaluation of the presentations.

Lastly, we honor and appreciate to all presenters and participants who took part in the summit for the good work done, sacrifice of your time. We are so grateful and thankful to see you again in the future summit.

Thank you so much.

Organizing Committee for UU-A Student Summit 2024

Summit Program (Student Video Presentations)

◆ UU-A Student Summit (Video On-Demand)

March 4th -8th, 2024 (Available 24 hours)

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- Abstracts
- Presentations
- Comments and discussions
- Q and A sessions

- **How to Enjoy On-Demand Platform**

→1. Please access URL/link and create your own account.

2. After creating your own account, the acceptance completion email will be delivered automatically to the email address you entered. Please make sure the email includes URL for accessing My Page, registration number, and password.

3. You can access the "UU-A Student summit 2024 MyPage" with the registration number and password which you received in your acceptance completion email. You can watch the presentation videos at "Online Venue Entrance". You can also download the abstract book at "Proceedings download".

【Number of Presenters】

UU	UG	AAU	JKUAT	MUST	UDSM	NMAIST	Total
22	5	8	9	5	4	3	60

【Categories of Presentations】

Agriculture and Environmental Sciences	24
Health Sciences and Social Sciences	21
Engineering and Telecommunication	15
Total	60

Summit Program (Hybrid Events)

◆ Opening Ceremony and SDGs Work Shop

March 4th, 2024 (JST: 16:30-19:00 / EAT：10:30-13:00 / UTC：7:30-10:00)

Venue: University Hall 2F (Utsunomiya University)

Zoom

https://us02web.zoom.us/j/84245354771?pwd=SmdXZkU4V2VCRzVxUlM0cDFmc0FNUT09

ID: 842 4535 4771 / Passcode: 711007

- HOST: Mr. SUGIMORI Kanju (UU)

- Opening remarks by Dr. SAKAMOTO Kumiko (UU / Sub-leader of UU-A Team)
- Greetings by Mr. ODOYO Vincent (MUST / Vice-Chair) : Online
- Explanation of UU-A by Dr. IIZUKA Akiko (UU)
- Introduction of UU-A inbound students and invited faculty members
- Introduction of SSP inbound students and an accompanying faculty member
- SDGs Work Shop Lecture by Prof. YUMOTO Hiroyuki (UU)
- Break
- SDGs Work Shop discussion
- SDGs Work Shop presentations
- Publicity for UU-A Student Summit 2024 by MANYARA Kennedy (MUST / Vice-Chair): Online
- Closing remarks by Mr. MENSAH Nii Duke (UG)

◆ Symposium 1

March 5th, 2024 (JST：17:00-18:30 / EAT：11:00-12:30 / UTC：8:00-9:30)

Venue: Main Meeting Room at School of Agriculture (Utsunomiya University)

Zoom

https://us02web.zoom.us/j/83085617614?pwd=ZXRCMWlrL0l3Q0NRR3lPQnQrRFlsUT09

ID: 830 8561 7614 / Passcode: 336544

- HOST: Dr. YOKOTA Shinso (UU)

- Lecture and Q&A session by Dr. Akiko Iizuka (UU)
  “Disasters and the SDGs: Towards a world where no one is left behind”
- Lecture and Q&A session by Dr. MARWA Janeth (NM-AIST)
  “Meta-Cognition and Spiritual Intelligence: A paradigm shifts for sustainable authentic self-knowledge engaging with efficient entrepreneurial practice in the era of artificial intelligence”

◆ Symposium 2

March 6th, 2024 (JST：17:00-18:30 / EAT：11:00-12:30 / UTC：8:00-9:30)

Venue: Main Meeting Room at School of Agriculture (Utsunomiya University)

Zoom

https://us02web.zoom.us/j/85261521983?pwd=d1VwQUo2REcwQkNGOVZ5VnRpOWk5QT09

ID: 852 6152 1983 / Passcode: 170264

- HOST: Dr. SAKAMOTO Kumiko (UU)

- Lecture and Q&A session by Dr. KAALE D. Lilian (UDSM)
  "Food Security in Africa: Challenges and Solutions"
- Lecture and Q&A session by Dr. AOYAMA Masato (UU)
  "Transportation stress in farm animals: Studies in goats"

◆ Symposium 3

March 7th, 2024 (JST：17:00-18:30 / EAT：11:00-12:30 / UTC：8:00-9:30)

Venue: Main Meeting Room at School of Agriculture (Utsunomiya University)

Zoom

https://us02web.zoom.us/j/81929528204?pwd=QTc4bTBWWlBRa09obVJsVTZvWkdydz09

ID: 819 2952 8204 / Passcode: 392081

- HOST: Dr. YOKOTA Shinso (UU)

- Lecture and Q&A session by Dr. AKAKPO B. Daniel (UG)
  "The Role of Grain Legumes in Enhancing Sustainable Intensification of Farming Systems"
- Lecture and Q&A session by Ms. KETTER C. Naomi (JKUAT)
  "Quantifying the effects of water stress on the growth and development of African nightshade (*Solanum* spp.) and spiderplant (*Cleome gynandra* L.)"

◆ Closing and Award Ceremony

March 8th, 2024 (JST: 17:30-18:30 / EAT：11:30-12:30 / UTC：8:30-9:30)

Venue: UU Plaza 2F (Utsunomiya University)

Zoom

https://us02web.zoom.us/j/83853810671?pwd=UUhEakppVmpoeWoyMUc0VWtWVUZKZz09

ID: 838 5381 0671 / Passcode: 573147

- HOST: Mr. SUGIMORI Kanju (UU) and Mr. SATO Yuki (UU)

- Video message by Dr. IKEDA Tsukasa (President of UU)
- Opening remarks by Ms. OMAR Fatma (JKUAT / Vice-Chair)
- Short briefing by invited faculty members
  Dr. KAALE D. Lilian (UDSM), Dr. MARWA Janeth (NM-AIST), Dr. AKAKPO B. Daniel (UG)
- Short presentation about UU-A Student Summit by Mr. SUGIMORI Kanju (UU)
- Announcement of award winners by Dr. YOKOTA Shinso (UU)
- Award Ceremony
- Comment by Dr. YOKOTA Shinso (UU / Leader of UU-A Team)
- Closing remakes by Mr. SATO Yuki (UU / Chair)

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~ Agriculture and Environmental Sciences~

Table of Presentations (B)

~ Health Sciences and Social Sciences~

Table of Presentations (C)

~ Engineering and Telecommunication~

UU-A STUDENT SUMMIT 2024

Summit Abstracts (A)

~ Agriculture and Environmental Sciences ~

A01 ~ A24

A01 (E0004)

Restoration of Soil Health and Soil Biodiversity Through Conservation Agriculture

KEMBOI Kiptoo Victor
Meru University of Science and Technology

BACKGROUNDS

Conservation Agriculture has emerged as a promising approach to address the challenges of modern agriculture, aiming to simultaneously improve productivity, preserve natural resources, and enhance environmental sustainability. The reduction in soil fertility and biodiversity within arid and semi-arid regions (ASALs) in Kenya has resulted in a decrease in maize (Zea mays) output. The decline in soil health and biodiversity is attributed to persistent tillage, monoculture practices, and the ongoing application of inorganic fertilizers. This situation has raised concerns about the need for proactive measures to address food insecurity, emphasizing the necessity for sustainable approaches to enhance food production and security in the ASAL regions. Therefore, this study aimed to assess the impact of conservation agriculture on soil health and soil biodiversity.

METHODOLOGY

A survey was conducted in Meru, Kenya, and soil samples were taken for physiochemical analysis. Soil macro-fauna was determined by laying traps on the ground.

RESULTS

The results showed that conservation agriculture (farming system) improved soil health and significantly increased soil macro-fauna ($p<0.05$). There was also a significant influence ($p<0.05$) on soil organic carbon and increased soil nitrogen, respectively.

CONCLUSIONS

In conclusion, the study demonstrates that conservation agriculture significantly improves soil health, enhances soil biodiversity, and positively influences key soil parameters, offering a sustainable solution for addressing agricultural challenges in arid and semi-arid regions. Based on the findings, it is recommended that the adoption of conservation agriculture practices be promoted and encouraged in ASAL regions to ensure long-term food security, restore soil health and environmental sustainability. Therefore, the study addresses the SDGs 1, 2 and 13.

Supervisor: Prof. MASINDE Peter

A02 (E0009)

Expression Analysis of Selenoprotein Genes in Ayu Fish (*Plecoglossus Altivelis*)

SAITO Yuki and IIGO Masayuki
Utsunomiya University

BACKGROUNDS

Selenium is an element with atomic number 34 and is one of the elements that the body needs even a little. Selenium deficiency causes Keshan and Kaschin-Beck diseases. Selenium in the body is thought to function in the form of selenoproteins. Selenoprotein is a protein with a "21st amino acid", selenocysteine, encoded in the genome. Selenocysteine is specifically encoded by the opal stop codon UGA and translation is continued only when a tRNA-like structure called selenocysteine insertion sequence (SECIS) is present in the 3' untranslated region of mRNA. Human has 25 selenoprotein genes but functions of some genes are still unknown. A few studies have been performed on selenoprotein genes in bony fishes. Therefore, in the present study, we focused on ayu fish (*Plecoglossus altivelis*), economically important migrating teleost living in Japan, Korean Peninsula, Taiwan and China. For comprehensive elucidation of functions of selenoprotein genes in teleost fish, as an initial step, we tried to identify selenoprotein genes in ayu fish and analyzed their daily and circadian expression in the brain.

MATERIALS AND METHODS

We searched for selenoprotein genes using mRNA-seq assembly data. After analyzing the gene structures, we designed primers and real-time PCR (qPCR) was performed to determine daily and circadian rhythm of mRNA in the brain collected at 4-h intervals under light-dark, constant-dark and constant-light conditions.

RESULTS

In ayu fish, 35 selenoprotein candidate genes were identified (Gpx1, Gpx2, Gpx3, Gpx4a, Gpx4b, Dio1, Dio2, Dio3a, Dio3b, Txnrd2.2, Txnrd3, Msrb1a, Msrb1b, Sephs3, Selenoe, Selenof, Selenoh1, Selenoh2, Selenoi, Selenoj, Selenok, Selenol, Selenom, Selenon, Selenoo, Selenop, Selenop2, Selenos, Selenot1, Selenot2, Selenou1a, Selenou1b, Selenow1, Selenow2a, and Selenow2b). Among them, mRNA levels of 16 and 24 genes were found to exhibit significant daily and circadian rhythms, respectively.

CONCLUSIONS

We successfully identified 35 selenoprotein candidate genes and determined their exon-intron structures. Furthermore, expression of some genes is under the control by light-dark cycles and/or circadian clock. We will test whether selenoproteins regulate the biological clock vice versa. We will also determine whether selenoprotein genes are involved in the regulation of seasonal rhythms. Our research will contribute to SDGs Goal 3 (Good Health and Well-Being), Goal 9 (Industry, Innovation and Infrastructure), and Goal 14 (Life Below Water).

Supervisor: Prof. IIGO Masayuki

A03 (E0010)

Chemical and Physical Characteristics of the Baobab Peat and Its Effect on the Growth of Lettuce

AHAWO Maureen Akinyi
Jomo Kenyatta University of Agriculture and Technology

BACKGROUNDS

Climatic change occurring worldwide has resulted in drought which has a direct impact on agricultural soil. Increased evaporation on soil and water loss in crops has been reported globally. There is an urgent need to improve soil water retention through soil amendments like biochar, and inert growth like sawdust, peat moss and baobab "peat". The wastes emanating from the production of both Baobab fruit powder and oil are approximated to be about 70% of the fruit pulp. Hydroponics is a technology that is gaining traction worldwide because of its advantages of being soilless and thereby removing overdependency on land. Apart from forest climate mitigation, hydroponics has been proven to be an option too resulting in sustainable crop production and food security. Other biowastes like coco peat, sawdust, coffee grounds, and eggshells have successfully been used as growth media in hydroponic farming systems. The use of Baobab fruit industry bio-waste has, however, not been sufficiently exploited. This study sought to establish the potential of baobab fruit industry bio-waste as a growth medium in hydroponic vegetable production, a case of lettuce.

MATERIALS AND METHODS

Physical and chemical analysis of the baobab "peat" and a greenhouse experiment comparing the growth performance of lettuce under baobab "peat" and other commonly used hydroponic growth media were performed. The material was sourced from Vokonel Limited which is situated in Kibwezi, Makueni County. Flame photometry, Kjedhal distillation, Ultra- ultra-violet spectroscopy, and Atomic Absorption Spectrophotometry were used for the analysis. The pH, electrical conductivity, moisture content, and lignin content were also analyzed.

RESULTS

The results showed that the pH was about 5.3 whereas the electrical conductivity was recorded to be 2.4. The moisture content obtained for the baobab biowaste was 6.4%. The Total nitrogen content was found to be 0.1% while the UV-V showed a phosphorous concentration of 0.03 which complies with the growth media optimal range. The lignin content was found to be 52% which is within the optimal range for growth media.

CONCLUSIONS

Given the results, the study concludes that Baobab biowaste qualifies as a growth media. The results are within specification when compared to other growth media currently in use. The study is in line with SDG 1; 2; 12; and 13. The use of Baobab "peat" as a growth media will contribute to food and nutrition security in the poverty-stricken areas of Makueni. In addition, the sale of baobab "peat" will provide an extra income avenue and contribute to the rapidly growing Baobab Industry, ensuring sustainable management and use of natural resources.

Supervisors: Prof. MADIVOLI Edwin, Prof. NGAMAU Catherine, and Prof. KARERU Patrick

A04 (E0012)

Effect of Different Processing Methods on the Level of Alkaloids in Slender Leaf Vegetable (*Crotalaria brevidens*)

OGUDA Okech Peter and ONYANGO Arnold
Jomo Kenyatta University of Agriculture and Technology

BACKGROUNDS

Vegetables are one of the most important nutrient-rich foods, with essential vitamins required for a healthy life. In Africa, the utilization of some of its indigenous vegetables is altered by the high anti-nutritional factors present in these vegetables, including some toxic alkaloids such as pyrrolizidine alkaloids. Post-harvest losses are also high due to a lack of efficient processing methods, hindering large-scale production of African indigenous vegetables. Slender leaf vegetable is one of these important nutrient-rich vegetables; its consumption is influenced by the presence of alkaloids, which are known to be toxic (pyrrolizidine alkaloids). This research seeks to exploit different processing methods to reduce the level of toxicity that might be caused by these alkaloids and also to enhance the nutritional content of the vegetable through lactic acid fermentation.

METHODS

Two vegetable samples were fermented through spontaneous and controlled fermentation. In controlled fermentation, the vegetables were washed with cold water, weighed (100 g), and placed in a 400-ml fermentation container. They were then inoculated with 1.0× 107 CFU/ml of *Lactobacillus plantarum* BFE 5092, and 250 ml of brine (3% salt and 3% sugar) was added. Chemical analysis included vitamin C by the indophenol method (AOAC 967.21), β-carotene by the UV-Vis method (AOAC 970.64), B-vitamins by the HPLC method (AOAC 2014,02) and alkaloids by the Harborne 1973, gravimetrical method.

RESULTS

The growth rate of yeast and mold decreased over fermentation in both spontaneous and controlled fermentation since it increased to a pH below 4.0 . The level of alkaloids in both vegetables decreased. *C. brevidens* decreased by 49.31%, while *C. ochraleuca* decreased by 38.72%. Addition of starter culture and temperature change had a significant effect on the rate of lactic acid growth, leading to a sharp decrease in pH and improving the safety of the vegetable. The nutritional value of the vegetable also improved considerably; vitamin C, β-carotene, thiamine, folate, and cobalamin increased by 12.92%, 49.42%, 152.7%, 33.33%, and 14.28%, respectively, by controlled fermentation, while spontaneous fermentation recorded 2.90%, 22.92%, 118.3%, 42.85%, and 7.15%, respectively.

CONCLUSIONS

Through lactic acid fermentation for 5 days, the shelf life of the vegetable increased. As slender-leaf vegetables are well known to be bitter, a reduction in alkaloids leads to reduced bitterness, improved utilization of the vegetable due to processing, and also reduced toxicity (pyrrolizidine alkaloids). An increase in vitamin levels will help solve the problem of micronutrient deficiency, which is a major contributor to childhood undernutrition. Hence, the research seeks to end hunger, achieve food security, and improve the health conditions of consumers of slender-leaf vegetables. This will help achieve the standard development goals of zero hunger and good health and well-being.

Supervisor: Prof. ONYANGO Arnold

A05 (E0014)

African Indigenous Food Epistemologies for Responsible Consumption: Triangulation with the Scientific Methods of Food Production

OYENGA Patrick Omusula
Jomo Kenyatta University of Agriculture and Technology

BACKGROUNDS

The current global consumption and production patterns are unsustainable and harmful to the environment and human well-being. While production has taken the scientific methods, the technological consumption methods come with added costs and effect on environment. Thus, the need for a comprehensive set of actions from society to transform the way we produce and consume goods and services, and to achieve sustainable development and lifestyles in harmony with nature. The study entailed three questions; What are the different types of indigenous food preservation techniques used in Africa? How effective are they in maintaining food quality and safety? What are the benefits and challenges of using them for food security and sustainability?

METHODS

The study involved conducting a comprehensive search of relevant databases and sources, using appropriate keywords and filters including “indigenous knowledge”, “food preservation”, “Africa”, and “food security”. The study included articles that focus on empirical studies of indigenous food preservation methods in Africa, and excluded articles that are not peer-reviewed, not in English, or not relevant to the research questions. A checklist was used to evaluate the methodological rigor, validity, and reliability of the studies. The study also used narrative synthesis and thematic analysis.

RESULTS

The study found that focusing on African traditional food conservation methods can be a significant way of reducing food wastage which complements the scientific methods of production. The study found that there are different types of indigenous food preservation techniques used in Africa including smoking, drying, salting and fermentation. The methods have been found to be effective in food preservation, use renewable energy, and thus have almost zero costs and zero effect on both human life and the environment.

CONCLUSIONS

The study concluded that triangulating the African indigenous food epistemologies in preservation with the scientific methods of food production is a significant way of achieving sustainable and responsible consumption. By the methods, renewable resources are utilized, less costs and friendly environmental approaches that check the unsustainable and harmful to the environment and human well-being. The findings are vital to the implementation of SDG12 on sustainable consumption and production patterns.

Supervisors: Prof. E. Mamati and Prof. E. Ateka

A06 (E0015)

Green Canopy of Change: Promoting Indigenous Trees for Land Resilience and Community Climate Adaptation

WAMALWA Robert Juma
Jomo Kenyatta University of Agriculture and Technology

BACKGROUNDS

This project was conducted in the watershed areas, aiming to address climate change impacts on local communities. The objective was to implement ecosystem and community-integrated strategies to reduce vulnerabilities and enhance climate resilience. By combining Community-Based Adaptation (CBA) and Ecosystem-Based Adaptation (EBA) techniques, the project sought to transform livelihood systems; combat poverty; and improve food security in the region. The primary goal was to promote sustainable landscapes and climate resilience through the conservation and planting of indigenous trees.

METHODS

The project employed a holistic approach by combining CBA and EBA techniques. This involved the planting of indigenous trees within the water catchment; incorporation of educational programs to raise awareness about the importance of preserving indigenous trees and adopting sustainable land use practices; and fostering support, creating awareness, and encouraging active participation of the community in tree planting programs. The study also collaborated with governmental bodies, non-profit organizations, local businesses, and other stakeholders to ensure the success and sustainability of the project's initiatives.

RESULTS

The project has yielded several positive outcomes. These include notable improved climate resilience in the community, biodiversity preservation, and community empowerment through the Green Canopy Initiative and active community engagement.

CONCLUSIONS

The study concludes that collaboration with stakeholders is essential for the success and long-term sustainability of interventions in watershed areas. Further, a comprehensive strategy geared towards sustainable landscapes, climate change resilience enhancement and the overall well-being of local communities has the potential to transform watershed areas. This study contributes to SDGs 1, 2, 3, 6, 14, and 15.

Supervisor: Prof. GATHENYA M. John

A07 (E0016)

More than Pollutant Removal: Constructed Wetlands and Waste Stabilization Ponds as Biodiversity Hotspots in Tanzania

MSAKI Liberath Gerubin[1, 2], NJAU Nicholas Karoli[1], TREYDTE Christina Anna[3], and LYIMO Jacob Thomas[4]

[1]Nelson Mandela African Institution of Science and Technology, [2]MJNUAT, [3]Stockholm University, [4]University of Dar es Salaam

BACKGROUNDS

Waste stabilization ponds and constructed wetlands (WSPs-CWs) are important ecotechnologies for wastewater treatment. Despite their potential and wastewater management being challenging in urban and peri-urban areas of Tanzania, their adoption and sustainability is not well developed. In this study we assessed community Knowledge Attitudes and Perception on wastewater treatment, the biodiversity status and potential of both CWs and WSPs and the bacterial composition of selected CWs in Tanzania.

METHODS

We used semi-structured household-level questionnaire to assess social KAPs. The study also employed point counts, fish net, direct observations, and camera traps to assess bird, reptiles and insects' diversity in WSPs-CWs. Additionally, wastewater was collected in four different CWs for bacterial diversity establishment. Social KAPs was analyzed using SPSS, while Jamovi and PAST software were used to analyze the diversity and abundances of bird, insects, and reptiles, whereas bacterial community composition was characterized using Illumina-based sequencing of the V3 and V4 hypervariable region of 16S rRNA.

RESULTS

The results show that social KAPs surrounding wastewater treatment and reuse were sufficient based on the KAPs score achieved from the asked questions. However, the general knowledge of treatment technologies, processes and reuse risks were found low. Furthermore, results showed that birds exhibit high species abundance (n = 1132), high species richness, Margalef index (D = 4.266), evenness (E = 0.815), Shannon diversity (H = 2.881) and Simpson index (λ =0.903). The study also recorded significant abundance and diversity of bacterial communities.

CONCLUSIONS

Since this study has found the WSPs and CWs provide additional benefits besides wastewater treatment, such as urban environment greening, resource recovery for reuse and biodiversity development, it is recommended that policies should incorporate these ecotechnologies into biodiversity conservation portfolios, environmental protection and resource recovery for socio-economic uses. This research work contributes to the achievement of SDG6: Clean water and Sanitation, targets no. 6A and 6B; SDG11: Sustainable cities and communities, targets no. 11.7 as well as SDG15: Life on land, targets 15.1.

Supervisors: Prof. NJAU N. Karoli, Prof. TREYDTE C. Anna and Prof. LYIMO J. Thomas

A08 (E0018)

Evidence Suggests that Existing Management Approaches Against Prosopis Juliflora are Not Scalable Level

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BACKGROUNDS

Prosopis juliflora is an invasive tree that is native to Central and South America, and it is now on the list of the 100 world's worst invasive species. Globally *Prosopis juliflora* has invaded about 54 million hectares of land. The study aimed to examine failure and success of the management approaches against *P. juliflora.* Various methods, including mechanical, chemical, biological, and integrated approaches, have been tried to eliminate *P. juliflora* globally. Still, over the last 20 years, the rate of spread has accelerated, suggesting that management approaches are not always effective.

METHODOLOGY

To fulfill the objectives of the study, online literature review was carried out to examine the extent of *P. juliflora* management approaches, challenges and lessons learned. Analyzed literature was obtained from the following databases, Google, Google Scholar, Science Direct, and CABI digital library.

RESULTS

Globally management approaches to control *P. juliflora* have been largely implemented at trial and small scale. On a large scale, mechanical, chemical, biological and integrated approaches have been practiced at 12%, 38%, 12% and 17% respectively. However, the applied management approaches failed because they were unsustainable and after the project was phased out there was no further implementation strategy.

CONCLUSIONS

Prosopis juliflora management approaches like burning the stump using cattle dungs have been found to double the spread since burning of the dungs breaks dormancy of seeds which pass undigested in animal feces and spread in grazing fields. This study contributes to SDGs 13 and 15.

Supervisor: Prof. MUNISHI K. Linus

A09 (E0026)

Assessment of Post-Harvest Losses of Small-Scale Rice Farmers and Its Implication on Livelihood in Kura-Kano Nigeria

AHMADU Zakariya
Utsunomiya University

BACKGROUNDS

The global population is projected to grow to 9.7 billion people by the year 2050. Most of this population rise is expected to come from the developing countries, most already facing the issues of postharvest losses. Reducing these losses in developing countries, could be a valuable and sustainable solution to increase food availability, eliminate hunger (SDG2: Zero hunger), and improves farmer's livelihood (SDG1: No poverty). This study will be carried out in Kura Local Government Area of Kano Nigeria. Kura is a major area of rice production and processing in Kano, Nigeria. The average rice yield in Kano state is very low (1.5tone/ha) compared to a yield of 6-8 tone/hectare reported on research plots. Considering the post-harvest losses and increasing demand for paddy from rice processing industries in the state and the entire country, it brought my attention to conduct my research in this field, with the aim of figure out the causes and stages where loss occur, and to come with possible solutions that can be used to overcome the issues.

METHODOLOGY

Multi-stages sampling procedure will be used to select the respondents. At the first stage three communities (Garin Kura, Karfi and Dan Hassan) will be selected based on their dominance in rice production from the target area. In the second stage simple random sampling techniques will be used to select 450 farmers from the selected communities. Data on socio economic characteristics, harvesting, drying, threshing, transportation and storage techniques will be collected directly from the respondents, using semi structure interview schedules.

DATA ANALYTICAL PROCEDURE

Descriptive statistics and regression analysis will be used for data analysis.

CONCLUSIONS

It will be concluded that if this research is carried out, possible measures will be provided that can be used to overcome the identified problems and bring about positive changes in improving livelihood. And also, can contribute to achieve SDG1: End poverty and SDG2: Zero hunger, in increasing yields, income and sustainable food production.

Supervisor: Prof. SCHRAGER Benjamin

A10 (E0028)

Analysis of the Roles of Farmer Trainers in Agricultural Inputs Uptake Behavior of Rice Farmers in Analamanga Region of Madagascar

RAKOTONDRASOA Voloina Stelly
Utsunomiya University

BACKGROUNDS

Rice is the staple food of Madagascar. Its production is vital to the economy and the livelihoods of smallholder farmers. Yet the country faces challenges such as low yields and limited access to agricultural inputs. As a result, domestic production does not catch up to the needs of the population which is still increasing. The PAPRIZ Project (Rice Productivity Improvement Project), initiated in collaboration with JICA (Japan International Cooperation Agency), aimed at improving rice productivity, has introduced a cascade style of extension, involving farmer trainers to facilitate the adoption of PAPRIZ technology which is a simplified adaptation of the System of Rice Intensification (SRI) . This cascade extension model proves crucial in disseminating technology, contributing to SDG 17 (Partnerships for the Goals). The PAPRIZ technology, rooted in sustainable agriculture practices, aligns with environmental goals by promoting eco-friendly farming methods, thus supporting SDG 13 (Climate Action). This research seeks to examine the role of farmer trainers in facilitating access to agricultural inputs for rice farmers in the Analamanga region of Madagascar, with the aim of enhancing rice production and smallholder farmers' livelihoods. By addressing these challenges and aligning with the SDGs, the research directly contributes to Sustainable Development Goals (SDGs) such as SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 8 (Decent Work and Economic Growth).

METHODS

The study will involve surveys and semi-structured interviews with 180 rice farmers in different PAPRIZ project intervention sites within the Analamanga region, along with interviews with farmer trainers and extension workers. Both qualitative and quantitative methods, including econometric analysis, will be used for data analysis.

RESULTS

The findings of the research are expected to shed light on the critical role of farmer trainers in improving agricultural input access and its impact on rice production and smallholder farmers' well-being, thus directly contributing to the targets and indicators of SDGs related to poverty eradication, food security, sustainable economic growth, climate action, and partnerships for the goals.

CONCLUSIONS

The study's insights and recommendations are anticipated to provide valuable guidance for the PAPRIZ Project to enhance its effectiveness and sustainability in Madagascar, aligning with the broader global agenda of sustainable development encapsulated in the SDGs.

Supervisor: Prof. KATO Koji

A11 (E0029)

Assessment of Constraints Militating the Productivity of Small-Scale Rice Farmers in Guma Local Government Area of Benue State, Nigeria

AKOR Solomon
Utsunomiya University

BACKGROUNDS

Rice production in Guma local government area of Benue state, Nigeria at present is on small scale basis and involves the use of less sophisticated technology. It is labour intensive thus requires considerable latent energy and capacity by farmers to execute most of the sector activities. Despite the effort of small-scale farmers to increase rice production, returns have been much below the expected potential. Crop yields continue to decline and are substantially lower than potential yields. Food crop production growth in Nigeria has been driven entirely by expansion in area planted, rather than by increasing productivity per hectare through improved technology and development of high yielding varieties of arable crops. The gap between potential and actual rice yields obtained by farmers suggests abundant scope for improvement in productivity. The broad objective for this study is to assess the barriers limiting the efforts of small-scale rice farmers from attaining higher productivity. The specific objectives are to determine if socio-economic characteristics of small-scale rice farmers have a strong correlation with lower or higher productivity; to evaluate the extent to which farming practices inform productivity of small-scale rice farmers; and to examine how limited access to inputs influence rice productivity.

METHODS

This study will adopt interview survey research design in which a multi-stage random sampling technique was used to select a total number of eighty (80) small scale rice farmers whose farm size ranges from 0.1 to 2.0 hectares. The questionnaire will be used to collect data from the sampled number of small-scale rice farmers in the study area. Data collected for this study will be analyzed using descriptive and inferential Statistic. Descriptive statistics such as frequencies, percentages, mean and Standard deviation will be used.

CONCLUSIONS

In a bid to help farmers increase productivity, the focus is usually on whether farmers are using better and improved technologies. It is however necessary to investigate whether these farmers are even making maximum use of what is available to them in terms of inputs. Therefore, this research will be able to contribute to SDG1: No Poverty, SDG2: Zero Hunger, SDG3: Good Health and Well-being, SDG8: Decent Work and Economic Growth, SDG12: Responsible Consumption and Production, and SDG13: Climate Action.

Supervisor: Prof. NISHIYAMA Mima

A12 (E0030)

Analysis of Temporal Changes in Disease Resistance-Related Genes and Phytohormone during Infection Process of Powdery Mildew in Wheat

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BACKGROUNDS

Bread wheat is one of the world's three most important crops that significantly contribute to food security. Generally, the main factors reducing productivity are disease, drought, and high temperature; therefore, we are focusing on wheat disease, specifically wheat powdery mildew (*Blumeria graminis*). It is known that when plants recognize the attack of pathogens, they accumulate a large amount of the phytohormone salicylic acid (SA) and exhibit resistance. Additionally, one of the bioactive small molecules, *N*-hydroxypipecolic acid (NHP), has similar effects to SA and is involved in disease resistance. In this study, we analyzed how SA and NHP change during the infection process of wheat powdery mildew.

METHODS

Wheat (cv. Fielder) cultivated in pots for both the untreated group and the wheat powdery mildew-inoculated 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.

RESULTS

The content of SA, NHP and its precursor pipecolic acid (Pip) increased significantly in the inoculated group after inoculation. Notably, the rate of increase in Pip and NHP was much higher than that of SA. The gene expression levels of *SARD1* and *WRKY33*, which are transcription factors for SA and NHP biosynthesis, were increased in the inoculated group, but the expression levels of *SARD1* were earlier than those of *WRKY33*. Although, the SA biosynthetic key enzyme *ICS1* increased toward the late inoculated stage, the NHP biosynthetic key enzyme *ALD1* increased in the early inoculated stage.

CONCLUSIONS

Our results suggest that disease resistance is primarily induced by Pip and NHP, rather than SA, and the early accumulation of Pip and NHP co-operates with SA in the disease response against wheat powdery mildew infection. Our study will apply to molecular breeding in order to contribute to SDG2: Zero Hunger and SDG13: Climate Action.

Supervisor: Prof. OKAMOTO Masanori

A13 (E0035)

Physicochemical Properties of Model Beverages and Baked Products Incorporated with Avocado Seed Powder

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Meru University of Science and Technology

BACKGROUNDS

Consumption of avocado (*Persea americana* mill) has increased worldwide in the recent years. The pulp is used but the peel and seed are discarded as waste. Studies have shown that the seeds are rich in phytochemicals that can be utilized in food systems. The objective of this study was to evaluate the potential of Hass avocado seed as a source of polyphenols in the processing of model beverages and baked products with functional properties.

METHODS

The proximate analysis of the avocado seed powder was carried out. The shelf life of phenols in avocado seed powder (ASP) stored in dark, amber colored bottle and transparent bottle was studied for six months. The seed extract was incorporated into model beverages of different pH and the shelf life was monitored for 20 weeks. The seed powder was incorporated into baked products at 0, 15, 30 or 50 % followed by total phenolic content and sensory properties analysis.

RESULTS

Proximate composition of the seed powder for moisture, ash, protein, fiber, fat and total carbohydrates were 14.19, 1.82, 7.05, 4.00, 13.64, and 59.30 per cent, respectively. During storage of the seed powder, there was no significant difference ($P>0.05$) in the phenol content under the different storage light conditions for six months. In the model beverages, lower pH levels (2.8, 3.8, and 4.8), and those stored at ambient temperatures recorded lower phenol content than the control pH i.e. 5.5, and those under refrigerated conditions throughout the storage period studied (20 weeks). The concentration of phenols in the baked products increased with increasing avocado seed powder. The sensory evaluation of the cakes in terms of color for all the formulations was liked very much. The aroma of 0% and 15% ASP was liked very much, while the other formulations were liked moderately. The taste rating and overall acceptability decreased with an increasing avocado seed powder in the queen cake formulations.

CONCLUSIONS

Our data shows that avocado seed extracts can be incorporated to prepare functional beverages and functional baked products that are acceptable by sensory panelists. This study addresses SDG 2 (Zero Hunger) by reducing food waste, in this case the avocado seeds to ensure food security and SDG 3 (Good health and well-being) by incorporating bioactive compounds with health-promoting properties into food products.

Supervisor: Prof. ARIMI Joshua

A14 (E0040)

Mitigation of Aerosol in the Weaning Piggery by Spraying Solution by Using Ultrasonic Sprayer

YOSHINO Takumi
Utsunomiya University

BACKGROUNDS

The study aims to compare the effectiveness of defend water spray, derived from grapefruit seeds, in reducing airborne microbial concentrations in a piggery. This approach is contrasted with traditional methods to gauge its efficacy in enhancing biosecurity in livestock environments.

METHODS

Defend water, made from grapefruit seeds, was sprayed in a piggery environment and on the operator's body. The study observed the impact of this spray on airborne microbial concentrations and on the operator's health, comparing it with a control area without such treatment.

RESULTS

Significant reductions in airborne microbial concentrations were observed in the test area treated with defend water. Aerobic microorganisms showed a reduction of 32.8%, E. coli by 64.6%, and Staphylococcus aureus by 88.4%. Additionally, the use of defend water on the operator's body demonstrated a marked decrease in skin-associated bacterial loads, enhancing the operator's personal safety. These results demonstrate the efficacy of defend water in controlling airborne pathogens in a piggery environment and in safeguarding the health of the operator.

CONCLUSTIONS

The study confirms that defend water spray is a potent tool in reducing airborne microbial concentrations in piggeries. Its utilization could be a crucial step in enhancing biosecurity and overall health standards in livestock farming environments.

CONTRIBUTION TO SDGs

The application of defend water aligns with SDG 3 (Good Health and Well-being) by mitigating health risks in livestock environments, thereby indirectly benefiting human health. It also supports SDG 12 (Responsible Consumption and Production) by promoting sustainable farming practices.

Supervisor: Prof. IKEGUCHI Atuso

A15 (E0041)

Physicochemical Characterization and Sensory Acceptability of Fortified Cassava Flour with Long-Horned Grasshopper – Kitarasa (*Musa spp.*)

GASPAR Audifas and KAALE Daniel Lilian
University of Dar es Salaam

BACKGROUNDS

Malnutrition is a significant issue in various African regions, notably Western, Eastern, and Southern countries. This problem has severe implications for children, leading to conditions like stunting, wasting, and hindering cognitive development. Pregnant and breastfeeding women are also affected. A major challenge contributing to this issue is the consumption of poor-quality diets, often centered around a single staple food. Particularly in Eastern, Western, and Central Africa, feeding practices are suboptimal. The growing population further strains limited resources, intensifying the problem of malnutrition. The goal of this study was to analyze the nutritional content of raw green Kitarasa (*Musa spp.*), focusing on both basic components (fat, protein, moisture, fiber, ash, and carbohydrates) and micronutrients (iron, zinc, calcium, and potassium).

METHODOLOGY

The raw Kitarasa was harvested from three different suckers, each with a slight difference in maturity. Standard AOAC methods were used for analysis.

RESULTS

The findings revealed significant differences in moisture, fat, calcium, and zinc contents ($P \leq 0.05$) among the suckers. However, there was no notable difference in protein, ash, fiber, iron, and potassium composition. The average iron content in raw Kitarasa *(Musa spp.*) was 16.2 mg/100g, exceeding the recommended dietary allowance of 12 mg/100g. This surpasses the nutritional requirements for both children under five and women of reproductive age.

CONCLUSTIONS

From the findings of this study, it can therefore be generalized that, Kitarasa has the potential to serve as a fortifying agent, enhancing the nutritional value of staple foods like cassava. This, in turn, could improve the health of children and women (SDG 2 (2.2, 2.3& 2.4), SDG 3 (3.1&3.2), SDG 12 (12.1)). Further research is necessary to determine suitable processing methods that preserve these nutrients for effective utilization by the body.

Supervisor: Prof. KAALE Daniel Lilian

A16 (E0043)

Antimicrobial, Antioxidant and Physicochemical Properties of Honey from Selected Tanzanian Phytochoria

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University of Dar es Salaam

BACKGROUNDS

Throughout history, honey has been recognized for its medicinal properties, and the extent of these properties may differ depending on the type of bee, nectar source, location and season. This study aimed to assess the antimicrobial, antioxidant, and physicochemical properties of honey from honeybees and stingless bees collected in two seasons from different districts within Somali-Masai and Zambezian centers of endemism in Tanzanian.

METHODS

The antimicrobial activity of the honey samples against *Staphylococcus aureus*, *Bacillus subtilis*, *Salmonella typhi* and *Candida albicans* was analyzed using an agar well diffusion method. DPPH radical scavenging method was employed to analyze the antioxidant activity while standard methods were employed to determine the physicochemical properties of honey samples which included the pH, sugar content, water content, Total Phenolic and Total Flavonoid compounds in honey. All the studied parameters were analyzed using multivariate analysis of variance (MANOVA) in SPSS software.

RESULTS

In all studied parameters there was no significant difference at the phytochoria level ($P>0.05$). Results obtained showed significant differences ($P<0.05$) in the physicochemical properties of honey based on type across the districts. Stingless bee honey had higher moisture content (29.39 ± 0.4%) than honeybee honey (20.07 ± 0.5%). The total phenolic and flavonoid content was higher (133.9 ± 0.68mgGAE/100g and 105.59 ± 0.56mgRE/100g) respectively, in stingless bees compared to honeybee honey (111.9 ± 0.29 mgGAE/100g and 83.57 ± 0.31mgRE/100g) respectively. The microbial inhibition zone ranged from 8.0 ± 0.7mm to 20.67 ± 0.8 mm (honeybee honey) and 10.83±0.3mm to 33.67±2.3mm (stingless bee honey). The observed differences between the microbial inhibition by stingless and honeybee honey were significant ($P<0.05$). Generally, honeybee honey from the first season had significantly larger inhibition zones (14.38 ± 2.48 mm) than those from the second season (9.47 ± 2.63 mm) against the tested microorganisms ($F=6.822$, $P=0.001$). The DPPH radical scavenging capacity was significantly higher in stingless bee honey than honeybee honey ($P<0.05$). There was a strong positive correlation between the antioxidant activity and physicochemical properties of honey ($P\leq0.01$).

CONCLUSTIONS

Conclusively, the composition, antioxidant and antimicrobial activity of honey was variable and dependent on where it was collected from, the plant species, bee type as well as the season of harvest. Stingless bees honey had higher phytochemical properties in terms of total phenolic and flavonoid content than honeybee honey. This would also explain for the elevated antioxidant and antimicrobial activity of stingless bees over honeybees' honey. This study serves as a steppingstone to more studies that will cement the clinical use of Tanzanian stingless bees' honey.

Supervisors: Prof. MKABWA Lawrence Manoko and Prof. NANIKE Esterhuizen

A17 (E0046)

Assessing Food System Resilience among Rural Communities Amid Economic and Climate Shocks in Southern Malawi

MAGOMBO Stater Noel and SUGITA Naoki
Utsunomiya University

BACKGROUNDS

Malawi just like other countries has recently been heavily affected by adverse incidences of economic, climatic, social and political shocks. These calamities have negatively affected sustainability of food systems among Malawian rural communities hence posing threats to livelihoods. The country encountered high inflation rates and natural disasters (cyclone lanina and cyclone freddy) which led to increase on cost of food production, poor food markets and distribution of food supplies, increased prices of food supplies, low agricultural production and productivity and loss of land and other productive assets. Such outcomes bring the country's goal of achieving food security in jeopardy. This study is therefore designed to assess resilience of the food systems to the prevailing shocks in order to ensure sustainable food security among rural households. The study will also identify socio-economic factors that affect household food system resilience.

METHODS

The study will involve identification of major shocks and determine their effect on food system across its elements such as production, processing, distribution, marketing and consumption. A determination of household livelihood sources outcomes and their adaptation in relation to food security will be established. This study targets rural households in southern Malawi. Questionnaire, FDGs and key informant interviews shall be used to collect data across the food system elements. The data will be analyzed using SPSS.

RESULTS

The research will establish; the effects of the shocks on the food system, adaptive capacity of food system element, responses of the food system towards the shocks, socio economic factors affecting food system resilience.

CONCLUSTIONS

The study is expected to establish level of food systems resilience among rural communities and suggest ways for their sustainability. The study will help in formulation of sound projects that will effectively enhance sustainable agriculture, humanitarian support and recovery initiatives, Therefore, this research will be able to contribute SDG2: Zero Hunger, SDG1: No poverty and SDG13: Climate Action.

Supervisor: Prof. SUGITA Naoki

A18 (E0052)

Extending the Shelf-Life of Indigenous Vegetables in Ghana: Case of Cocoyam Leaves

MENSAH Duke Nii Tettey, ESSILFIE Gloria, and SAALIA Firibu
University of Ghana

BACKGROUNDS

Cocoyam leaves (*Colocasia esculenta* or *Xanthosoma sagittifolium*) are one of Ghana's nutritious underutilized vegetables used in soups and stews. Although this crop is nutritious, it is not mostly consumed due to reasons such as unavailability in large quantities all year round. To effectively promote cocoyam leaves and mainstream them into the diets of consumers, especially urban dwellers, there is a need to add value thereby making it available all year round. This study therefore sought to evaluate preservation technologies that can extend the shelf life of cocoyam leaves while maintaining their quality.

METHODS

A 2x2x3x3 factorial design with three replications was used. The factors were blanching, sodium metabisulfite, preservation technology (freezing or solar drying), and storage temperature. Packaged value-added cocoyam leaves were stored for up to 28 days at different temperatures and analyzed at 7-day intervals. Indices measured were proximate analysis, color, phenolic content, antioxidant activity, flavonoids, and vitamin C. The data was analyzed using Analysis of Variance.

RESULTS

Results obtained showed that all treatments were able to extend the shelf-life of cocoyam leaves whilst maintaining the quality. There were no significant differences in the quality indices measured between blanched and unblanched samples except for color. Sensory evaluation revealed an overall acceptability of all the samples and consumers also indicated a willingness to purchase the value-added cocoyam leaves.

CONCLUSTIONS

Value addition of cocoyam leaves using simple technologies such as solar drying and freezing can extend the shelf life, and maintain quality attributes, making them available to urban dwellers all year round. This would contribute to Sustainable Development Goal 2 and 3

Supervisors: Prof. SAALIA K. Firibu and Prof. ESSILFIE Gloria

A19 (E0053)

Chloroplast Movement in Wild Strawberry (*Fragaria vesca*)

KIPRONO Daisy Jepchirchir[1, 2], CYNTHIA Mugo[1], and KODAMA Yutaka[2]
[1]Meru University of Science and Technology, [2]Utsunomiya University

BACKGROUNDS

Chloroplasts are essential organelles that play a crucial role in photosynthesis, the process by which plants convert light energy into chemical energy. The movement of chloroplasts within the plant cell is a critical mechanism for optimizing photosynthesis (accumulation response) and protecting the plant from excess light and photo-oxidative damage (avoidance response). The wild strawberry (*Fragaria vesca*), an ancestral species of the cultivated strawberry, presents an intriguing alternative. Despite its diminutive size, this species harbors a complete set of genes that are functionally relevant to those of *F. x ananassa*, arranged in a small diploid chromosome. Additionally, its shorter vegetative-to-reproductive life cycle facilitates genetic manipulation and gene editing of economically relevant traits through simpler gene transfer techniques. These advantages make *F. vesca* an ideal model for studying chloroplast responses to environmental changes, such as variations in light and temperature.

METHODS

Fragaria vesca plants were cultivated from runners/ stolon of healthy mother plants and allowed to grow to maturity. After this the trifoliate leaves were used in band assaying, light transmittance studies using a photosensor to study the chloroplast response with respect to blue and red light and microscopic studies to observe the cells and position of the chloroplast.

RESULTS

The preliminary results obtained from this study indicate that chloroplast in *Fragaria vesca* respond to blue but not red light. Also, that strong blue light of different intensities 50,100 and 200 photons elicits an avoidance response, while weak blue light of 5, 10 and 20 photons elicit an accumulation response while the inter-merit intensities of 30 and 40 photons elicited no response. *F. vesca* leaves also showed a cold avoidance response at 5ºC under 40 photons and a dark positioning response when plants are deprived off of light.

CONCLUSTIONS

These results advocate for a potential molecular mechanism underlying chloroplast relocation processes in adaptation to challenging environmental conditions in strawberries. However, to validate this hypothesis, a study of chloroplast response to the change of temperature, and further functional genomics and molecular genetics studies are necessary to unveil significant insights into chloroplast dynamics. The implications of this research could be transformative in advancing sustainable strawberry cultivation systems, and hence contribute to not only SDG 2: (Zero Hunger) but also SDG 3 (Good Health and Well Being), SDG 12: (Responsible production and consumption), SDG 13 (Climate Action) aligning with SDG 7 (Affordable and Clean Energy).

Supervisors: Prof. KODAMA Yutaka and Prof. CYNTHIA Mugo

A20 (E0056)

Assessment of Genetic Diversity of Latent Bacteria in Coconut Leaves Associated with the Lethal Yellowing Disease Symptoms in Kenya

OMAR Fatma[1], NEONDO Johnstone[1], MWEU Cecilia[1], and MULI Joshua[2]
[1]Jomo Kenyatta University of Agriculture and Technology, [2]University of Embu

BACKGROUNDS

Coconut (*Cocos nucifera L.*) is an economically important palm tree with myriad utilities for its different parts. This crop significantly contributes to Kenya's agricultural GDP (1.5%) and national GDP (0.4%), translating to about US$44.5 million. Despite its economic importance, scanty scientific documentation exists regarding diseases affecting coconuts on the Kenyan coast. Previous attempts to characterize diseases affecting this plant have failed to diagnose the causative agents. This cross-sectional study aimed at investigating the genetic diversity of latent bacteria associated with yellowing symptomatic coconut plants along the Kenyan coast.

METHODS

Sixty-two samples were purposively collected, and their bacterial diversity assessed using culture-independent methods. DNA was extracted from controls and symptomatic samples using CTAB method. NGS technique was used to profile the bacterial communities using amplicons of 16S rRNA sequences (V4 region) with Illumina Mi-seq. Sequence data was analyzed using the Quantitative Insights into Microbial Ecology 2 (QIIME 2) pipeline.

RESULTS

Sixty-two samples were purposively collected, and their bacterial diversity assessed using culture-independent methods. DNA was extracted from controls and symptomatic samples using CTAB method. NGS technique was used to profile the bacterial communities using amplicons of 16S rRNA sequences (V4 region) with Illumina Mi-seq. Sequence data was analyzed using the Quantitative Insights into Microbial Ecology 2 (QIIME 2) pipeline.

CONCLUSTIONS

The research sheds light on potential disease agents, providing molecular evidence of bacterial pathogens in diseased and healthy coconut plants while revealing variations in bacterial composition across different counties. The findings emphasize the importance of monitoring and managing these microbes to mitigate risks. This research aligns to SDG2 (Zero Hunger), SDG1 (No Poverty), and SDG15 (Life on Land). Overall, it offers critical insights for the Kenyan Coconut Development Authority's efforts in preservation and utilization of coconut germplasm.

Supervisor: Prof. NEONDO Johnstone

A21 (E0057)

Development of Fish-starch Snacks Using a 3D Food Printer

MURERWA Linsey[1], TAMURA Masatsugu[2], and OJIJO Nelson[1]
[1]Jomo Kenyatta University of Agriculture and Technology, [2]Utsunomiya University

BACKGROUNDS

Silver cyprinid (*Rastrineobola argentea*), locally known as *omena*, comprises about 44% of the total catch of fish from Lake Victoria on the Kenyan side. It is known to be a nutritionally dense fish and a relatively cheap inclusion in the human diet. However, its potential as a rich dietary source of nutrients for humans remains largely unexploited given that the animal feed industry currently consumes about 70% of the total catch. One of the key reasons for the low dietary contribution of *omena* is the lack of value-added products with a wide consumer appeal. This research therefore aims to introduce 3D Food printing as a new processing technique which will promote the consumption of this fish. 3D printing is an automated manufacturing process that deposits layers of raw materials or combines raw materials to create physical 3D structures.

METHODS

The research method to be used will be the response surface methodology to optimize the appropriate processing parameters and also determine the ideal flour-fish blend to be used in the manufacture of the 3D Fish-Starch Snack products. 3D Printing of the snacks using starch flours and fish powder at various ratios will be done, while varying independent variables such as (discharge speed, and diameter of the discharge port) under the same temperature, and thereafter, evaluation of the dependent variables (particle size, hardness, dimension retention, texture, starch digestibility, and color). Evaluation of the nutritious value, functional properties, and consumer acceptability through sensory evaluation of the raw materials, the gelatinized 3D printing ink, and the snacks made will then be done. The results will be analyzed by the analysis of variance (ANOVA) using the Stat-Ease statistical software.

EXPECTED RESULTS

Development and optimization of process parameters and flour-fish blend to make high-quality snack products.

CONCLUSTIONS

This research intends to develop and characterize novel *omena*-based products using 3D Food Printing technology to promote mass consumption across the various social, physiological and income groups. The research also promotes SDG goals 3: Good Health and well-being, SDG 2: Zero Hunger, and SDG 12: Responsible Consumption and Production.

Supervisor: Prof. TAMURA Masatsugu

A22 (E0061)

Assessing the Engineering and Environmental Efficacy of Eco-San Toilets in Rachuonyo North Sub-County, Homa Bay County, Kenya

ODOYO Ouma Vincent
Meru University of Science and Technology

BACKGROUNDS

This research addresses the pressing challenges of onsite sanitation in Rachuonyo North Sub-County, where conventional sanitation systems contribute to waterborne diseases and environmental degradation. The study evaluates the engineering and environmental efficacy of eco-san toilets as a sustainable alternative, addressing the gap in knowledge regarding their specific applicability in this context. The study objectives are 1. Assess the Engineering Design, Construction, and Technical Functionality of Eco-San Toilets 2. Assess the Environmental Impact of Eco-San Toilets 3. Analyze the Long-Term Sustainability, Durability, and Economic Implications of Eco-San Toilets

METHODS

The research employs a comprehensive methodology, including stratified random sampling, purposive sampling for key stakeholders, cluster sampling, convenience sampling for community surveys, and systematic sampling for onsite inspections. Data collection involves surveys, interviews, laboratory testing, and onsite assessments.

RESULTS

Preliminary findings indicate variations in the engineering design and construction quality of eco-san toilets, with noteworthy impacts on the surrounding environment. Nutrient recycling shows potential and initial economic assessments suggest challenges and opportunities for sustainable adoption.

CONCLUSTIONS

This study contributes valuable insights into the engineering and environmental efficacy of eco-san toilets in Rachuonyo North Sub-County. The results inform policy and decision-making processes, fostering the adoption of sustainable sanitation practices and offering a template for similar contexts globally. The work will contribute to SDG6 and SDG3.

Supervisor: Prof. TOO amd Prof. KUBAI

A23 (E0062)

Isolation, Screening and Production of L-asparaginase, Anti-Cancer Enzyme, from *E.coli* Isolates from Gubriye Area, Wolkite University, Ethiopia

TUFA Fikadu Kajelcha[1], MOSISA Beri Senbeto[2], and TUFA Fikadu Aklilu[2]
[1]Addis Ababa University, [2]Wolkite University

BACKGROUNDS

L-Asparaginase is a promising enzyme for cancer treatment, and it found in plants, animals and microbes. This enzyme is of greater medical and industrial importance. It is used withinside the remedy of acute lymphoblastic leukaemia (ALL), tissue and bone ailment in children; and helpin removing and/or reducing the acryl amide substance found in fried and baked foods that are carcinogenic in nature. Its source varied from bacteria to yeast and fungi. This study aims at screening the production of L-asparaginase from *E.coli* isolated from river and sewage samples near- by Gubryie area, SNNPR-Ethiopia.

METHODS

In the study *E.coli* bacteria were isolated from Wabe River and Wolkite University student cafeteria sewage. The required biochemical tests have been performed to confirm the bacteria. On *E. coli* positive samples, Screening of L-asparaginase was performed using phenol red indicator.

RESULTS

The color change in M9 media from yellow to pink due to the acidic environment created when L-asparagine degraded to urea indicates the presence of L-asparginase in the potent *E.coli* cells. The enzyme production of L- asparaginase was also carried out using submerged fermentation. During the study, six cells confirmed to be *E.coli* using TSI, SCA, and gram tests. The potential of the *E. coli* cells in producing L-asparginase has also been checked using rapid plate assay method using indicator dyes, phenol red. Three strains have shown positive result for L-Anase from intercellular and extracellular sources when the enzyme activity intracellular measured to be 20mm compared to the extracellular, which is 9 mm in average. The commonly used software system is SPSS. The isolate from the sewage have showed better L-Asparaginase production potency compared to that of Wabe River isolates.

CONCLUSTIONS

This study indicated that the *E.coli* are promising sources of L-asparginase for food processing companies and pharmacological units if scaling up of this work has been done in the future. Therefore, the study contributes to multiple SDGs such as SDG2 (Zero Hunger) apart from SDG3 (Good Health and Wellbeing).

Supervisor: Prof. BERHANU Admas

A24 (E0067)

Construction of a VIGS Vector Based on BaYMV and Examination for the Method of Inoculation

EW Kelvent
Utsunomiya University

BACKGROUNDS

Barley yellow mosaic virus (BaYMV) is a bipartite (+) single-stranded RNA virus belonging to the genus Bymovirus of the family Potyviridae. Recently, the vector expressing green fluorescent protein (GFP) has been developed using BaYMV and used for resistance gene analysis. Two-row barley produced in Tochigi Prefecture is mainly used for beer production, and research is being conducted at the gene level to improve quality. Although genome editing to knockout the expression of target genes is possible, virus-induced gene silencing (VIGS) is expected to advance the analysis quickly and efficiently. However, since VIGS vectors have not yet been developed for bymoviruses, we attempted to develop VIGS vectors based on the expression vector of BaYMV.

METHODS

First, a partial phytoene desaturase (*pds*) gene, which is required for chlorophyll synthesis was inserted into a BaYMV-infectious clone downstream of the *P2* gene in RNA 2 for gene gun inoculation, and susceptible barley cultivar 'New Golden' was used thorough the whole experiment. Next, three constructs which the *pds* gene was inserted downstream of the *CP* gene, upstream of the *P1* gene, and between the *P1* and *P2* genes, respectively were created.

RESULTS

As a result, inoculation of the susceptible barley cultivar 'New Golden' resulted in systemic infection of barley with all four virus vectors, but no chlorosis due to *pds* silencing was observed in the upper leaves.

CONCLUSTIONS

In conclusion, we are considering inserting the *pds* gene into different region on viral genome, and the direction of the inserted gene at the antisense or inverted repeat sequence to improve the efficiency of VIGS vector. It is necessary to examine inoculation conditions during the future experiments such as plant stage and temperature conditions, and we are working to establish optimal inoculation methods such as using in vitro transcription and Agrobacterium infiltration. The target of our research is to establish a quicker, cleaner, and more efficient gene analysis tool for breeding of new barley cultivar, therefore our research will be related to SDG9: Industry, Innovation and Infrastructure.

Supervisor: Prof. NISHIGAWA Hisashi

UU-A STUDENT SUMMIT 2024

Summit Abstracts (B)

~ Health Sciences and Social Sciences ~

B01 ~ B21

B01 (E0013)

East Asian Nations' COVID-19 Initial Response Strategies: Lockdown and Border Control Measures

ALGAA Tuvshinzaya
Utsunomiya University

BACKGROUNDS

COVID-19, a disease caused by the coronavirus, originated in Wuhan, China in December 2019. The virus spread rapidly across China and then to other countries and territories. In the early stages, most countries primarily focused on curtailing or reducing the likelihood of infected cases being imported by implementing border control measures. Subsequently, after the virus was detected within their borders, the countries have imposed lockdowns to prevent outbreak clusters and limit the spread of the virus. The effectiveness and impact of these early measures taken by East Asian countries have been widely acknowledged by the international community.

PURPOSE AND METHODS

The purpose of this study is to scrutinize the characteristics and outcomes of lockdown and border control measures implemented by East Asian countries (China, South Korea, Japan, and Mongolia) during the early stages of the pandemic, and to identify the factors contributing to their global recognition. In view of this, we conducted a review of previous studies on lockdown and border control measures, summarized the key aspects of each country's infection control measures in a table, and evaluated the impact of these measures on the spread of infection using an interrupted time-series analysis method. We sourced information on the number of infections for each country from The Centre for Systems Science and Engineering (CSSE) at Johns Hopkins University, available on GitHub.

RESULTS

The purpose of this study is to scrutinize the characteristics and outcomes of lockdown and border control measures implemented by East Asian countries (China, South Korea, Japan, and Mongolia) during the early stages of the pandemic, and to identify the factors contributing to their global recognition. In view of this, we conducted a review of previous studies on lockdown and border control measures, summarized the key aspects of each country's infection control measures in a table, and evaluated the impact of these measures on the spread of infection using an interrupted time-series analysis method. We sourced information on the number of infections for each country from The Centre for Systems Science and Engineering (CSSE) at Johns Hopkins University, available on GitHub.

Supervisor: Prof. IIZUKA Akiko

B02 (E0017)

Moral Education Class for Students in Conflict

YAMASE Tatsuya
Utsunomiya University

BACKGROUNDS

In the 2018 revision of the Courses of Study in Japan, it was made a subject as a special subject Morality. The background of this change is the issue of bullying, which requires students to act on their independent judgment and cultivate moral character to live better with others as independent human beings. In addition, the morality lessons are linked to all 17 goals of the SDGs. Issues involving diverse values related to society, daily life, human rights, and the natural environment are treated as teaching materials, and students are encouraged to think and discuss from multiple perspectives and viewpoints. And they acquire the ability to live with a satisfactory solution of moral values. Based on this background, the goal of this study is to design lessons that enable students to learn in a proactive, interactive, and deep way.

METHODS

(1) Survey subjects: A classroom of 3rd grade elementary school students in Utsunomiya City
(2) Practice Details:
(i) Inventive class development: Name of material-new record of long rope competition.
Content item-Honesty and sincerity. The main question was divided into three positions for discussion: honest, deceitful, and confused. I investigated the learning attitude through class observation and worksheet descriptions.
(ii) Learning format: Trio-learning:(Wainai, 2018). I developed methods of group discussion and hand raising presentations. I analyzed their effectiveness using the self-interaction scale:(Nagasato, 2009) and questionnaire.

RESULTS

In this practical class, students learned while experiencing conflict. Students learned through conflict. Because from the class and from the worksheets, they were thinking from different positions. Many of them said, "My first thought is this, but I can understand the opposite thought, and it's not so easy, I can't feel better". Continued Trio-learning helps students to have a secure idea of self by telling friends and hearing from friends. The analysis results showed that Trio-learning increased the autonomy and independence of dialogue on the self-interaction scale, (before $M=12.6 \rightarrow$ after $M=13.1, t=-2.15, p<.05$). In addition, the questionnaire showed that many respondents indicated that they were able to develop their own ideas by discussing what they did not understand. In summary, the moral education class design was developed to encourage proactive thinking about issues and promote dialogue with oneself and others.

Supervisor: Prof. WAINAI Yoshiki

B03 (E0024)

Survival Status and Predictors of Mortality Among Neonates Admitted with Hyperbilirubinemia

MALO Keto Terefe[1,2], ADMASU Mekonen[1], and AGA Fekadu[1]

[1]Addis Ababa University, [2]Mizan Aman Health Science College

BACKGROUNDS

Neonatal jaundice is a major cause of neonatal intensive care unit admission and is one of the leading causes of morbidity in neonates. However, little is known about the time to death and its predictors among neonates with hyperbilirubinemia. Therefore, this study aimed to assess survival status and predictors of mortality among neonates admitted with hyperbilirubinemia in neonatal intensive care units of public hospitals in Addis Ababa.

METHODS

This retrospective cohort study was conducted in public hospitals in Addis Ababa, Ethiopia, and included 380 neonates admitted with hyperbilirubinemia from January 2021 to December 2022. The data was collected from patient cards using a simple random sampling method with a pretested checklist between March 16 and April 16, 2023. Kaplan Meier analysis was used to estimate the median survival time and cumulative probability of survival, while the logrank test was used to compare survival curves among different predictor groups. The relationship between independent and outcome variables was analyzed using the Cox proportional hazard regression model, with statistical significance set at a p-value of <0.05 and a 95% confidence interval.

RESULTS

The overall incidence density of mortality was 18 per 1000 person-day observations (CI: 1325) with 1980 follow-up days. Several factors were identified as significant predictors of mortality, including maternal age below 20 years (AHR = 18.2, 95% CI: 3.2–102.7), living in a rural area (AHR = 4.16, 95% CI: 1.64-10.52), premature rupture of membranes (AHR = 3.49, 95% CI: 1.14-10.66), gestational age below 37 weeks (AHR = 7.3, 95% CI: 1.84-28.8), birth weight below 2500gm (AHR = 15.1, 95% CI: 3.85-59.5), requiring both phototherapy and exchange blood transfusions (AHR = 48.6, 95% CI: 7.30323.4), and presence of sepsis (AHR = 3.03, 95% CI: 1.17-7.9).

CONCLUSIONS

The neonatal mortality among neonates admitted with hyperbilirubinemia in Addis Ababa hospitals is high. This suggests that there is room for improvement to meet the 2030 WHO target of 12 or fewer deaths per 1,000 live births. Therefore, emphasis should be given to neonates who were born from a mother whose age is <20 years and from rural settings, present with PROM and neonates with GA <37 weeks, Birth weight <2500gm and neonates with sepsis.

Supervisors: Prof. MEKONEN Admasu, Prof. FEKADU Aga

B04 (E0031)

Study on Automatic Measurement of Capped Honeybee Brood Cells Using PSPNet

SUGIMORI Kanju and HASEGAWA Madoka
Utsunomiya University

BACKGROUNDS

Honeybees play an important role as major pollinators for cultivating fruits and vegetables. However, the shortage of honeybees has frequently become a significant issue. The causes of the shortage are pesticide spraying, mite infestations, and unpredictable weather conditions. To facilitate early detection of the shortage, monitoring the health status of beehives is crucial. To assess the health of bee colonies, measuring the brood area has proven effective as an indicator of colony vigor. Currently, beekeepers rely on visual inspections of numerous hives to make judgments. This process is time-consuming, and evaluations of hive frames vary depending on the individual conducting the inspection. Therefore, there is a pressing need for a more efficient and consistent quantitative measurement using image processing techniques.

METHODS

We studied on a measurement method utilizing PSPNet, a semantic segmentation model that classifies at the pixel level, to categorize honeycomb images into two classes: ‘regions of capped brood’ and ‘other regions.’ Improving the classification accuracy typically demands a substantial volume of training data. However, the existing honeycomb image dataset is limited. Therefore, we used the strategy of fine-tuning a pre-trained model on an image set designed for scene image segmentation and applied it to honeycomb images, incorporating data augmentation for enhanced performance.

RESULTS

Simulation results indicated an average accuracy of 97.5% for 21 test images. The precision, recall, and F1-score were 92.3%, 81.0%, and 83.3%, respectively.

CONCLUSIONS

We studied a method utilizing PSPNet for measuring capped honeybee brood. We applied fine-tuning on a large dataset with data augmentation. Compared to a conventional method, there were fewer false positives for pollen and larvae cells, and faster inference speeds were achieved. Our research has the potential to contribute to SDG 2: Zero Hunger and SDG 9: Industry, Innovation, and Infrastructure.

Supervisor: Prof. HASEGAWA Madoka

B05 (E0032)

Universities' Democratic Culture and Youth Political Participation in Africa

DULO Abraham
Addis Ababa University

BACKGROUNDS

A society's democratic existence is largely dependent on the involvement of youth in their nation's development activities (Badaru & Adu, 2021). Higher education is regarded to have a fairly large impact on the socio-economic and political wellbeing of a nation because of its function in preparing the young for life in the society today and in the future (Kam & Palmer, 2008; Mayer, 2011). Particularly, through their organizational culture, universities would cultivate political participation among the young generations including university students (Sloam, Kisby, Henn, & Oldfield, 2021). However, the pursuit of democracy has not been fully achieved in emerging nations such as African where young people's political engagement has remained minimal. The previous studies on the issue disregarded the context of emerging democracies and the influence of meso-level factors on youth political participation. The, current study, on the other hand, examined the contributions of higher education culture to political engagement among university students in Africa with main focus on Ethiopia. Therefore, the study has significant implications for sustainable development goal 4, 8, 10 and 16 combining the issues of education, inclusive growth, inequality, and institutions wellbeing.

METHODS

The research employed quantitative research approach along with cross-sectional survey design. Data were collected through questionnaire from 540 students selected from public universities in Ethiopia through random sampling technique. Based on the nature of data, analysis was conducted quantitatively.

RESULTS

According to the result of the study, activism and disengagement appeared to be the most prevalent forms of political participation among university students; and state of democracy culture in the universities seem to be more likely to positively influence patterns of political participation among students.

CONCLUSIONS

Based on the findings, it was concluded that establishing culture of democracy in universities would improve the students' political participation which eventually helps country's progress towards democratization.

Supervisor: Prof. NEKATIBEB Teshome

B06 (E0036)

Empowering Women and Girls: Sexual Reproductive Health in Cape Coast Metropolitan Area

ADJEI-MAWUTOR Gideon
University of Ghana

BACKGROUNDS

The World Health Organization defines unsafe abortion as procedures conducted without proper skills or in substandard medical conditions. From 2010 to 2014, 97% of global abortions occurred in low-income countries, with higher rates in nations with restrictive abortion laws. Despite liberal laws, barriers like facility requirements and waiting periods lead to unsafe abortions. Self-managed abortions with pills can reduce maternal mortality, but inadequate information poses risks. In West Africa, all abortions were unsafe in 1995, 2003, and 2008, contributing to complications and 14% of maternal deaths in Africa. Unsafe abortions cause health problems, hospitalizing five million women yearly. In Ghana, 15% of women aged 15–49 sought unsafe abortions, with varying rates across regions. Unsafe abortions in Ghana strain resources, increase maternal mortality, and face stigma despite liberal laws. Limited data impedes planning reproductive health services, and a 2017 Guttmacher Institute study estimated 23% of pregnancies in Ghana ended in abortion, contributing to maternal morbidity and mortality. Despite studies, national representation is lacking.

METHODS

This study employed a qualitative research approach. Primary data, gathered through questionnaires and interviews focused on 100 women aged 15-35 in Cape Coast. Convenience sampling ensured easy data access. Secondary data was sourced from journals on Google Scholar, Sci-Hub, JSTOR, and Sage.

RESULTS

There was increased awareness of sexual reproductive health centres and clinics. Yet economic reasons prevented most women and girls from accessing these facilities. It was using contraceptives were deemed as luxurious. In addition, male partners forbade women and girls from accessing sexual and reproductive health centres.

Subsequently, abortion was less likely accepted. If a girl or woman was found to be mistakenly pregnant, they preferred to have the child. Teenage pregnancy was on the rise due to socio-economic factors, which led to many school dropouts inducing a cycle of poverty among the women and girls.

Supervisor: Prof. KWASI Richmond

B07 (E0038)

Storage Stability of Maize Flour: A Review Paper

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Jomo Kenyatta University of Agriculture and Technology

BACKGROUNDS

Maize ranks as the second most widely produced cereal crop in the world after wheat. More than 90% of maize is produced in developing countries. Maize remains an important cereal, especially in Kenya where it is highly consumed. Maize is processed by wet milling, the dry grind process for ethanol production, dry milling and nixtamalization processing. Maize flour is susceptible to deterioration and spoilage during storage due to various factors. These include the growth and activities of microorganisms, enzymatic reactions within the food, and chemical reactions. The objective of this study was to review the storage stability of maize flour.

METHODS

Data was collected using secondary data to enable us to ascertain the storage stability of maize flour in Kenya.

RESULTS

The information collected showed that the quality of maize grain remains stable for a longer duration when the kernels are kept intact. However, once the grain is ground into a meal, its quality deteriorates rapidly. Grinding disrupts the kernel's structure by breaking cell walls, leaving the endosperm vulnerable to enzymatic, microbial, insect, and environmental attacks. This leads to deteriorative processes within the flour, including free radical oxidation, non-enzymatic reactions altering proteins, lipids, and sugars, thereby affecting the chemical and quality parameters of maize flour and its milling products.

CONCLUSIONS

The secondary data indicates that the storage stability of maize flour is affected by milling. Milling leaves the flour vulnerable to enzymatic and microbial hence the maize flour rich in germ and bran deteriorates faster than the one which the components have been removed. Therefore, our research will be able to contribute to SDG2: Zero Hunger, SDG 9: Industry, Innovation and Infrastructure, SDG12: Responsible Consumption and Production and SDG13: Climate Action.

Supervisors: Prof. SILA Daniel and Prof. ONYANGO Arnold

B08 (E0039)

Processing of Aerial yam-soy Functional Beverage: Influence on Rheological, Sensory and Phytochemical Properties

DIONICE Crispin Ndelende, VICENT Victor, and RWEYEMAMU Leonard
University of Dar es Salaam

BACKGROUNDS

Aerial yams and soybeans are plant-based foods that remain underutilized in Tanzania, despite their potential health benefits. Studies indicated that both aerial yams and soybeans contain several essential nutrients and phytochemicals such as saponins, tannins, flavonoids, sterols, polyphenols, glycosides, carotenoids, and steroidal saponins, which may exhibit high biological activity and potential therapeutic effects for various diseases. The role of diet in controlling and treatment of diseases is known, and dietary supplementation with nutrient rich foods, such as soy milk that possess potent phytochemicals is crucial and can reduce disease frequency. However, there is a lack of understanding about how aerial yams and soymilk can effectively be used as ingredients in formulating functional food to enhance their phytochemical properties. Therefore, this study is designed to combine the two beverages and assess the rheological, sensory and phytochemical properties.

METHODS

Materials will be procured from the local market and process them individually into juices and milk. Subsequently, these juices will be blended in various ratios, and a comprehensive analysis will be conducted to assess their rheological, sensory, and phytochemical properties.

EXPECTED OUTCOMES

The final beverage is anticipated to exhibit a rich profile of phytochemicals, demonstrating favorable flow behavior and garnering consumer acceptance. It is envisaged to be seamlessly incorporated into a regular diet, offering benefits beyond mere nutrition and potentially serving as a therapeutic option for various diseases.

CONCLUSIONS

Enhancing the value of an underutilized crop through this process will not only contribute to Food Security (SDG 2) but also presents an opportunity for the prevention and treatment of Non-Communicable Diseases (NCDs) (SDG 3). This innovative approach aligns with broader sustainability goals and health initiatives.

Supervisors: Prof. VICENT Victor and Prof. RWEYEMAMU Leonard

B09 (E0042)

The Role of Urban Agriculture on Community and City Resilience in Kinondoni Municipality, Dar es Salaam

MASELE Wilson Elias[1], MAJULE Amos[1], and THORN Jessica[2]
[1]University of Dar es Salaam, [2]University of St Andrews

INTRODUCTIONS

The complex interplay among social dynamics, the physical infrastructure, and natural ecosystems gives rise to various challenges within urban areas. The challenges in cities encompass population growth, unemployment, high food and fuel costs, biodiversity loss, and climate-related issues. These challenges are amplified by human intervention and others by climate change. Urban agriculture has emerged as a key strategy to address these challenges and improve city livability by mitigating negative impacts. This study examines the role of urban agriculture in building resilient cities and communities in the face of environmental, social, and economic challenges. The objective is to examine the role of urban agriculture in building resilient cities and communities.

METHODOLOGY

The study utilizes various methods to assess the spatial and temporal coverage of urban agriculture and vegetation health in the city from 2002 to 2022. Land cover maps were created using the Google Earth Historical Imagery. Landsat imagery was used to analyse the Normalized Difference Vegetation Indices (NDVIs), followed by trend analysis to assess their changes. Information regarding the challenges and opportunities of urban agriculture was collected through a household survey (n = 233), Focus Group Discussions (n = 4), and Key Informant Interviews (n = 25). Participants expressed their agreement levels on challenges, opportunities and contributions of urban agriculture towards community and city resilience using a Likert scale questionnaire. A χ^2-test, cross-tabulation, one-way ANOVA, and SWOT analysis were used for data analysis.

RESULTS

Results indicate that urban agricultural land decreased from 84.2% in 2002 to 50.2% of total land cover in 2022 in Bunju, while in Mabwepande, decreased from 77.7% in 2002 to 55.5% in 2022. Similarly, in Makumbusho, it dropped from 9.8% in 2002 to 3.5% in 2022.

CONCLUSIONS

This study highlights the importance of addressing government policies, land access, eviction concerns, enforcement mechanisms, and extension services to improve the prospects and effectiveness of urban agriculture in Kinondoni Municipality.

Supervisors: Prof. MAJULE Amos and Prof. THORN Jessica

B10 (E0044)

Discrimination in Japan: Perceptions Held by Foreigners Living in Tochigi Prefecture

MBIRU Peter Kimani
Utsunomiya University

BACKGROUNDS

With Japan's recent declining and aging population, the government has increasingly turned to immigration to have the manpower needed to remain economically competitive. The number of foreigners in Japan has increased rapidly in a country that has often been thought of as homogeneous. The foreign population in Japan as of January 2023 was 2.39% which was an increase of 10.7% from the previous year. With foreigners being such a minority and increasing so rapidly, understanding foreigners' perceptions of discrimination takes on a new urgency. This study looked at discrimination in Japan and the perceptions held by foreigners living in Tochigi prefecture.

METHODS

A structured online questionnaire was used to gather data about 74 participants' demographics, experiences of discrimination, and perceptions regarding the causes and consequences of discrimination. The research used a qualitative methodology alongside the concurrent collection of quantitative data. Thematic analysis was utilized to scrutinize the qualitative data derived from open-ended questions. Descriptive analysis was applied to examine and present the data collected from participants systematically.

RESULTS

A notable 77% of the participants in the study reported experiencing incidents perceived as discriminatory during the survey. Men, especially those from developed countries, exhibited higher rates of reporting perceived discrimination. Intriguingly, women reported comparatively lower levels of perceived discrimination.

CONCLUSIONS

The study shows that discrimination is perceived as a problem by foreigners living in Tochigi prefecture. Addressing discrimination will require a multi-faceted approach that encompasses substantial civil education, policy, and educational reforms to cultivate a more inclusive society that values and appreciates cultural diversity. Consequently, this research will contribute to SDG5: Gender Equality, SDG10: Reduced Inequalities, and SDG16: Peace, Justice, and Strong Institutions.

Supervisor: Prof. SAKAMOTO Kumiko

B11 (E0047)

The Ghanaian Experience and Issues of Establishing Vocational Pedagogy at Purely Academic Institutions: The Views of Lecturers

FRIMPONG Andrew Charles
Utsunomiya University

BACKGROUNDS

The aim of aligning secondary education with industrial needs, by incorporating technical and vocational education (TVE), has prompted universities and institutions involved in training TVE teachers to integrate hands-on training into their courses. However, concerns have arisen regarding how universities can effectively blend hands-on training with their academic traditions. This study examines the integration of hands-on practical training in the pre-service of TVE teachers at Akenten-Appia Minka University of Skill Training and Entrepreneurial Development (AAMUSTED) in Ghana.

METHODS

The approved undergraduate programs of AAMUSTED were examined to understand how practical lessons are integrated into the curriculum. Following this, 23 teaching staff members involved in pre-service training of TVE teachers were interviewed to assess the challenges associated with incorporating practical lessons into the university-level TVE teacher training program.

FINDINGS

The study finds that universities can incorporate hands-on practical training into TVE teacher preparation programs, albeit with a significant portion taking place in industrial settings. This approach enables educators to gain dual qualifications. However, differing opinions exist regarding the effect of industry recognition: some believe it improves professional skills and credibility, while others caution it may incentivize teachers to exit the education sector for more lucrative opportunities in the industry.

CONCLUSIONS

In conclusion, effective integration of hands-on training in TVE teacher training programs requires active collaboration between academic institutions and industries. This collaboration is vital for providing prospective TVE teachers with the necessary theoretical and practical skills to meet industry demands. This study contributes to SDGs 4 and 8, which aim to ensure quality education and promote decent work and economic growth, respectively.

Supervisor: Prof. SAKAMOTO Kumiko

B12 (E0058)

Fecal Carriage of Extended-Spectrum Beta-Lactamase Producing *Escherichia coli* in Livestock and Abattoir Workers

AMOAH Frederick Obeng
University of Ghana

BACKGROUNDS

Antimicrobial resistance (AMR) is a critical global health issue, particularly affecting low and middle-income countries, leading to significant mortality and morbidity. Transmission of resistance, including through zoonotic routes, is a major concern. Extended-spectrum beta-lactamase-producing bacteria, resistant to vital antibiotics like extended-spectrum cephalosporins, are commonly found in animals, potentially posing a risk of transmission to humans. This study focuses on assessing the carriage of such bacteria in abattoir workers and livestock, exploring transmission possibilities. Specifically, it aims to evaluate the fecal carriage of ESBL-producing E. coli and associated risk factors among Sekondi-Takoradi abattoir workers and livestock.

METHODS

From January to April 2024, a comparative cross-sectional study in Sekondi-Takoradi will examine ESBL-EC transmission dynamics among abattoir workers and non-workers. Samples from workers and livestock will be cultured, sequenced, and analyzed via bivariate and logistic regression to identify risk factors. The study aims to elucidate ESBL-EC transmission dynamics and associated risks.

EXPECTED OUTCOME

Data obtained would help determine the carriage of ESBL-EC in livestock and abattoir workers the genetic similarities of resistant bacteria present and risk factors for ESBL-EC carriage in abattoir workers.

CONCLUSIONS

This study aligns with SDG 3 (Good Health and Well-being) and SDG 11 (Sustainable Cities and Communities) by identifying risk factors for ESBL-EC transmission in abattoir workers, informing occupational and public health interventions. Additionally, it aids in understanding the spread of antimicrobial resistance across human and animal populations, crucial for combating antimicrobial resistance (SDG 3.3).

Supervisors: Prof. LABI Appiah-Korang and Prof. EGYIR Beverly

B13 (E0063)

A Retrospective Study on The Epidemiology and Trends of Road Traffic Accidents, Fatalities and Injuries in Three Municipalities of Dar es Salaam Region, Tanzania Between 2014-2018

WALUGEMBE Francis[1], LEVIRA Francis[2], GANESH Balasubramanian[3], and LWETOIJERA Dickson Wilson[2]

[1]Nelson Mandela Institute of Science and Technology, [2]Environmental Health and Ecological Sciences Department, [3]ICMR-National Institute of Epidemiology

INTRODUCTION

Over 90% of injuries and deaths still occur in low and middle-income countries like Tanzania due to Road traffic accidents. Available literature indicates that Tanzania suffers massive human and economic losses every year from RTAs despite several interventions that have been made to curb this scourge. To gain an insight into the current state of RTAs we examined the pre- historical case fatality rates from RTAs in Ilala and two other municipalities (Kinondoni and Temeke) in Dar es Salaam Region, Tanzania.

METHODS

We conducted a retrospective study using the secondary data on road accidents from Road Accident Information System (RAIS) for the period 2014 to 2018.

RESULTS

A total of 6,772 road traffic injuries were reported between 2014 and 2018 and the study recorded the highest RTAs in the year 2014 as compared to the other years within the study period. The death rate from RTAs in Ilala Municipality alone was 36.4 per 100,000 population. About 28% of the total fatalities were recorded among the pedestrians, and there was a significant difference ($P < 0.05$) in the RTAs among the other road users.

CONCLUSTIONS

This study feeds into SDG 3.6 and recommends the improvement of road transport infrastructure to ensure safety for all the road users by implementing the existing policies, strengthening the enforcement of existing legislation and introducing express penalties on a real-time basis. We encourage the use of this data to develop strategies in Tanzania that protect pedestrians and other vulnerable road users from RTAs.

Supervisors: Prof. LEVIRA Francis and Prof. LWETOIJERA Dickson Wilson

B14 (E0065)

Assessment of WASH Interventions in Controlling Cholera Outbreaks among Households in Garissa County, Kenya

MWENDE Emmah, KAIMURI MaryJoy, and MUTEMBEI Josephine
Meru University of Science and Technology

BACKGROUNDS

WASH, emphasizing improved water access, sanitation, and hygiene, aims to prevent waterborne diseases like cholera, which is a severe bacterial enteric disease. In regions lacking adequate infrastructure, cholera outbreaks pose significant threats highlighting the urgency of targeted WASH Interventions. These programs, involving community engagement and infrastructure development, play a vital role in controlling these outbreaks and improving public health. The study aims to assess WASH interventions in cholera control and prevention, providing valuable insights for public health initiatives.

METHODS

The study will employ a descriptive survey design incorporating both qualitative and quantitative approaches. Data will be gathered from 422 heads of households through structured questionnaires and observational insights. Additionally, Key Informant interviews will provide qualitative perspectives. Multivariate regression analysis will be conducted to explore the relationships between various factors and the control of cholera outbreaks.

RESULTS

The study, currently in the proposal stage, is slated for data collection and analysis in March 2024. Anticipated results will shed light on the effects of WASH interventions, encompassing factors like clean water access, sanitation facility availability, effectiveness of hygiene campaigns, success of behavior change initiatives, and impact of health education programs. The study aims to yield comprehensive insights into how these elements collectively contribute to controlling cholera outbreaks.

CONCLUSTIONS

The study closely aligns with multiple Sustainable Development Goals (SDGs) set by the United Nations. It directly contributes to SDG 3 by seeking to decrease cholera outbreaks and enhance population health, while also addressing SDG 6's goals of universal access to clean water and adequate sanitation crucial for cholera prevention.

Supervisors: Prof. KAIMURI MaryJoy and Prof. MUTEMBEI Josephine

B15 (E0070)

Barriers to High School Admission for School-Aged Foreign Students

RI Buncho
Utsunomiya University

BACKGROUNDS

This study focuses on high school admission support for overage students with foreign roots in Japan. In general, overage students with foreign roots have faced various difficulties and hardships in terms of learning, including opportunities to learn Japanese. Needless to say, Japanese language is the biggest barrier for foreign students to enter high school. In Japan, the distribution of Japanese language support for entering high school is unbalanced, and the issue of how to get students from areas with poor support to enroll in high school remains a challenge.

METHODS

This study was conducted through interviews with 13 students living in Chiba, Tokyo, and Tochigi Prefectures who had passed the exams and who are preparing to take the exams. Questions were asked in three areas: 1) learning; 2) living; and 3) recognizing, and each student's life story was listened to find out what their specific challenges had been.

RESULTS

By comparing the stories of students who failed and those who passed the exam, we can divide the factors that contribute to success or failure in entering high school into two categories: personal factors and external factors.

CONCLUSTIONS

One of the important reasons for success in entering higher education is knowledge of the Japanese system of higher education and a successful study strategy for entrance exams. In areas where there are no tabunka-freeschools that specialize in school counseling and resources to support students, the author recommends that the local city hall and education committee work together to help students and their parents make an appointment with the education committee when they first arrive in Japan to introduce the system to the students. The author also suggest that local education committee could introduce contact information for tabunka-freeschools , so that students can get in touch with tabunka-freeschools via the Internet to obtain study programs and appropriate preparation materials.

Supervisor: Prof. YOSHIDA Kazuhiko

B16 (E0072)

Unlocking Triple Impact: Kobe Beef's Contribution to Decent Work (SDG 8), Responsible Consumption (SDG 12), and Climate Action (SDG 13) in Alignment with the SDGs

GRACIA Lidia
Utsunomiya University

BACKGROUNDS

Kobe beef, a pinnacle of Japanese culinary artistry, holds cultural significance and drives economic activity domestically and internationally. Amid scrutiny of the luxury food industry's environmental and ethical impact, the production of Kobe beef serves as a focal point, aligning with SDG 8 (Decent Work and Economic Growth) and emphasizing fair labor practices. The examination of sustainable practices in the luxury food sector resonates with SDG 12 (Responsible Consumption and Production). Additionally, the study aims to understand how this industry participates in being environmentally responsible in food production, supporting SDG 13 (Climate Action).

METHODS

This study utilizes in-depth interviews, stakeholder analysis, and content analysis of industry practices to examine the social, economic, and environmental dimensions of Kobe beef production. Data collection involves engaging with farmers, workers, consumers, and industry experts to understand the nuances of the beef production process.

RESULTS

The findings reveal a significant positive impact of Kobe beef production on SDG 8, as it provides employment opportunities, fair wages, and safe working conditions for local communities. Additionally, the study highlights how Kobe beef contributes to SDG 12 by promoting responsible consumption through transparent supply chains, ethical practices, and the promotion of local economies. Furthermore, the research demonstrates Kobe beef's alignment with SDG 13 by showcasing sustainable agricultural practices that mitigate climate change, emphasizing carbon-neutral farming methods and land-use efficiency.

CONCLUSTIONS

This study underscores the potential for specific industries, such as Kobe beef production, to serve as catalysts for achieving multiple SDGs simultaneously. By promoting decent work, responsible consumption, and climate action, Kobe beef exemplifies a model for sustainable development. Policymakers, stakeholders, and consumers can draw valuable insights from this case study to inform strategies for fostering holistic and impactful approaches to addressing global challenges in alignment with the Sustainable Development Goals.

Supervisor: Prof. YOKOTA Shinso

B17 (E0085)

Weight Perception and Risk of Non-Communicable Diseases among Female Adults Living in Accra Metropolis

ASIEDU Enoch Sam Sakyi
University of Ghana

INTRODUCTION

The surge in the prevalence of non-communicable diseases (NCDs) among female adults living in the Accra metropolis is alarming. This is because NCDs have been associated with the high mortality rate in the country. Over the years, researchers have become interested in finding the causes of these NCDs. Existing studies have looked at the objective measurement like the body mass index (BMI), waist to hip ratio (WHR) and their association with the prevalence on the NCDs without attention to how respondents perceive their own weights. Studies outside the country have linked weight perception to the development of NCDs. However, there is no documentation on the relationship between weight perception and the prevalence of NCDs in the Ghanaian context. The aim of the study is to investigate the relationship between weight perception and non-communicable diseases (obesity, diabetes, and hypertension) among female adults living in Accra Metropolis.

METHODS

This study will use a cross-sectional design to conduct a survey on three hundred and seventy-five (375) participants. Study population will be female adults aged (18 to 65 years) living in the Accra Metropolis. Their demographic data, dietary intake (using a single 24-hour recall and diet quality questionnaire), anthropometric measurement (weight, height, hip and waist circumference), weight perception, blood pressure, and random blood glucose levels will be collected. Data analysis will be done using Statistical Package for Social Sciences (SPSS) version 27.

EXPECTED OUTCOME

Study outcomes will reveal the prevalence of obesity, diabetes, and hypertension in the targeted population. Finding from this study will also inform a targeted nutrition intervention which aligns with the broader global public health agenda of achieving Sustainable Development Goals (SDG 3), which emphasize the importance of reducing the burden of NCDs and promoting "Good health and well-being" in the global population.

Supervisors: Prof. OHEMENG Agartha Narki and OTOO Gloria Ethel

B18 (E0086)

Prevalence, Antimicrobial Resistant Profiles of Nasal Carriage of *Staphylococcus Aureus* and Coagulase Spp. among Health Workers in Selected Hospitals in Makueni County

NZOMO Caroline Mumbua, MABEYA Sepha, and KARIUKI Samuel
Jomo Kenyatta University of Agriculture and Technology

BACKGROUNDS

Staphylococcus aureus (S. aureus) and Coagulase Negative Staphylococcus species (CONS) are prominent pathogens in healthcare, posing risks due to antibiotic resistance and healthcare worker (HCW) transmission. This study, based in Makueni County, focuses on 294 HCWs in selected health hospitals.

METHODOLOGY

The Cochran formula determines the sample size after obtaining consent. Swabs will be cultured in mannitol salt agar (MSA), identifying strains through various tests. Antimicrobial susceptibility will be assessed via the Kirby-Bauer method, and the mecA gene will be identified through multiplex PCR. Statistical analyses will be performed using SPSS v21.0 software.

RESULTS

The study aims to disclose the prevalence and resistance profiles of *S. aureus* and CONS among HCWs, providing crucial insights for infection prevention and treatment strategies in hospitals.

CONCLUSTIONS

The study will be significant in understanding bacterial transmision, this research will contribute to combatting infections related to *S. aureus* and CONS, aligning with Sustainable Development Goal 3 (SDG3): Ensuring Good Health and Well-being.

Supervisor: Prof. MABEYA Sepha

B19 (E0087)

Gender Inequality in Management Decision Making at the Tertiary Level: The Case of Tamale Technical University

AWUNI Cynthia Azochiman[1,2] and WRIGLEY-ASANTE Charlotte[1]

[1]University of Ghana, [2]Tamale Technical University

BACKGROUNDS

This research centers on gender inequalities at the university level. Its primary objective is to identify and address challenges related to gender disparities in higher education management, offering viable solutions. The study critically analyzes the underrepresentation of women in academic and administrative roles, emphasizing the necessity for comprehensive recommendations.

METHODS

Conducted at Tamale Technical University in August 2021, and utilizing qualitative data collected through purposive sampling. Participants, primarily teaching and non-teaching staff in management roles, underwent in-depth interviews involving 7 females and 5 males. The interviews were conducted in English, transcribed verbatim, and analyzed through thematic analysis. Ethical considerations were addressed and the researcher's dual role as a graduate student and institution staff was managed.

RESULTS

The study reveals a significant dearth of women in various decision-making levels within university management, emphasizing a notable inadequacy in their involvement. Barriers to women's participation fall into institutional barriers including lobbying complexities, political maneuvering, ethnic considerations, male chauvinism, stereotyping, and a lack of supportive structures. Societal barriers are rooted in acculturation norms, marriage responsibilities, family duties, and restricted resource access. Self-imposed barriers involve women's hesitation in competitive activities, lack of assertiveness, and reluctance to support fellow women, often attributed to perceived discrimination.

CONCLUSTIONS

The study concludes that the absence of women in management is starkly influenced by discriminatory practices and cultural factors. Women's roles are shaped by Islamized, traditional, and patriarchal influences, perpetuating misconceptions about their leadership capabilities. The research emphasizes significant disparities between men and women in the university's management structure. The internalized belief that certain spaces are unsuitable for women perpetuates barriers that necessitate comprehensive strategies and interventions to foster a more inclusive and equitable environment for women in higher education leadership.

Supervisor: Prof. WRIGLEY-ASANTE Charlotte

B20 (E0088)

Exploration of Food-Related Factors Causing Hypertension in Asuncion, Paraguay

NAKANO Yoshihito, CABALLERO Yuko
Utsunomiya University

BACKGROUNDS

Previous research by the Non-communicable Disease Risk Factor Collaboration (NCD-RisC) reported that the Republic of Paraguay had the highest hypertension prevalence among 200 countries in 2019. However, there is limited evidence regarding the relationship between hypertension and salt intake from foods in Paraguay. This study aims to explore sources of high salt intake in Paraguayan foods and clarify food-related factors causing hypertension.

METHODS

We collected 22 food samples commonly consumed in Paraguay, and measured salt concentration with a salinometer. In addition, to analyze hypertension, defined as having high systolic (≥140 mmHg) or diastolic (≥90 mmHg) blood pressure, we conducted logistic regression analysis on demographic data, Body Mass Index (BMI), and Food Frequency Questionnaire (FFQ) from 355 urban volunteers (Asunción).

RESULTS

Results showed that chicken risotto (guiso de pollo con arroz) contained 6.3 g of salt per serving, surpassing the WHO's recommendation of > 5 g per day. Processed foods such as salami, dry-cured ham, and breadstick (grissini) showed high salt densities (5.2%, 5.1%, and 2.0%, respectively). Logistic regression analysis results showed that sex, dieting, cassava consumption, and illnesses (except for hypertension, diabetes, heart diseases, and hyperlipidemia) were positively associated with hypertension ($p < 0.05$).

CONCLUSTIONS

This study's findings advocate for reduced salt intake and improved nutrition education in Paraguay, contributing to SDG 3 by promoting health and well-being through decreased hypertension. Simultaneously, it supports SDG 12 by encouraging responsible consumption and production of food products, and SDG 17 by highlighting the need for collaborative partnerships across sectors to implement these health-promoting strategies effectively."

Supervisor: Prof. CABALLERO Yuko

B21 (E0089)

Evaluation of Air-Water Two-Phase Flow as an Effective Cleaning Method for Water Pipes

ISLAM MD Rashedul
Utsunomiya University

BACKGROUNDS

Access to clean drinking water is crucial for the well-being and development of communities worldwide, as well as the 6th goal of SDGs. However, in many developing countries, ensuring the provision of safe drinking water remains a challenge. Water purification plants may produce drinkable water, but it often becomes contaminated as it passes through distribution pipe systems due to inadequate maintenance and cleaning. This paper aims to evaluate air-water two-phase flow as a cleaning method suitable for developing countries.

METHODS

The methodology employed in this study involved several key steps. First, test pieces (TP) were created using samples made of Portland cement and plaster to simulate common adhesion in water distribution pipelines. Afterward, the samples were cured for 24 hours to achieve sufficient strength. The cured TP were then set within the pipeline of a testing facility to represent a contaminated pipe. Two TP were placed per cleaning cycle, one in the upstream section and one in the downstream section. This setup allowed for evaluating cleaning effectiveness at different pipeline locations. Two different initial statuses were considered: one where the pipeline was initially filled with water and another where the pipeline was initially empty.

RESULTS

The results of the cleaning simulation are summarized, highlighting the impact of the initial state of water in the pipeline on the cleaning efficiency and the influence of various parameters on the cleaning process. The results indicate that the initial state of water in the pipeline significantly influences the cleaning efficiency. TPs subjected to an initial state of being full of water (TP 1,2,3 and 4) demonstrated shorter cleaning times compared to those initially empty (TP 5 and 6). This finding suggests that the presence of water in the pipeline at the start of the cleaning process increase the effectiveness of the air-water two-phase flow method.

CONCLUSTIONS

In conclusion, the study on air-water two-phase flow as a cleaning method for pipeline systems, especially in developing countries, highlights the importance of the initial water state in cleaning efficiency. This research significantly contributes to SDG 6: Clean Water and Sanitation by exploring innovative pipeline cleaning techniques, supporting global efforts to ensure access to safe water and sanitation for all. Efficient pipe cleaning methods enhance water infrastructure performance, directly advancing SDG 6 targets in developing nations.

Supervisor: Prof. YAMAOKA Satoshi

UU-A STUDENT SUMMIT 2024

Summit Abstracts (C)

~ Engineering and Telecommunication ~

C01 ~ C15

C01 (E0008)

Electromagnetic Radiation from Laser-Generated Plasma with Longitudinal Electric Field When Gas Is Changed

KASHIHARA Ren
Utsunomiya University

BACKGROUNDS

Electrons, protons, and ions are called charged particles. Charged particles can be accelerated by an electric field using an accelerator. Accelerators are used in particle physics and cancer treatment. Cancer treatment using an accelerator can kill cancer cells deep within the body without damaging healthy cells. We are conducting research on a new method, an accelerator that uses laser-generated plasma. If laser-generated plasma can be put into practical use, accelerator therapy can be expected to become more widespread as the equipment becomes smaller and more sophisticated. The structure of an accelerator using laser-produced plasma can be roughly divided into two parts. One is the part that extracts charged particles from the plasma, and the other part is that accelerates the charged particles using the plasma-derived electric field. This research is about the second part, which is acceleration. The characteristics of the electric field derived from plasma were investigated experimentally.

METHODS

A laser pulse with an energy of 75 mJ, a pulse width of 100 fs, and a frequency of 10 Hz was focused using a lens with a focal length of 400 mm to generate plasma. The plasma was generated inside a sealed chamber. We measured the angular distribution of electromagnetic waves radiated from the plasma in the range of 0.1-0.5 THz. Air or He was used as the gas inside the chamber. The radiated electromagnetic waves were measured while changing the pressure and type of gas.

RESULTS

When the chamber was filled with Air, radiated electromagnetic waves were confirmed. On the other hand, when the chamber was filled with He, the radiated electromagnetic waves were weaker than in the case of Air, and in some cases could not be measured. Air is considered to have a higher electron density than He. We believe that the surface area of the plasma does not change even if the type of gas is changed. The electromagnetic waves radiated from plasma are thought to be related to electron density.

CONCLUSIONS

We measured changes in radiated electromagnetic waves due to the gas that generates plasma. We would like to find out the conditions necessary to increase the output of electromagnetic waves by changing experimental conditions and conducting simulations. Our research will be able to contribute to SDG3: Good Health and Well-being, SDG9: Industry, Innovation and Infrastructure.

Supervisor: Prof. YUGAMI Noboru

C02 (E0019)

Industrial-Based GSM Water Leakage Detection, Monitoring and Controlling System: A Case of North Rift Valley Water Agency in Kenya

KIPKETER Dickson Tuwei
Nelson Mandela African Institution of Science and Technology

BACKGROUNDS

The current system for detecting and monitoring water leaks in Kenyan industries is manual and costly. Despite emerging new technological trends, many industries lack automated systems to detect, monitor, and control water leakage due to the high cost of maintenance and installation. This study's objective was to develop an automatic, remote, and real-time detection, monitoring, and control of water leaks in North Rift Valley Water Works Agency.

METHODS

The system is made up of two nodes, one at the source and one at the destination or tap. The two nodes are made up of an ESP microcontroller, which is used to control all the connected components. The use of the microcontroller was efficient due to its ability to provide WI-FI. Aside from the solenoid valve, which was used to turn the water flow on or off in the event of leaks, the system also includes the FY-201 water flow sensor, which was used to gauge the amount of water flowing through the pipe.

RESULTS

Water leakage is detected when the volume of water passing through the two sensors differ slightly in terms of volume, indicating that a water leakage has just occurred. Thing Board, an IoT-based platform used to monitor and visualize data from various devices connected together, was used for real-time monitoring, visualization, and control. By remotely turning the water leaks on and off from their phone, the system administrator was able to log into the system and manage it.

CONCLUSIONS

The developed system was tested with different water service providers, including Eldoret water and sanitation company, and the results show that the system responds positively to water leakage parameters. The system detected water leaks, and the administrator monitored and controlled the system. The study is linked to SDGs 9 and 13.

Supervisors: Prof. MDUMA Neema and Prof. TARUS K. John

C03 (E0021)

Development of Adhesive Materials Using Trithiocarbonate

HUYNH Ngoc Dan Phuong
Utsunomiya University

BACKGROUNDS

Currently, the problem of environmental pollution is becoming more serious due to global industrialization and modernization. Environmental pollution is also having a major impact on the quality of life of all kinds of animals, plants, and humans, and the dangerous effects of environmental pollution are also emerging. Protecting the environment means protecting our lives, and humans cannot survive if the environment is polluted or destroyed. Therefore, with the aim of contributing to environmental conservation, I am conducting research aimed at developing self-healing materials and adhesive materials using trithiocarbonate (TTC) groups. This can contribute to greatly reducing the amount of waste generated by preventing or reducing waste, recycling and reusing it.

METHODS

I am going to develop self - healing materials and adhesive materials using the trithiocarbonate (TTC) groups. I am going to create polystyrene (PS) containing TTC groups by RAFT polymerization of styrene, which is often used as a plastic material, with TTC polymer. I am also going to decompose of RAFT polymer by amines, and then try to reattach by applying external stimulation such as heat or light.

CONCLUSIONS

Self-healing materials can be applied to many fields such as agriculture, the food industry, medicine, recycling, etc. Besides, Adhesive materials using trithiocarbonate (TTC) groups can reduce the amount of waste and recycle to contribute to protecting the environment. In the future, I hope my research contributes to not only SDG12: Responsible Consumption and Production, but also SDG3: Good Health and Well-being.

Supervisor: Prof. TAMESUE Shingo

C04 (E0022)

Profitability Nexus of Micro-Enterprises: An Investigation into Profitability Dimension of Home-Based Micro-Enterprises in Sri Lanka

POLGAHAGEDARA DON Pubudu Sanjeewa
Utsunomiya University

BACKGROUNDS

Micro-enterprises (MEs) distinguish themselves by being an Owner Manager Entrepreneur (OME) centric informal income-generating setting, catering to the highly volatile demand of a niche market. Ridden by the OMEs' rigid personal traits and other factors, most of the MEs are born to die some others in contrast, stagnate for years as just livelihoods without generating a considerable impact on the economy of the OME and the country as a whole. One of the main factors behind the high failure rate of MEs is the lack of knowledge of the financial performance of the enterprise due to the complex nature of cost allocations for overheads between the ME and the household.

METHODS

Adopting a mixed approach, the research surveyed 104 OMEs through multistage sampling and had one-to-one interviews with 35 deliberately selected OMEs out of the same sample to collect data. Thematic analysis was performed on qualitative data to enhance the validity of the results.

RESULTS

The results revealed that the main purpose of a higher portion of the OMEs is not to make a net profit but to maintain a cash flow to finance day to day household requirements. The OMEs utilize the costs of own labor and the other sunk costs to be in par with the retailer margin, adopted by large scale producers with economies of scale, in the market. The same strategy is employed to be price competitive even when the production costs are higher. The emphasis on the indirect costs and own and family labor is not considered to be important for calculation of profit. The fit between the day-to-day life and the operation of the ME is a critical factor for the continuation of household- enterprise system.

CONCLUSIONS

Profitability of home based ME cannot be determined just by focusing on financial transactions of traditional profit and loss statement but by various other non-financial costs and benefits. The findings of the research contribute to the Sustainable Development Goals (SDG), 8: Decent work and economic growth and the goal 9: Industry, innovation and infrastructure.

Supervisor: Prof. SAKAMOTO Kumiko

C05 (E0023)

Possibilities for Rural Revitalization and Agriculture in “A Town with More Robots than Residents”

FUSHIMOTO Haruka and FUKUZAKI Yoshihide
Utsunomiya University

BACKGROUNDS

We are third-year students at Utsunomiya University’s Faculty of Engineering. Unlike many of my seniors who will be presenting at this UU-A Student Summit 2024, we have not yet engaged in research activities at Utsunomiya University. This time, we will summarize what we would like to tackle in our future research activities at Utsunomiya University.

INVESTIGATIONS

The Ozaki laboratory to which we belong conducts research and development of agricultural robots and mobile robots. we thought of an idea to put our research activities into practical use in society. It is “To create a local city where agricultural robots are concentrated in a depopulated area of Japan”. Based on this idea, we participated in a business plan contest held in Tochigi Prefecture in December 2023 and received an award for excellence.

IDEAL FUTURE

In recent years, there has been a worldwide need to build smart systems, and Japan is no exception. In addition to engineering about agricultural robots, we would also like to work on “rural revitalization” in Japan, where aging and depopulation are becoming more and more serious. In “A town with more robots than residents”, we would like to promote the practical application of various agricultural robots. By doing so, we will improve the technology that supports the production of local specialties. A future society equipped with these technological infrastructures can be said to be related to goals 9, 11, and 15 of the SDGs.

CONCLUSIONS

The idea of” A town with more robots than residents” is still incomplete in many parts. We would like to continue to grow by participating in various business plan contests and receiving advice from people with business experience and university professors. We will also lead to research that future increases the sustainability of agriculture and towns, as indicated by goals 9, 11, and 15 of the SDGs.

Supervisor: Prof. OZAKI Koichi

C06 (E0027)

Integrated Infrastructure Planning in Historic Places to Improve the Connectivity of Infrastructure and Livability: A Case of Shonke Village, Ethiopia

TEMECHEW Hiwot Ergetie
Addis Ababa University

BACKGROUNDS

Shonke village (SV) is a 900-year-old settlement on the top of a mountain located some 23 km away from Kemise town. About 20 generations have lived in the village, but residents now say half of the village's estimated households have left in search of farmlands down the hill. Thus, this study investigates how integrated infrastructure planning can support the long-term viability, connectivity, and cultural preservation of historic districts.

METHODS

The research incorporates a mixed-method approach, utilizing a comprehensive literature review, focus group discussions, observations, transect walks, key informant interviews, best practice case studies, and surveys.

RESULTS

Despite holding significant tangible and intangible cultural heritage dating back 900 years, SV has not fully harnessed its tourism potential and has struggled with a lack of economic opportunities, population decline, and inadequate infrastructure services that jeopardize the village's livability, connectivity, and the preservation of its legacy for future generations. Nevertheless, peer cases demonstrate that historic sites can serve as extraordinary laboratories, showcasing how cultural heritage can drive regeneration, sustainable development, and economic prosperity through integrated planning strategies.

CONCLUSIONS

Integrated infrastructure planning in SV is essential for enhancing connectivity, livability, and the preservation of cultural heritage. This can be achieved by considering the unique needs and challenges of the area and understanding its historical context, identifying areas for improvement, prioritizing pedestrian and accessibility considerations, adaptive reuse of historic buildings, mixed land use, and sustainable infrastructure management practices. Additionally, non-physical factors such as effective management, creative financing strategies, community and stakeholder participation, promotion of indigenous knowledge, collaboration, and win-win solutions between conservation and development the findings and recommendations can guide policymakers, planners, designers, cultural heritage experts, and tourism professionals in their efforts to create more sustainable communities in historic areas. Moreover, the research findings intersect with several Sustainable Development Goals (1,3,4,5,6,7, 8, 9,11,12,13 &17).

Supervisors: Prof. MAMO Zegeye Chernet and Prof. BEKELE Tesfaye Hailu

C07 (E0045)

Compact MTF Measurement of a Fisheye Lens

SUN Manning, HAGEN Nathan, and OTANI Yukitoshi
Utsunomiya University

BACKGROUNDS

The widespread use of fisheye lenses has become a reality in modern optics, making accurate evaluation of their performance critical. However, traditional test methods for fisheye lenses often require large test benches and complex laboratory environments, which makes testing expensive and less practical. One previous test system measured the widefield lens along angles in a single plane . For this reason, we have designed and manufactured a fisheye lens test system with dimensions in the range of 0.5 m × 0.5 m × 0.5 m that is compact, can be used for a wide range of lens types, and can provide detailed performance information.

METHODS

To develop a testing system that can operate over a small space while also capturing the entire lens field of view at once, we employ a low-power meniscus adapter lens that compresses the test space into a 0.5 m × 0.5 m × 0.5 m region. Because the lens is quite low power, it has minimal effect on the test lens performance, allowing one to keep accurate MTF data. The reduced space also allows makes fisheye lens performance evaluation easier to achieve. In addition, our approach provides a higher degree of experimental control, ensuring reliable and repeatable test results.

RESULTS

We analyze the changes in light intensity across an edge in fisheye lens' image. We select regions of interest (ROI) from various locations within the image and estimate the MTF at each of these positions. The edges at three ROIs, located at field angles of 5°, 35°, and 65°. We see that the lens MTF value is highest at the center of the image, and gradually decreases towards the edges. To visualize more the change of MTF at different angles in both ways, we put the two sets of curves together. We can see that the values of the two sets of curves as well as the change trends are almost the same.

CONCLUSIONS

This research not only addresses a specific need within the realm of fisheye lens testing but also holds broader implications for optical system evaluation and quality assessment. The compactness and efficiency of our testing setup not only reduce space and resource requirements but also pave the way for more streamlined and cost-effective measurements . The findings of the research contribute to the Sustainable Development Goal 9: Industry, innovation and infrastructure.

Supervisor: Prof. OTANI Yukitoshi

C08 (E0048)

EcoChlor: A Next-Gen Electro Chlorinator for Sustainable Water Disinfection in Hardship Areas

KHWESA Peredy
Addis Ababa University

BACKGROUNDS

The worldwide water shortage dilemma underscores the critical importance of ensuring that available water resources are safe for consumption and use. The development of efficient and cost-effective disinfection techniques, such as the use of chlorine and sodium hypochlorite, directly contributes to achieving SDG 6 targets by ensuring the provision of safe drinking water and sanitation services. Chlorine, whether in gaseous form or as sodium hypochlorite, is widely employed in water treatment due to its efficacy in disinfection. However, the safety concerns associated with chlorine gas often led to the preference for sodium hypochlorite as a safer alternative. This reflects efforts within SDG 6 to prioritize water treatment methods that not only effectively disinfect water but also minimize risks to human health and the environment. Thus, the adoption of sodium hypochlorite contributes to the broader objectives of ensuring access to clean water and promoting sustainable water management practices.

METHODS

This study investigates a novel method for disinfecting water by producing sodium hypochlorite on-site utilizing a laboratory-scale reactor equipped with a titanium/iridium dioxide anode and a stainless-steel cathode by electrolysis. The study utilizes the Response Surface Methodology (RSM) experimental methodology to identify the most favorable circumstances for generating sodium hypochlorite.

RESULTS

The optimal conditions for the formation of NaOCl were discovered using titanium coated with iridium oxide and stainless-steel electrodes, a NaCl concentration of 32g, a voltage of 7v, a spacing between the electrodes of 2.5cm, and an electrolysis time of 70 minutes at a temperature of 25°C. In this investigation, the most excellent effective concentration value of NaOCl was 0.72 % (7.2gpl) of chlorine concentration with a pH of 11.

CONCLUSIONS

The WHO standard used for NaOCl endodontic irrigation is within the range of 0.5% to 6%. Experimental results for this study (0.72%), falls within this region thus indicating the viability of this method. Further research is being conducted in field trials in Hawassa by fabricating a smart electro chlorinator for disinfection of water in a local water treatment facility.

Supervisor: Prof. GETACHEW Gizaw

C09 (E0049)

Composition and Activities of Cul-De-Sacs with Component in Vacant Land in Blocks

OKOSHI Kampei
Utsunomiya University

BACKGROUNDS

In the suburbs of Japanese regional cities, residential areas have been formed rapidly, Due to increasing demand for housing since the period of high economic growth. In the process, the subdivision of farmland led to necessitate a line of movement for access to the created residential areas, and cul-de-sacs were formed. Therefore, the inner part of the cul-de-sac has a semi-private character, with limited access by non-residents. In many vacant lands, elements of the resident's daily activities, such as clothes pole and verandas placed in the garden, can be seen facing the cul-de-sac. This study aimed to clarify the relationship between the characteristics of the inner space of residential areas and the activities formed there, by examining the composition of such cul-de-sac spaces.

METHODS

The residential area in the Hiramatsu area, Utsunomiya, Tochigi, Japan, forms a typical residential area in a suburb with multiple cul-de-sac spaces in a single block. In Chapter 2, the ‘vacant land arrangement’, ‘road boundary elements’ and ‘elements within the vacant land’ are examined for each site. In Chapter 3, the composition of the cul-de-sac space is examined by combining the dwellings row patterns facing each other.

RESULTS

A1-L2 dwelling row patterns are obtained by organizing and combining the arrangement of vacant land, active character by row. For example, A is composed of sites with orthogonal vacant lands, and active character. This indicates open and active characteristics. In contrast, L is composed of non-orthogonal vacant land and static character. This type is close and static cul-de-sac.

CONCLUSIONS

These 7 types of cul-de-sac space compositions show the local spatial characteristics of a residential area are located approximately in relation to the primordial factors in the formation of this residential area, namely the location and arrangement of cul-de-sacs in the town block. This study leads to SDGs 11.

Supervisor: Prof. ENDO Koichi

C10 (E0050)

Energy Challenge to the Sustainability of Small Enterprises in Africa: Is Biogas a Reliable and Affordable Alternative Source?

MWAMAFUPA Esther Lucas and MARWA Janeth
Nelson Mandela African Institution of Science and Technology

BACKGROUNDS

The sustainability of small enterprises constitutes a crucial imperative for achieving global economic growth. Empirical investigations indicate that a substantial majority, accounting for 95% of businesses worldwide fall within the category of small enterprises. These entities play a pivotal role in fostering employment opportunities and economic advancement on a national scale. Despite their significance, over 50% of small enterprises face viability challenges and succumb within the initial five years of establishment, encountering various impediments, notably unreliable and insufficient energy provision.

METHODS

To undertake this investigation, a combination of quantitative and qualitative research methodologies will be employed. Structural Equation Modeling (SEM) and NVIVO will serve as the analytical tools for processing the acquired data.

RESULTS AND COCLUSIONS

The anticipated outcomes of this study encompass an in-depth analysis of the cost-benefit dynamics associated with biogas technology, identification of potential areas for cost reduction, and the development of a business model aimed at enhancing the reliability and affordability of biogas technology. Ultimately, these efforts seek to stimulate heightened demand for biogas adoption among small enterprises. Furthermore, this research aligns with the United Nations Sustainable Development Goals (SDGs), specifically addressing SDG 1 (No poverty), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent work and Economic Growth), and SDG 13 (Climate action).

Supervisor: Prof. MARWA Janeth

C11 (E0066)

Solving Optimal Path Planning Problem of an Intelligent Mobile Robot in Dynamic Environment

AYALEW Wubshet, NEGASH Lebsework, and MERGA Chala
Addis Ababa University

BACKGROUNDS

Africa has failed to catch up with new technological advancements, develop infrastructure, promote sustainable industrialization, and foster innovation. Robotics is one of the hot areas in this technological era that Africa should strive for. When we come to robotics, path planning is an important task for mobile service robots. Most of the available path-planning algorithms are applicable only in static environments. Achieving path planning becomes a difficult task in an unknown, dynamic environment.

METHODS

To solve the problem of path planning in unknown dynamic environment, this work proposes BRRT*-DWA algorithm with Adaptive Monte Carlo Localization. Bidirectional Rapidly exploring Random Tree Star (BRRT*) is used to generate an optimal global path plan, Dynamic Window Approach(DWA) is a local planner and Adaptive Monte Carlo Localization(AMCL) is used as a localization technique. By using the map file of the unknown environment created by SLAM and LiDAR sensor, the robot is able to navigate while avoiding dynamic as well as static obstacles. In addition, the object identification algorithm YOLO was adopted, trained, and used for the robot to recognize objects and people.

RESULTS

From the tests in simulation and the tests in the real environment, the proposed method of using BRRT* as a global planner in integration with DWA and AMCL for an environment mapped with SLAM gives a satisfactory result. In addition, image recognition using YOLO gives great results (up to 95 per cent certainty about the detected object).

CONCLUSIONS

In this work, we presented an optimally navigating robot with the ability to identify objects and people. We believe this work will have a small contribution in relation to SDG9: Industry, innovation, and infrastructure and indirectly to SDG11: Sustainable cities and communities.

Supervisor: Prof. NEGASH Lebsework

C12 (E0069)

Neuro-Fuzzy Sliding Mode Controller Design and Implementation of Quadrotor UAV for Locust Detection

MENEBO Muluken
Addis Ababa University

BACKGROUNDS

In recent years, desert locusts have caused widespread devastation to green vegetation, leading to drought and starvation. This study aims to efficiently detect locusts and combat their impact with a limited number of trained experts and reduced costs, all while minimizing environmental impact. The main idea is that automating locust identification and pesticide application systems could reduce the overall amount of pesticide used to tackle locust invasions. In this study, Artificial Intelligence (AI) techniques are deployed to develop an intelligent Quadrotor UAV flight controller and a real-time locust management system. Through the use of AI, we can design a high-performance closed-loop control system using a Neuro-fuzzy Sliding Mode controller (SMC) that leverages the learning and decision-making capabilities of Neural Network and Fuzzy Logic controllers, and we can automate the hardware for real-time locust detection using a deep learning approach.

METHODS

To design controller we first, derived quadrotor flight dynamics by using Newton quaternion formalism. Secondly, conventional SMC is designed, and the stability of the system is validated by using Lyapunov stability analysis. Finally, the designed SMC equivalent control part is estimated online by ANN meanwhile its switching control part is estimated by FLC. To verify controller performance, extensive simulations have been conducted in nominal scenarios and in the presence of matched and unmatched uncertainties. Furthermore, for real time locust detection, image data is collected and deep learning model is trained.

RESULTS

The research is in progress. Presently, the controller design phase has been completed, and the results show that the proposed controller effectively tolerates both matched and unmatched uncertainties; also it has superior tracking and disturbance rejection capabilities with minimal control effort when compared to both fuzzy-based SMC and conventional SMC.

CONCLUSIONS

The anticipated outcome of this work is the development of an AI Quadrotor capable of identifying and killing the locust swarms. This will establish high-productivity agriculture, thereby improving the food production program of the second Sustainable Development Goal.

Supervisor: Prof. MERGA Chala

C13 (E0073)

Adaptive Super Twisting Sliding Mode Controller for Quadcopter

ABERA Belay Nardos, LEMMA Negash Lebsework, and ABDISA Merga Chala
Addis Ababa University

BACKGROUNDS

Quadcopter can be used for a wide range of applications, ranging from aerial photography package delivery, and military surveillance to precision agriculture and exploration, offering versatile solutions across diverse fields. However, its control presents challenges due to non-linear and under actuated characteristics.

METHODS

First, Newton-Euler approach was used to model the dynamic of quadcopter and model verification was done in Simulink. Then, adaptive super twisting sliding mode controller of a quadcopter was developed for attitude and position trajectory tracking of a quadcopter. Controller design involves tuning the parameter of super twisting sliding mode controller using adaptation law. Comparison of conventional sliding mode controller with the proposed controller was analyzed.

RESULTS

The effectiveness of the proposed control scheme has been verified by developing simulation result for quadcopter in MATLAB/SIMULINK software. The results show high tracking accuracy, chattering reduction, and disturbance rejection capability of the proposed controller.

CONCLUSTIONS

Different flight maneuvers, including infinity, square wave, and helical trajectories, have been utilized to evaluate the overall performance of the designed controller in trajectory tracking. The simulation results highlight the superior trajectory tracking capabilities of the proposed controller compared to the conventional sliding mode controller, which exhibits sluggish system response and increased deviations from the specified trajectory. This technological advancement aligns with several Sustainable Development Goals (SDGs). Specifically, it contributes to SDG 9 (Industry, Innovation, and Infrastructure) by enhancing drone motion control for more efficient aerial surveillance, supports SDG 13 (Climate Action) through improved environmental conservation efforts, addresses SDG 2 (Zero Hunger) by enhancing crop monitoring efficiency in precision agriculture, and bolsters disaster response capabilities, thereby contributing to SDG 11 (Sustainable Cities and Communities). This research underscores the critical role of drone motion control as a key driver in fostering a more sustainable and resilient world, enabling focused interventions that align with the overarching goals of sustainable development.

Supervisor: Prof. MAMO Mengesha

C14 (E0074)

Trajectory Tracking Control of Quadcopter Using Fuzzy Super Twisting SMC with PID Surface

GEDEFAW Andarge Elisabeth, LEMMA Negash Lebsework, and ABDISA Merga Chala
Addis Ababa University

BACKGROUNDS

Quadcopters, with four rotors, play a vital role in advancing sustainable development through applications such as aerial photography, surveillance, and precision agriculture, fostering technological advancements and eco-friendly practices across various sectors. However, their control poses challenges due to non-linear and under-actuated characteristics.

METHODS

This study addresses these challenges by designing a flight controller to guide the quadcopter along desired trajectories using a Fuzzy super twisting sliding mode controller with PID surface. The process involves initially modeling the quadcopter using the Newton Euler method, followed by flight controller design. This controller is divided into inner and outer loops capable of automatically adjusting its parameters, and the system is then simulated in Matlab/Simulink.

RESULTS

The validity of the proposed control scheme has been confirmed through the generation of simulation outcomes for a quadcopter using MATLAB/SIMULINK software. The findings illustrate the effectiveness of the controller in navigating the quadcopter along predetermined trajectories, resiliently mitigating disturbances, and effectively handling parameter variations.

CONCLUSTIONS

The integration of the super-twisting algorithm has successfully addressed the chattering problem associated with sliding mode control, concurrently achieving a significant reduction in the computational load through the automatic tuning of Super-Twisting Sliding Mode Control parameters. This advancement in drone motion control aligns seamlessly with several Sustainable Development Goals (SDGs). Notably, it contributes to SDG 13 (Climate Action) by enhancing environmental conservation through advanced aerial surveillance. The precision agriculture enabled by this technology promotes SDG 2 (Zero Hunger) through efficient crop monitoring, ensuring food security. Furthermore, the strengthened disaster response capabilities contribute to SDG 11 (Sustainable Cities and Communities) by fostering resilience in the face of crises. By optimizing operational efficiency and minimizing environmental impact, this technology plays a pivotal role in achieving broader sustainable development objectives, addressing goals such as SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production).

Supervisor: Prof. NEGASH Lebsework

C15 (E0080)

Optimization of Small Horizontal Axis Wind Turbine for Maximum Energy Extraction

TEREFA Temesgen Geneti
Jomo Kenyatta University of Agriculture and Technology

BACKGROUNDS

Wind energy is one of the most popular, sustainable, and renewable energy technologies. It has a very small environmental impact with respect to fossil fuels. The large Horizontal axis wind turbine is the most common which is widely used. However, the large HAWTs are require more space, high wind speed, and they have high environmental impact such as noise. For domestic purpose, where the population density is high and land is used to the greatest extent possible, finding a large enough area to build a wind farm is difficult. Also, in an urban area, the wind required for higher power generation is less. This study focuses on small-scale wind energy systems as alternative use to get power at the location where it's needed especially for domestic applications. Due to intermittent wind behavior and less flexibility of small horizontal axis wind turbine, it is necessary to comprehensively assess and optimize the performance of the small-scale turbines to maximize their energy output.

METHODS

In this study a mixed airfoil blade will be designed for optimal power production. A multi-objective optimization by genetic algorithm will be conducted to increase the power output while decreasing the starting time of the wind turbine. The chord and twist angle distribution which are the main parameters in wind blade design will be compared and the best will be selected through the optimization process. Finally, simulation and experimental analysis will be conducted to validate the work done.

EXPECTED RESULTS

An optimal blade which maximizes the power output will be designed. The best distribution of chord and twist angle which contributes to energy maximizing will be selected. The multi-objective optimization will result in maximized power output and minimized starting time. This research will contribute to SDG7: Ensure access to affordable, reliable, sustainable, and modern energy for all. Additionally, it will become grant for SDG13: Take urgent action to combat climate change and its impact.

Supervisors: Prof. NJIRI Jackson, Prof. MUIRURI Irungu, and Prof. MERGA Chala

List of 10 Best Presentations

As a result of the evaluation by UU-A Team members, 10 presentations were selected the "Best Presentation Award"－3 Gold Award, 3 Silver Award, and 4 Bronze Award.

Gold Awards

A02 (E0009) SAITO Yuki (UU) **Expression Analysis of Selenoprotein Genes in Ayu Fish (*Plecoglossus altivelis*)**
A19 (E0053) Kiprono Daisy Jepchirchir (MUST) **Chloroplast Relocation in Wild Strawberries (*Frgaria Vesca*)**
B04 (E0031) SUGIMORI Kanju (UU) **Study on Automatic Measurement of Capped Honeybee Brood Cells Using PSPNet**

Silver Awards

B10 (E0044) MBIRU Peter Kimani (UU) **Discrimination in Japan: Perceptions Held by Foreigners Living in Tochigi Prefecture**
B20 (E0088) NAKANO Yoshihito (UU) **Exploration of Food-Related Factors Causing Hypertension in Asuncion, Paraguay**
C08 (E0048) KHWESA Peredy (AAU) **Ecochlor: A Next-Gen Electro-Chlorinator for Sustainable Water Disinfection in Hardship Areas**

Bronze Awards

A14 (E0040) YOSHINO Takumi (UU) **Mitigation of Aerosol in The Weaning Piggery by Spraying Solution by using Ultrasonic Sprayer**
A20 (E0056) OMAR Fatma (JKUAT) **Assessment of Genetic Diversity of Latent Bacteria in Coconut Leaves Associated with the Lethal Yellowing Disease Symptoms in Kenya**
B05 (E0032) DULO Abraham (AAU) **Universities' Democratic Culture and Youth Political Participation in Africa**
B06 (E0036) ADJEI-MAWUTOR Gideon (UG) **Empowering Women and Girls: Sexual Reproductive Health in Cape Coast Metropolitan Area**

We presented a certificate to all 60 presenters who introduced their research by both abstract and video at the UU-A Student Summit 2024.

Shinso Yokota

YOKOTA Shinso
Leader of UU-A Team

Bridging Young Researchers with the SDGs

UU-A STUDENT SUMMIT 2024

Hybrid Events

March 4th - 7th, 2024

March 4th SDGs Work Shop
Prof. YUMOTO Hiroyuki (UU)

March 5th Symposium 1
Dr. Akiko Iizuka (UU) and Dr. MARWA Janeth (NM-AIST)

March 6th Symposium 2
Dr. KAALE D. Lilian (UDSM) and Dr. AOYAMA Masato (UU)

March 7th Symposium 3
Dr. AKAKPO B. Daniel (UG) and Ms. KETTER C. Naomi (JKUAT)

Organized by the Organizing Committee for UU-A Student Summit 2024 in Conjunction with 7 Partner Universities

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

Summary Report of SDGs Work Shop

SDGs Work Shop Lecture by Prof. YUMOTO Hiroyuki (UU)

"The Post-SDG World is Sustainable? －What will you do for a sustainable future?－"

At first, we watched videos made by United Nations－"Video1: What are Sustainable Development Goals? (https://www.youtube.com/watch?v=1c48vhokWLQ)" and "Video2: SDGs: No one will be left behind (https://www.youtube.com/watch?v=yEQJzdrYIcM)." We learned what are the SDGs and their importance from video1 and map of the SDGs, the big picture, economics to grow and access to nutritious food from video2. Also, it showed the progress of SDGs was only 15% until 2023.

After watched videos, Prof. YUMOTO elaborated on the 5 key areas of agent actions; climate change, food and water, education and sanitation focusing on SDG2 "Zero Hunger", SDG3 "Good Health and Well-being", SDG4 "Quality Education", SDG5 "Gender Equality", SDG6 "Clean Water and Sanitation" and SDG13 "Climate Change".

Lastly, he posed the following questions:

1. Why is the progress on the SDGs slow?
2. With all the innovations in agricultural technology, why can't we solve the problem of hunger and famine?
3. Will the international community be able to achieve the SDGs even if it cannot stop the wars in Ukraine and Palestine?
4. What is needed to achieve the SDGs by 2030?
5. How can your research contribute to building a sustainable society and future?
6. After all, will the world after 2030 be sustainable?

SDGs Work Shop Discussions

- On-site: 7 groups (32 participants)
- Online: 5 groups (18 participants)

- ❖ What's the problem?
- ❖ Where is the problem happening?
- ❖ Why choose this problem?
- ❖ Solution for the problem
- ❖ SDGs relation

【Purpose】

The purpose of the discussion is to exchange ideas and knowledge on how to solve social issues by utilizing the SDGs.

Where in the world are the problems occurring and how to solve them using the SDGs?

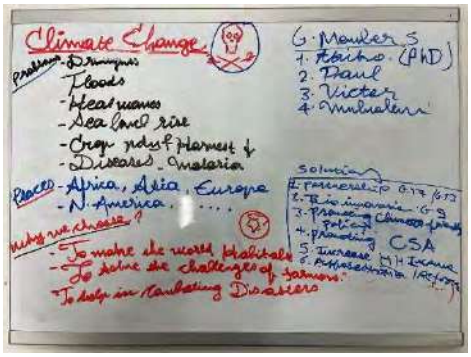
→Climate Change (SDG13), Food and Water (SDG2, 6), Gender (SDG5), Education (SDG4), and Health (SDG3)

SDGs Work Shop Presentations

- The presentations were made using the whiteboards distributed to the participants.
- A few groups presented in public for 3-5 minutes.

※ We showed some acheivements of group discussion as below.

Discussion Topic: Climate Change (Group1)



What is the problem?

Drought, Floods, Heat waves, Diseases-malaria

Where is the problem happening?

Africa, Asia, Europe, North America

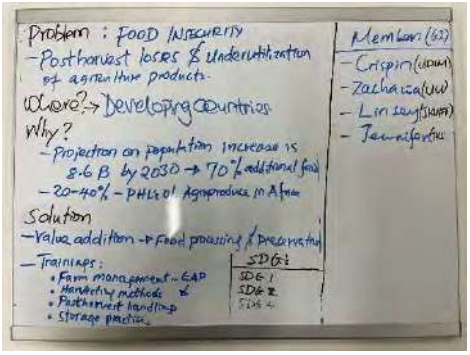
Why you choose this problem?

- To plant plantation
- To help in combating diseases
- To achieve the challenges of farmers

Solution for the problem related to SDGs

Partnership, Bio innovation, Promoting CSA, Promotion of afforestation

Discussion Topic: Food and Water (Group2)



What is the problem?

Food insecurity- postharvest losses and underutilization of agricultural products

Where is the problem happening?

Developing countries

Why you choose this problem?

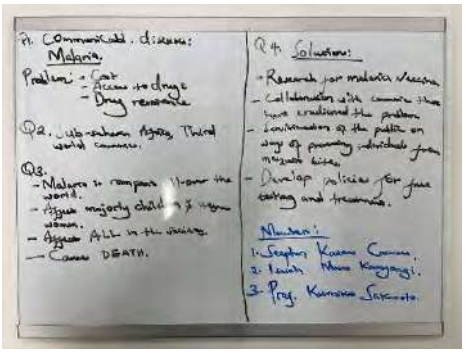
- Protection on population increase is 8.6 B by 2030: 70% additional food
- 20-40%: PHLs Agroproduce in Africa

Solution for the problem related to SDGs

- Value Addition-Food processing & presentation
- Trainings; Farm management-GAP, harvesting methods, postharvest handling and storage practices.
  →SDG1 “No Poverty”, SDG2 “Zero Hunger”, SDG4 “Quality Education”

SDGs Work Shop Presentations

Discussion Topic: Food and Water (Group3)



What is the problem?

Communicable diseases;

→malaria due to cost, access to drugs, drug resistance

Where is the problem happening?

Sub-Saharan Africa

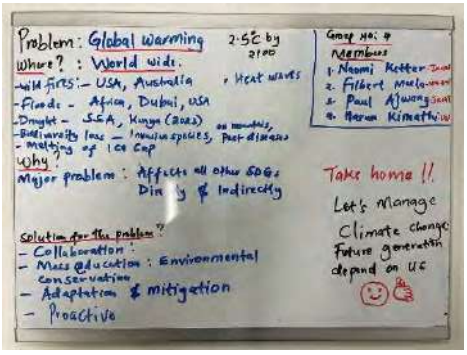
Why you choose this problem?

- Malaria is rampant all over the world.
- Affect majorly children and pregnant women.
- Affect all the society.
- Causes death

Solution for the problem related to SDGs

- Research for malaria vaccine.
- Collaboration with countries that have eradicated the problem.
- Sensitization of the public on ways of preventing individuals from mosquito bites.
- Develop policies for free testing and treatment.

Discussion Topic: Health (Group4)



What is the problem?

Global Warming

Where is the problem happening?

Worldwide

- Wild fires: USA/Australia
- Floods: Africa, Dubai, USA
- Drought: Sub-Saharan Africa, Kenya (2025)
- Biodiversity loss-invasive species, pest and diseases
- Melting of ice cap

Why you choose this problem?

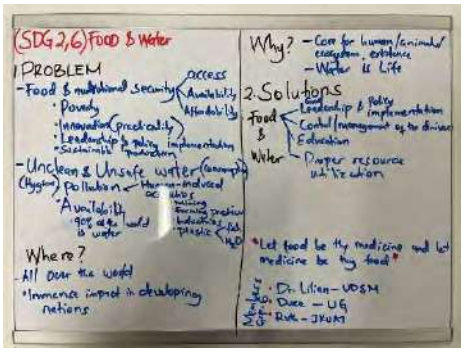
Affects all other SDGs directly and indirectly

Solution for the problem related to SDGs

Collaboration, Mass education: environmental conservations, Adaptation & mitigation, Proactive

SDGs Work Shop Presentations

Discussion Topic: Food and Water (Group6)



What is the problem?

Postharvest losses and underutilization of agriculture products

Where is the problem happening?

Developing countries

Why you choose this problem?

Projection on population increase is 8.6 B by 2030 - 70% additional food

20-40% postharvest losses of agro produce in Africa

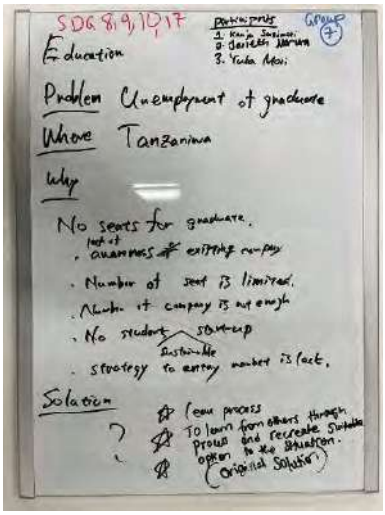
Solution for the problem related to SDGs

Value addition /food processing & preservation

Trainings: farm management, harvesting methods, postharvest handling, storage

→SDG1 “No Poverty”, SDG2 “Zero Hunger”, SDG3 “Good Health and Well-being”

Discussion Topic: Education (Group7)



What is the problem?

Unemployment of graduate

Where is the problem happening?

Tanzania

Why you choose this problem?

- No seats for graduate.
- Lack of awareness existing company.
- Number of seats is limited.
- Number of companies is not enough.
- No student startup.
- Strategy to entity.

Solution for the problem related to SDGs

- Learn process
- To learn from others through process and recreate suitable

Abstracts of Symposium 1

Disasters and the SDGs: Towards a world where no one is left behind

Dr. IIZUKA Akiko
Utsunomiya University

Abstract

This lecture will begin with an introduction of the speaker's research topics and contents on community-based disaster management and international cooperation, followed by the current situation and characteristics of disasters, especially in Japan, and an international definition of disasters. The relevance of disasters to the SDGs will then be discussed, including whether and how disasters are related to any of the SDG targets.

Meta-Cognition and Spiritual Intelligence: a Paradigm Shift for Sustainable Authentic self Knowledge engaging with efficient entrepreneurial Practice in the Era of Artificial Intelligence

Dr. MARWA Janeth
Nelson Mandela Africa Institution of Science and Technology

Abstract

In the age of artificial intelligence (AI), meta-cognition is the means of attaining spiritual intelligence, transforming ordinary knowledge into authentic self-knowledge that fosters human creativity for inventiveness and autonomy. In order to experience meta- cognition, one must have high self-awareness to extract sophisticated internal resources through effective mental transactions supported by the SI. AI is widely used nowadays and may seem to alert human intelligence, influencing a choice to coexist or use both AI and humans as means of production. High unemployment rate may only become worse, leaving most recent graduates with few career options due to the scarcity of new markets and the consequent lack of work creation. Conversely, adaptable options of self knowledge are proposed to increase capacity to develop a new market where everyone has equal access to entrepreneurial activities. The ideas of meta-cognition, spiritual intelligence, and consciousness evolvement for self-knowledge are explained by management theories.

Keywords

Intelligence, Meta-cognition, Spiritual Intelligence, Sustainable authentic Self Knowledge, entrepreneurial practice, Artificial Intelligence

Abstracts of Symposium 2

Food Security in Africa: Challenges and Solutions

Dr. KAALE D. Lilian
University of Dar es Salaam

Abstract

Food security has continued to be a high priority issue on the development agenda in developing countries. Although substantial progress has been made still problems exist along the value chain that need to be addressed before African countries can be food secure. Particularly the region is facing low agricultural productivity, processing, value addition and marketing. The major setback has been the non-holistic and non-integrative approaches that have excluded some of the key players such as universities, business community, and some government entities. Further, with a wide range of agricultural crops being produced, post-harvest handling process create different degrees of quantitative and qualitative losses in a complex market chain, which are estimated at 30% to 50% depend on the agricultural produce. Africa's food security would be ensured by utilizing integrative and holistic approaches throughout the agricultural value chains, a post-harvest handling monitoring system that guarantees the scientific handling, storage, and transportation of agricultural produce, well-designed economic centers with well controlled environments, the use of innovative technologies, and artificial inelegancy.

Transportation stress in farm animals: Studies in goats

Dr. AOYAMA Masato
Utsunomiya University

Abstract

Sometimes farm animals are transported to other place by truck, ship or aircraft. The transportation can be the severe stresses for farm animals. The World Organisation for Animal Health (WOAH: sometime it referred as OIE) have established some guidelines concerning the Animal Welfare, including the guideline for transportation. However, the physiological responses of farm animals, especially in farm ruminants such as cattle, sheep or goats, to transportation still are not fully understood. This presentation introduces some researches that tried to reveal the physiological responses of goats to road transportation, especially the existence of motion-sickness in goats that do not possess the emetic reflex.

Abstracts of Symposium 3

The Role of Grain Legumes in Enhancing Sustainable Intensification of Farming Systems

Dr. AKAKPO Brain Daniel
University of Ghana

Abstract

Smallholder farming systems in Africa are characterised by poor soil fertility and other biophysical and socio-economic resources. These limitations hinder the increased and sustained crop productivity needed to feed the growing population. Intensification of farming systems with grain legume production is important in improving soil fertility, crop productivity and household food and income. This lecture focuses on ways of integrating grain legumes and their roles in major cropping systems to enhance farm productivity. It will also discuss the challenges and advances of grain legume production research. Finally, this lecture will dwell on several important research outcomes on grain legumes to promote and harness the full potential of such legumes for the sustainable intensification of smallholder farming systems in Africa.

Quantifying the effects of water stress on the growth and development of African nightshade (*Solanum* spp.) and spiderplant (*Cleome gynandra* L.)

Ms. KETTER C. Naomi
Jomo Kenyatta University of Agriculture and Technology

Abstract

A study was conducted with the aim to enhance water use efficiency in agriculture by determining precise irrigation needs of African nightshade and spiderplant, and by evaluating drought tolerance among African nightshade genotypes in Leibniz Universität Hannover. Field experiments were conducted over two summers to establish crop coefficients (Kc) for these plants using lysimeter-measured evapotranspiration and the Penman-Monteith FAO 56 method. Additionally, greenhouse experiments assessed drought responses of 48 African nightshade genotypes, highlighting variability in traits such as transpiration, leaf expansion, and stomatal conductance under water stress. Results showed both crops' evapotranspiration rates and Kc values varied annually, indicating a sigmoidal growth pattern. Drought experiments revealed differences in water use efficiency (WUE), stomatal conductance, and biomass production among genotypes, with specific genotypes showing notable drought resistance. The study suggests significant genetic diversity in drought tolerance within African nightshade species, with implications for breeding and water management practices in agriculture.

Photos of UU-A Student Summit 2024

Group Photo at the Opening Ceremony and SDGs Work Shop (March 4th)

Group Discussions at the SDGs Work Shop (March 4th)

Symposium 1 (Left) Dr. IIZUKA Akiko / (Right) Dr. MARWA Janeth (March 5th)

Photos of UU-A Student Summit 2024

Symposium 2 (Left) Dr. KAALE D. Lilian / (Right) Dr. AOYAMA Masato (March 6th)

Symposium 2 (Left) Dr. AKAKPO B. Daniel / (Right) Dr. KETTER C. Naomi (March 7th)

Group Photo at the Closing and Award Ceremony (March 8th)

The 7 Partner Universities

350 Mine-machi, Utsunomiya, Tochigi, JAPAN, 321-8505