The 2nd Meru University of Science and Technology

International Conference

On

SDGs FOR DEVELOPMENT

Meru, 26th to 28th June 2023

Conference Theme:

"Leveraging Interlinkages among the SDGs to Realize the 2030 Agenda through Research and Innovation in the Post Covid Era"

ORGANIZED BY:	Meru University of Science and Technology
IN CONJUCTION WITH:	NRF, PACJA, Meru Slopes Hotel
KEYNOTE SPEAKER:	Dr. Beatrice Muganda Inyangala
	Principal Secretary, State Department for Higher Education and Research
VENUE:	Meru University of Science and Technology, Main Campus

CONFERENCE PROCEEDINGS

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THEME	SESSION CHAIRS	RAPPORTEURS
Agriculture, food security, safety and bio-security	Dr. John Thuita Prof. Gitonga Mburugu	Dr. Eric Mworia Dr. Rebecca Ebere
Business, Economy, and Society: challenges in the post-pandemic era	Dr. Mohammed Shano Dr. Agnes Mungania	Dr. Gabriel Waweru Dr. Halldess Munene
Climate change: adaptation, mitigation, resilience	Dr. George Mugambi Dr. Eric Mworia	Dr. Kennedy Gachoka Dr. Sarah Wandili
Disruptive technologies for sustainability in the circular economy	Dr. Mary Mwadulo Dr. Stephen Mutua	Dr. Amos Chege
Education for sustainable development for the world in the time and beyond pandemics	Dr. Hilda Omae Prof. Kageni Njagi	Dr. Mercy Thuranira Dr. Charles Ibuathu Njati
Health Interventions for Global Pandemics through Innovation	Prof. Eric Muchiri Dr. Jane Rutto	Dr. Patrick Kubai / Dr. Muriungi Robert Gitunga Dr. Joan Simam
Integrating the Social Sciences in pandemic Preparedness and response	Dr. Beatrice Owiti	Dr. Guyo Huka
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THE 2nd MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

CONFERENCE ON SDGs FOR DEVELOPMENT

Meru, Kenya
26th to 28th June 2023

Conference Theme: "Leveraging Interlinkages among the SDGs to Realize the 2030 Agenda through Research and Innovation in the Post Covid Era"

VENUE: MAIN CAMPUS, NCHIRU

Conference Sub-themes

- Agriculture, Food Security, Safety and Bio-security (AFS)
- Business, Economy and Society: Challenges in the Post Pandemic Era (BES)
- Climate Change: Adaptation, Mitigation, Resilience (CC)
- Disruptive Technologies for Sustainability in the Circular Economy (DT)
- Education for Sustainable Development for the World in the Time and Beyond Pandemics (ESD)
- Health Interventions for Global Pandemics through Innovation (HI)
- Integrating the Social Sciences in Pandemic Preparedness and Response (SS)
- Reimagining Pure and Applied Sciences for the Post Pandemic Future(PAS)
- Water, Sanitation, and Hygiene (WASH) and SDGs (WASH)

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PRE-CONFERENCE PAPERS

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Moses Njoka[1]*, Peter Masinde[1], Cynthia Mugo Mwenda[2]

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Chia (Salvia hispanica L.) is an annual tropical plant belonging to the Lamiaceae family. In Kenya, Chia has gained significant attention in recent years due to its nutritional benefits and increasing demand in the local and global market. This review aims to explore the potential of chia production in Kenya as a source of income for farmers. The review highlights the agronomic requirements of chia, including soil, water, and climate conditions, as well as practices necessary for successful cultivation. Chia production is becoming a favorite enterprise for most farmers in Kenya due to its ease of management and short growth period. However, a seamless production has been encountered by several challenges, including scarce information regarding its agronomic management practices, poor yielding varieties, emerging pests and diseases, and poor harvesting and post-harvesting techniques. The growing demand for chia globally presents an opportunity for Kenyan farmers to tap into this market and generate income through export. Chia has the potential to become a new golden crop for Kenyan farmers, contributing to food security, poverty reduction, and sustainable development. However, to realize this potential, there is a need for investment in research, extension services, and market linkages to support chia production, improve agronomic practices, and create a sustainable market for the crop.

Keywords: *Crop Management, Crop Nutrition, Diseases, Insect Pests, Production Practices, Varieties.*

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2. Development and characterization of *Dovyalis caffra* fruit yoghurt

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Dovyalis caffra fruit is highly underutilized for food purposes in Kenya despite its edible nature and richness in nutrients. Though currently used in establishment of live fences, the food potential of Dovyalis caffra fruit tree is yet to be exploited. The current study aimed at utilization of ripe Dovyalis caffra fruit in development of fruit yoghurt and determination of physicochemical, microbiological and sensory properties of the product during storage. Various proportions of pasteurized Dovyalis caffra fruit pulp were combined with freshly made plain cow milk yoghurt to make formulations constituting 0 %, 5 %, 10 % and 15 % fruit part by weight. Notably, the addition of fruit pulp indicated significant enhancement of the vitamin C content of yoghurt formulations with quantities of up to 14.49 mg/100 g in the 15 % fruit yoghurt. Significant decrease in pH was recorded with increase in pulp ratio at the range of 4.2 – 2.97 in formulations 0 % and 15 % respectively. The variation of viscosity in all formulations was insignificant. Storage of yoghurts at 4 oC for three weeks indicated product stability with no significant change in viscosity of all formulations. A significant decrease in pH was however recorded between week 1 and week 3 of all formulations. There was no detection of coliforms, yeasts and moulds in all samples throughout the 21 days storage period. With regard to sensory parameters, formulations with up to 10 % pulp were shown to be potential for acceptance with an average overall acceptability score of above 7 (like – moderately). The overall acceptability was not significantly affected by storage in all formulations. In summary, this study demonstrates that Dovyalis caffra fruit has significant potential in the formulation of nutritious, desirable and shelf stable fruit-based yoghurts. Further product optimization is however recommended.

Keywords: *Dovyalis caffra, Yoghurt, Physicochemical, Microbiological, Sensory*

3. Nutritional and glycemic index of stiff porridges produced with composite flours in Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Background: Glycemic index is how rapid or slow the blood sugar changes after food consumption. Stiff porridge usually referred to as ugali is processed from whole cereal flours such as a maize in combination with other cereals has been recommended for the T2DM persons. Unfortunately, the GI of stiff porridge from these cereals foods has been shown to be high. Moreover, there is overreliance on the maize in the preparation of ugali and less use of cereals such as millet and sorghum. In the literature, there is little information on the GI of ugali from composite flours.
Methods: Ugali formulations of maize-millet, maize-sorghum, cassava-millet, cassava-sorghum flour were mixed in the ratios 4:1 and cassava-millet-sorghum at 4:1:1 were prepared in the ratio 3:5 of flour is to water. Proximate composition was determined using AOAC methods while carbohydrates were determined by difference (100-moisture+fat+protein+ash+fiber content). Energy values were determined by Atwater method and GI according to Brouns et al., (2005).
Results: The moisture content, fat and protein content of maize-millet ugali was the highest at 67.5%, 5.7% and 9% respectively. The cassava ugali had a low fat (0.7%) and protein (1.2%) compared to other stiff porridges. Cassava-millet ugali had the highest (3.1%) ash and fiber (11.5%) content whereas cassava-sorghum-millet ugali had the lowest ash (1.7%) and fiber (1.3%) content. The carbohydrate content of cassava ugali was the highest (92.9%) whereas maize-sorghum ugali was lowest (76.9%). Maize-millet ugali had the highest energy content (422.1 Kcal) while for cassava ugali was the least (394.2 Kcal). Ugali from cassava-sorghum, cassava-millet, maize-millet and maize-sorghum flour recorded a GI of 46,45,47 and 45 respectively.
Conclusion and recommendations: Based on the results, the cassava-sorghum, cassava-millet, maize-millet and maize-sorghum stiff porridges have low GI presenting them as potential foods for management and prevention of T2DM.

Keywords: *Glycemic Index, Composite Flours, Millet, Maize, Soghurm and Cassava*

4. Harvesting and characterization of camel milk whey and casein proteins as functional ingredients in food products

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Despite neglect by scientists and various governments, camel milk is increasingly becoming commercialized because of its health and nutritional benefits. Like other types of milk, camel milk also contains several components, for instance, Protein (3.1%), total solids (11.9%), ash (0.79%), and lactose (4.4%). Additionally, camel milk has bioactive properties such as antioxidant, antimicrobial, anti-diabetic, anti-hypersensitive, and anti-cholesterol properties. Whey proteins and caseins are the major bioactive components in camel milk. Whey proteins from milk can be either of three types: whey protein concentrate, whey protein isolate, and whey protein hydrolysate (WPH). Besides, casein micelles are constituted of four main types of Protein: αS1-casein, αS2-casein, β-casein, and k-casein. Studies show that Kenya losses about 50% of camel milk due to lack of proper value addition and diversification techniques and processes due its technological properties. Currently, there are no camel milk whey and casein products in the Kenyan market due to the limited information about camel milk proteins and processing techniques that can diversify its uses and contribute to SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being). As a result, this study precipitated, isolated, and derivatized different types of camel milk whey proteins, casein fractions and amino acids. This study will also develop whey and casein products for use as ingredients in various food formulations such as biscuits and cookies. The mean of the triplicate data sets was used for further analysis by applying the SPSS software.

Key words: *Camel Milk, Whey Protein Hydrolysate (WPH), Casein Proteins*

5. Processing and characterization of camel milk butter

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Camels are usually reared in the arid and semi-arid areas in Kenya. They are not only for transport but they also produce milk and meat which forms part of subsistence of the people in the ASAL regions.. Camel milk fat in specific is unique for it contains more of the unsaturated fatty acids as compared to bovine milk. The demand for the camel milk products is on an increase not only in the rural areas but in the cities also calling for production to meet the demand. Kenya produces the highest quantities of camel milk but there is no camel butter in the market. This could be because camel milk has unique fat properties, such as the distribution of fat as a tiny and thick membrane which is strongly attached to the proteins and the presence of long chain fatty acids, hence making it difficult to use the same technology as bovine milk in the making of camel milk butter. The higher melting point of camel milk fat (41-44)°C is linked to a higher ratio of long-chain fatty acids to short-chain fatty acids. The high melting point of camel milk fat makes it hard to process camel milk butter at normal conditions as bovine. Hence, the main aim of the study was to analyze the physicochemical properties of CMB produced by optimizing conditions..Butter was prepared using camel milk obtained from the two ASAL counties (Isiolo and Laikipia). The butter was produced for temperatures of 21°C, 25°C and 27°C as the time was monitored. The butter produced was white in color, physico-chemical properties of the milk were determined using standard and published methods. The fatty acid profiles and the volatile fatty acids were determined using GC-MS. The butter was passed through sensorial analysis to check its acceptability to the consumer.

Key words: *Camel Milk butter, Fatty acid profile, value addition, ASAL*

6. Effects of land preparation methods and organic soil amendments on soil properties, growth and yield of maize (Zea mays)

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Subtheme: Agriculture, Food Security, Safety and Bio-security

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Abstract

Maize (Zea mays L.) is important food crop popular in Kenya and its production has a direct influence to nutrition and economic security. In 2020-2021 maize production in Kenya was about 85% of total cereal production of which it declined by about 550,000 metric tons. Here, we combine land preparation method and organic soil to evaluate their effects on maize growth, yield and soil physical and chemical properties. The experiment was set at Meru University Farm in split plot design with randomized complete block design (RCBD) land preparation being the main plot and nutrient management being the sub-plots. Conservational (CA) and conventional (CN) land preparation was done. The nutrient levels were 2.5t ha-1 BSF, 5.5t ha-1 BSF, 8.5t ha-1 BSF, 2.5t ha-1 BSF + Biochar, 5.5t ha-1 BSF + Biochar, 2.5t ha-1 BSF + Trichoderma 125g ha-1, 5.5t ha-1 BSF + Trichoderma 125g ha-1, 5t ha-1 FYM, 100kgN ha-1 DAP and control. Data collection was based on soil bulk density, soil moisture, vegetative growth and yields. CA increased the soil moisture retention by 8%in season one (S1) and 4% in season two (S2) as compared to CN. Plots amended with 5.5t BSF + Biochar increased the moisture retention by 5% in S1 and 3% in S2 compared to 5.5t ha-1 BSF, 2.5t ha-1 BSF + Biochar by 2% in S1 and 10% in S2 compared to 2.5t ha-1 BSF, 8.5t ha-1 BSF by 3 % in S1 and 5% S2 as compared to 5.5t ha-1 BSF was 2% in S1 and 5% in S2 higher than 2.5t ha-1 BSF, 5.5t ha-1 BSF + Trichoderma 125g ha-1 was 1% higher than 5.5t ha-1 BSF in S1 and S2, 5t ha-1 FYM increased the moisture retention by 9% S1 and 24% in S2 and 100kgN ha-1 DAP was 3% in S1 and 4% increase in S2 as compared to control. Amendment of biochar and BSF reduced the soil bulk density up to 0.7g/cm3 S1 and 0.6g/cm3 S2 as compared to control which had 0.9g/cm3 in S1 and S2. Plots with 8.5t ha-1 BSF and 100kgN ha-1 DAP increased the vegetative growth by 37%, amendment, Biochar amendments had no significant difference and application of Trichoderma increased by 7%. CA increased the vegetative growth by 6% in S1 and 4% in S2 as compared to CN. 8.5t ha-1 BSF increased the vegetative growth by 21% in S1 and 19% in S2, 5.5t ha-1 BSF by 1% in S1 and 9% in S2 compared 2.5t ha-1 BSF. Biochar had no significant effect on vegetative growth while Trichoderma increased the vegetative growth by 15% in S1 and 6% in S2 and 2.5t ha-1 BSF + Trichoderma increased by 2% in S1 and 7% in S2. CA increased the yields by 6% in S1 and 14% in S2 compared CN. BSF increased the maize yield by 29% and 18% in S2, biochar had no significant difference on yields and increased the yield by 1% in S1 and S2. Trichoderma increased the yields of maize by 12% in S1 and 11% in S2. Increase in maize yield and vegetative growth is due to increased soil moisture condition in CA as compared to CN. Addition of organic matter into the soil improved soil moisture retention, reduced soil bulk density and improvement in soil nutrient content which led to an increase in growth and yield. **Keywords:** *Biochar, Black soldier fly manure, Maize vegetative growth, Maize yield, Soil moisture, Soil bulk density, Trichoderma.*

7. Chloroplast relocation in wild strawberry (Fragaria species)

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Background: Chloroplasts are essential organelles that play a crucial role in photosynthesis, the process by which plants convert light energy into chemical energy. However, the efficiency of photosynthesis is highly dependent on the availability of light, and the movement of chloroplasts within plant cells is a key mechanism by which plants adapt to changing light conditions. The movement of chloroplasts within the plant cell is a critical mechanism for optimizing photosynthesis and protecting the plant from excess light and photo-oxidative damage. Despite its importance, little is known about the mechanisms and regulation of chloroplast relocation in wild strawberries. **Objective**: This study proposes to investigate the chloroplast relocation in wild strawberries cultivated from runners/stolons using fluorescence microscopy and data analysis through Image J. This study aims to identify the mechanisms and responses of chloroplasts to changes in light intensity in wild strawberries by inducing a response using different intensities of blue and red light. Methods: The proposed method involves growing wild strawberries from runners/stolons under controlled light conditions, light and temperature treatment of the new plants to accustome them to the experimental conditions and imaging the chloroplasts using fluorescence microscopy. The images will be analyzed using Image J software to track the movement of chloroplasts over time by generating a time lapsed video and quantify their distribution within the plant cell. To visualize chloroplast relocation, data using time-lapse microscopy and image analysis software will be used to identify spatial and temporal patterns and underlying mechanisms. Finally, a mathematical model to simulate chloroplast movement under different conditions will be developed. this will help test hypotheses and identify key factors that influence movement. **Data analysis:** The study will analyze chloroplast movement parameters such as speed, distance, and direction, to measure the rate of relocation in response to stimuli. To compare treatments, statistical analyses such as ANOVA will be used. The visualization of chloroplast relocation patterns will be achieved through time-lapse microscopy and image analysis software to identify spatial and temporal patterns and underlying mechanisms. Chloroplast relocation data between wild strawberry plant species and experimental conditions will be compared to identify similarities/differences and provide insights into evolutionary history. Additionally, mathematical models will be developed to simulate chloroplast movement under different conditions and test hypotheses, while also identifying key factors that influence movement. **Expected outcomes:** The findings of this study will provide insight into the chloroplast relocation mechanism in wild strawberries, which could be used to improve crop yield and optimize plant growth under different light conditions. Additionally, the study will demonstrate the potential of wild strawberries as a model plant for studying chloroplast movement and other important biological processes

Keywords: *Fragaria species, Chloroplast relocation*

8. A Comparison of animal biodiversity in conventional and conservation small scale farms in Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Small-scale farming is a prevalent practice in Kenya playing a major role in maintaining biodiversity. However, threats of habitat loss, climate change, and unsustainable farming practices are common. Assessing their impact on animal biodiversity can inform policies and practices that promote sustainable agriculture and conservation. This study aimed to evaluate bird communities and compare the abundance and diversity of pollinator and pest communities in small-scale conventional and conservation farms in Kirinyaga, Tharaka-Nithi and Laikipia regions in Kenya. Fourty farms were surveyed using point count methods for birds, trapping and observation of the pollinator- plant interactions and scouting, use of pheromone traps and sticky traps to monitor pests. Shannon- Wiener diversity index was used to measure diversity. Statistical analysis revealed a significant difference ($P<0.05$) in biodiversity measures between conservation and conventional farms ($t(28) = 2.34$, $p = 0.027$). Fourty-five species were recorded, averaging 28 in conservation and 18 in conventional farms. Conservation farms exhibited a richer diversity, higher pollinator abundance and lower pest abundance. This emphasizes the importance of promoting conservation farming for sustainable agriculture. Avifaunal distribution only varied across the three regions. The findings can inform policies and practices that promote sustainable agriculture and conservation. This study demonstrated that conservation farming could promote animal biodiversity in small-scale farms and positively impact pest control, and crop productivity. Further research can explore long-term effects. Policy makers and farmers should promote conservation farming for sustainable agriculture and conservation.

Keywords: *animal biodiversity, conservation, conventional, Kenya, small-scale, sustainable agriculture.*

9. The potential of black soldier fly, *Hermetia illucens* larvae, to convert avocado organic waste into organic fertilizer for avocado seedling production

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

The avocado industry generates significant amounts of organic waste in the form of fruit pulp, skins, and leaves, which are typically discarded as waste and can contribute to environmental pollution. To address this issue, this project aims to investigate the potential of Black Soldier Fly (BSF) larvae Hermetia illucens (Linnaeus) ((Diptera, Stratiomyidae) to recycle different avocado organic waste streams into high-quality organic fertilizer for avocado seedling production. The project will involve the rearing of black soldier fly larvae on different avocado waste streams, including fruit pulp, skins, and leaves, to produce frass fertilizer. The nutrient composition of the frass will be analyzed, and its efficacy as a soil amendment and fertilizer for avocado seedling growth will be assessed through greenhouse experiments. The project will also explore the feasibility of scaling up the production of BSF larvae and frass fertilizer to meet the needs of avocado farmers. The potential benefits of this project are significant. By converting avocado organic waste into a valuable resource, the project can help reduce the environmental impact of the avocado industry while providing a sustainable and cost-effective approach for farmers to manage their waste. The use of BSF frass fertilizer can improve the nutrient content and quality of soil, enhancing the growth and health of avocado seedlings. This, in turn, can contribute to increased yields and profits for farmers. The project will employ a range of analytical and experimental methods, including chemical analysis, greenhouse experiments, and statistical analysis. The results of the project will provide valuable insights into the potential of BSF larvae to recycle different avocado organic waste streams into organic fertilizer and its impact on avocado seedling production. The ultimate goal of this project is to develop a sustainable and environmentally friendly approach to avocado waste management that benefits both the industry and the environment in a circular economy targeting the avocado value chain.

Keywords: *Avocado waste, Black soldier fly larvae, circular economy, Hermetia illucens, organic fertilizer.*

10. Inhibition of Ralstonia solanacearum by *Warburgia ugandensis* stem bark and leaf crude extracts obtained using organic solvents

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Bacterial wilt is one of the major diseases that affect solanaceae family and other crops caused by Ralstonia solanacearum that is a soil-borne bacterial pathogen. Many chemicals have been used to control bacteria but were ineffective. Treatment using various methods has been unsuccessful so far. W. ugandensis is an evergreen native to Africa and mostly found in East African countries belonging to the family canellaceae was tested against R. solanacearum. The study was done to determine the in vitro efficacy of W. ugandensis stem bark and leaf crude extracts against R. solanacearum. W. ugandensis stem barks and leaves were collected, cleaned, dried under shade and extracted using organic solvents viz. methanol, ethanol, dichloromethane and hexane. In vitro, antagonistic activities against R. solanacearum of all organic crude extracts of W. ugandensis were determined by standard agar well diffusion assay on Kelman's 2, 3, 5- Triphenyl tetrazolium Chloride medium in triplicates. Two-way analysis of variance (ANOVA) was used in the statistical analysis of the mean diameter inhibition zones. It was observed that the mean diameter inhibition zones of stem bark crude extracts were statistically significant difference to leaf crude extracts. All the organic solvents crude extracts of W. ugandensis were inhibitive against R. solanacearum. W. ugandensis leaf and stem bark crude extracts were subjected to a serial dilution (2.5 mg/ml to 0.5 mg/ml) using sterile DMSO as a diluent. The highest dilution of the plant extract that retained its inhibitory effect resulting in no growth (absence of turbidity) of a microorganism is recorded as the minimum inhibitory concentration (MIC) value of the extract.

Keywords: *Ralstonia solanacearum, crude extracts, Warburgia ugandensis, minimum inhibitory concentration*

11. Molecular characterization of *Ralstonia solanacearum* isolates from potatoes in Meru county

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Background: Bacterial wilt is among the most devastating diseases of potatoes worldwide. In Kenya, it has affected 77% of potato-growing regions and can result in up to 100% yield losses. It is caused by *Ralstonia solanacearum* which is one of the most important phytopathogenic bacteria in the world causing disease in more than 450 species of plants. Control of bacterial wilt is difficult due to a wide host range, high variability, the ability of the pathogen to survive in harsh environmental conditions, and the pathogen being soil born in nature. While bacterial wilt is a major threat to potato production, there is limited information available on the phylotype infecting potatoes in Meru County. The control measure requires information on the phylotypes of the pathogen in the affected area. **Methodology and Results:** To achieve this, 32 symptomatic potato samples were collected in selected regions in Meru County. The samples were subjected to a vascular streaming test, 29 samples were positive for the test, tubers were cleaned, vascular sections scoped, macerated, and cultured on Kelman's triphenyl tetrazolium chloride (TZC) media for 4 days at 28°C, 27 isolates showed large, elevated, fluidal, white colonies with pink centers on the TZC medium. Gram staining test was performed on the 27 isolates which indicated they were all gram-negative. The isolates were purified, and DNA was isolated by the modified CTAB method. Further PCR amplification using 759/760 primers generated 280bp PCR product which confirmed that the pathogen was *R. solanacearum*. All the isolates were identified to be phylotype II through multiplex PCR using the Nmult primer set.
Conclusion: The study recommends sequencing to determine the sequevars of the *R. solanacearum* phylotype in Meru. This will provide epidemiological inferences and a baseline for the development of a disease control strategy.

Keywords: *Bacterial wilt, potatoes, Ralstonia solanacearum, Phylotype II, Meru, CTAB Protocol*

12. In vivo studies on the effect of Warburgia ugandensis crude extracts against bacterial wilt in

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Tomato plants are affected by *R. solanacearum* that cause bacterial wilt which is the most devastating disease that has no cure. *Warburgia ugandensis* crude extract have exhibited biocontrol properties against pathogenic fungi and bacteria in animals but in plant the information is limited.

The current study was done to evaluate the in vivo efficacy of *W. ugandensis* crude extracts against *R. solanacearum* in tomato plants. *W. ugandensis* leaves and stem barks were collected, cleaned, dried and extracted using ethanol, methanol, hexane and dichloromethane. The obtained crude extracts were tested against *R. solanacearum* in the greenhouse. The treatments were done in triplicate. Statistical analysis of the data was carried out using analysis of variance. Tomato plants established in soil inoculated with *R. solanacearum* but treated with W. *ugandensis* stem bark dichloromethane crude extract showed bacterial wilt disease incidence and severity of 0% which was similar to positive control. Tomato plants established in soil inoculated with R. solanacearum but treated with *W. ugandensis* crude extract obtained from the leaf using ethanol had the highest average height of 62.50cm which was similar to positive control. The study propose that W. ugandensis crude extract have ability to be used as antibacterial biocontrol against *R. solanacearum*. Further research is important to determine the bioactive compounds against *R. solanacearum*.

Keywords: *Tomato, Ralstonia solancearum, incidence, severity, height, stem diameter and Warburgia ugandensis*

13. Effects of soil and water conservation techniques on sorghum yield, runoff and soil moisture content in Upper Eastern Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Water and nutrients are the main factors limiting grain production in the dry regions of sub-Saharan Africa. Given the onset of global climate change, the effects of drought stress on crop yield becomes more pronounced. Different approaches have been initiated to address this; however, they have been introduced at different times, in isolation, and at varying spatial scales. We evaluated four soil and water conservation technologies (mulching, minimum tillage, tied ridging and MBILI- intercrop) for three cropping seasons (short rains2020, long rains 2021, and short rains 2021) in the dry zones of central highlands of Kenya. The objectives were to determine effects of the technologies on run off, soil moisture content and to assess the influence of the technologies on sorghum yield. Experimental design was a randomized complete block with six treatments replicated four times. At the start of the experiment soil was sampled at 0-20cm and analysed for pH, N, P, K, C, Ca and Mg. Mulch was applied at a rate of 5t ha^{-1} and runoff sampled. Data were subjected to analysis of variance (ANOVA) using SAS version 9.4 and means separated using Tukey-Kramer Honest Significant Difference Test $P \leq 0.05$. Runoff, soil moisture and sorghum yield were significantly influenced by mulching. Run off was reduced by 50% ($p=0.01$) during long rains of 2021 and by 49% during short rains of 2021 under mulching treatment. During short rains of 2020 yield increased by 90% and 77% ($p=0.001$) under mulching and tied ridges respectively. The study highlights the importance of analyzing selected soil and water conservation technologies under rain fed conditions in response to declining food production with a focus on tied ridges and mulching.

Keywords: *Soil Conservation; Water conservation; Sorghum*

14. Evaluation of beef adulteration and KAP in Meru county

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Beef frauds is one of the leading illegal activities facing meat industry. Studies have indicated the use of various chemical adulterants to intentionally preserve beef, manipulate color of beef and as well as manipulation of consumers. The adulterants include; Sodium metabisulfite, Sudan dyes, formalin and organochlorine pesticides. The mentioned beef adulterants have been associated with various diseases such as cancer, asthma and some allergic reactions. This abstract discusses the knowledge, attitudes and practices of 40 beef handlers within 5 towns in Meru County who were supplied with an introductory letter and a structured questionnaire to submit their response on beef adulteration. The results from the questionnaires were subjected to Microsoft Excel for analysis. The results recorded that 61% of the beef handlers were > 30 years all being male (100%). Secondary education ranked the highest with 56% while beef handlers with no formal education ranked the lowest with 7%. 75% understood the meaning of beef adulteration with 100% having not used the beef adulterants. 70% were aware of health threat beef adulteration can pose to human health while 20% and 5% said no and unaware respectively. This maybe attributed to limited government policies anchored towards beef adulteration education. 90% responded that the government should undertake regular surveillance to reduce various beef frauds that results from adulteration. 20% had freezers as a means of preservation while 80% had no method of beef storage. This is due to the fact that most of the beef handlers were selling all their beef. This abstract recommends thorough government surveillance to curb illegal beef adulteration.

Keywords: *Beef adulteration, chemical adulterants, surveillance, Meru County, preservation, diseases*

15. Influence of nitrogen and spacing on growth and yield of chia (*Salvia hispanica*) in Meru county, Kenya

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Abstract

Chia (*Salvia hispanica* L.) is an emerging food crop in Kenya and has attracted a lot of attention due to its edible seeds and leaves. Despite its importance, Chia production is still very low due to scarce information on the agronomic management. A field experiment was conducted in the upper-midland zone Meru County, at the Meru University of Science and Technology, in two seasons (February-June 2021 and March-August 2021), to determine the influence of nitrogen fertilizer and spacing on growth and yield of Chia (*Salvia hispanica* L.). The experimental design was a randomized complete block design with a split plot arrangement with four nitrogen rates (0, 40, 80, 120 kg N ha^{-1}) as main plots and three plant spacing levels (30 cm x 15 cm, 30 cm x 30 cm, 50 cm x 50 cm) as the sub plots, replicated three times. Application of 120 kg N ha^{-1} significantly increased ($p \leq 0.05$) vegetative growth and seed yield of Chia. Chia height, number branches, stem diameter, number of leaves and total dry weight increased by 23-28%, 11-13%, 43-55%, 59-88% and 59-101%, respectively. 50 cm x 50 cm significantly increased ($p \leq 0.05$) vegetative growth. An increase of 7-8%, 27-74%, 36-45% and 73-107% was recorded in number of branches, number of leaves, stem diameter and dry weight, respectively. Chia yield per plant was significantly higher ($p \leq 0.05$) in 50 cm x 50 cm. However, when expressed per unit area, 15 cm x 30 cm significantly produced higher yields. The study recommends 120 kg N $ha^{-1}$and a 15 cm x 30 cm as the best option for Chia production in Kenya.

Keywords: *Height, Leaves, Branches, Dry weight, Stem, Production.*

16. Feasibility of the use of Chia Plant Crude Extract in the Control of Cowpea Weevil, *Callosobruchus maculatus* (Coleoptera: Chrysomelidae).

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Food security is of concern now more than ever. This is due to the increase in human population dwindling natural resources such as rivers and climate change. Not only are crops at risk in the field from pests, but in storage as well these pests pose a greater threat. These come in the form of bruchids, which can cause overwhelming damage and loss in a short amount of time. Bruchids Callosobruchus maculatus is a major pest in stored cow peas especially in the tropics where conditions of high temperatures and humidity favor it. Damage caused by Bruchids is weight loss, loss of germination potential, nutritional quality and quantity of cowpeas by feeding and producing contaminants such as excrement and eggs. Currently the most widely used method of cowpea weevil control is by use of insecticidal dusts which have a long residual activity. There is however a growing concern over safety to both the user and the environment, this necessitates the need for natural insecticides which are both safe and environmentally friendly. Bruchids will be reared in the lab and exposed to crude extracts of chia plant roots, leaves, flowers and seeds .Objectives include evaluation of the efficacy of use of chia plant parts and oil ,LD50,LC50 will be established for each of the extracts, to compare which chia plant part has the highest efficacy, to determine effect of the powders and oil on oviposition and adult emergence in bruchids. Performance will be measured by determination of weight loss of cowpeas, and mortalities of Bruchids.

Keywords: *Callosobruchus maculatus, chia, crude, damage, mortalities, residual.*

17. Growth, yield and quality of selected sweet potato (*Ipomoea batatas* [l.] lam.), lines under varying nutrient management levels

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Sweet Potato (*Ipomoea batatas* [L.]) has increasing potential as a food security crop in Kenya. However, its' production is comparatively low compared to its potential production which is attributed to drought conditions low soil fertility conditions alongside use of local landrace cultivars that are low yielding. A study was conducted at Meru University of Science and Technology to assess the performance of selected improved sweet potato lines under varying nutrient management conditions. Three sweet potato varieties were used; CIP 106988.1 (Naspot13) and CIP 112286.1(Margarette), and a farmer-preferred variety Kemb-10 and three NPK (17:17:17) levels: 0, 120 and 240kg NPK ha-1 were used. A randomized complete block design in a split plot with 3 replicates was used; varieties on the main plot and NPK levels as the subplots. Data collected data was analyzed using SAS 2007, and means were separated using the least significance difference test ($P \leq 0.05$). There was no significant interaction between NPK levels with the varieties. However, NPK levels significantly affected vine length, number of leaves and tuber yield. Sweet potato growth parameters (vine length, number of branches, number of leaves) and tuber yields (tuber length, tuber circumference, number of tubers and tuber fresh weight were significantly affected by different NPK levels applied. Application at 240 kg NPK ha-1 produced the highest vegetative growth and tuber yields. As the NPK rates were increased from 0 kg NPK ha-1, through 120kg NPK ha-1 to 240 kg NPK ha-1 both vegetative and tuber yields escalated. Naspot 13 and kemb 10 varieties performed well across the treatments as compared to Margarette hence these varieties could perhaps possess other superior attributes other than just the NPK treatments. Based on findings, NPK nutrients supply is fundamental to the crop. It is recommendable that farmers incorporate inorganic fertilizers in sweet potato farming for enhanced production.

Keywords: *Vine length, Number of leaves, Fresh tuber weight, Number of tubers, tuber circumference, NPK levels*

18. Categories and identities of feed resources for beef cattle calves in Tana river county, Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Livestock productivity increases with increase in number of animals in Kenya and other developing countries. This increment of livestock is dictated by the number of successful calvings and successful transition of young stock into mature animals. Good performance (growth and survival) of calves is influenced by the quantity and quality of feeds as well as feeding practices during preweaning and postweaning stages. In Tana River County (TRC) of Kenya, nomadic pastoralism is one of the key economic activities. A study was therefore conducted in Wenje division of TRC to identify the types and identities of feeds commonly fed to beef calves, their availability as well as calf feeding and watering strategies. The study utilized a cross sectional design using semi-structured questionnaires to collect data. The categories of feeds used for pre-weaned calves were natural pastures (100%), crop residues, fodder, and concentrates. The commonly utilized natural pastures were Dactyloctenium aegyptium (92%), Panicum virgatum (87%), Panicum maximum (42%), Commelina Africana (52%), Cyprus rotundus (33%), Cyonodon dactalon (7%) and Typha angustifolia (1%). Crop residues were used by 28.3% of farmers with green gram haulms and maize stovers being the most preferred. Only 1.7% used concentrates (sorghum grain meal) to supplement their calves. Among the most preferred fodder were sweet potato vines and green banana leaves. Feeding of post-weaned calves was via grazing on dry natural pastures. Slightly more than three quarters of farmers (77%) watered their calves once daily while only 3% watered their calves adlibitum. Proper calf nutrition in the area was constrained by climate change-induced feed scarcity which decreased quantity and quality of feeds offered to calves. Feed scarcity challenges can be mitigated by adopting technologies such as conservation of grasses in form of hay during periods of surplus, growth of drought tolerant crops, irrigation of fodder crops and ensiling such feeds.

Keywords: *ASAL, Beef Calf feeds, Climate change, watering frequencies Pre-weaning, Post-weaning*

CONFERENCE PAPERS

19. Attitudes and practices of meat traders and consumers in Meru Town and its environs towards illegal meat supplies

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

In Kenya the regulation of all aspects of trade in all types of meat including gazettement of food animals, gazettement and regulation of slaughter houses, transportation, branding and handling of meat are covered the meat control act cap 356. However, the increasing demand for meat expected to rise to 13.3 million tons per year by 2025 coupled with annual deficit projections of 300 000 metric tonnes, raise the possibility of meat from illegal sources finding its way to the food chain. This study was designed to find the attitudes and practices of meat traders and consumers in Meru Town and its environs towards adherence to the meat control regulations while selling or buying meat. The study employed a descriptive cross-sectional technique and involved the use of both primary and secondary data obtained from slaughterhouses, butcheries, veterinary department and the National Police service. A total of 52 respondents were interviewed using a structured questionnaire. Data analysis was done using statistical package for social sciences. The results revealed that the monthly consumption of meat in the area was 80-120 metric tonnes of beef, six tonnes of mutton/chevron and 25 tonnes of pork. Demographic characteristics of respondents revealed that trade in meat was dominated by males (83%) while the proportion of those who had attained at least a high school level of education was 75%. A total of 97% of the meat traders were able to show evidence of meat inspection stamps and meat transport authorization documents. However, 30% of meat consumers indicated that they were willing and had actually bought meat from unauthorized sources such as home-slaughtered animals. The study shows that while compliance with meat control regulations by meat traders is good, consumers need to be educated on the dangers to public health of buying meat from unauthorized sources.

Keywords: *Meat, meat control regulations, Public health, trade in meat, Meru Town*

20. An Investigation into the paradox of food security, floods and drought in the Lower Tana River Region, Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Food security is captured directly in Goal Number No. 1 and in related other goals namely, two, three and six of the United Nations Sustainable Development Goals (SDGs). Sustainable development is the development that satisfies the needs of the present generation without compromising that of future generations. The wellbeing of populations depends on availability of food in terms of quality, adequate quantity and fair distribution. It is with this in mind that this study was carried out in the lower Tana River Region. The specific study area sampled was Zubaki sub-location. The lower Tana River region in general suffers from both annual floods and drought. During the wet seasons there is excess water, floods are common and water flows freely, while during the dry season, there is scarcity of water. Floods and drought affect the livelihoods of local communities and result in scarcity of food and malnutrition among children. The general objective of this study was to investigate the paradox of food security amidst excess water and floods on one hand and prolonged drought in the lower Tana River Region. The specific objectives included: i) to investigate the magnitude of floods in the area, ii) to investigate the frequency and intensity of drought; iii) to establish the effects of alternating episodes of drought and floods on food security in the Tana River Region, and; iv) to establish local community, County government and other stakeholder initiatives in addressing and management of excess water during floods and water scarcity during the dry season for sustainability. In terms of methodology, the study used the case study method and judgmental sampling to acquire data. A total of one hundred respondents including local community members and Key Informants (KIs) were sampled purposively and enlisted for the study. Tools for data collection included Observation and Key Informant guides. Both primary and secondary data and sources were used. Primary data was obtained through Key Informant Interviews and Observation. Secondary data was obtained though Desktop Search and application of Space and Geospatial Technologies in the form of Satellite Remote Sensing Images, Aerial Photographs and Google Earth. Data was analyzed using descriptive statistics. Microsoft Excel was employed in data manipulation and management. Results are presented in the form of statistical and non-statistical narratives, graphs and tables. The results indicate that the lower Tana River region suffers from both extreme weather and climate events in the form of floods and extended periods of drought. The region's food security is compromised both during the dry and wet seasons. Local communities and the County government have put in place management plans and strategies and incorporated other stakeholders to initiate projects aimed at minimizing the effects of floods and drought, while enhancing the capacity of local communities in agriculture and food production. Strategies have also been put in place to enhance sustainable supply of drinking and irrigation water during the dry and wet seasons, respectively. The study suggests that there is need for concerted efforts and application of both indigenous and modern technologies to address the challenges encountered in management of these extreme events.

Key Words: *Food Security, Floods, Drought; Indigenous Knowledge; Geospatial Technologies, Sustainable Development Goals*

21. Cockroach Entomoculture; A Sustainable Source of Chicken Feeds, Income Generation and Organic Wastes Management

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Abstract

Entomophagy has gained popularity as a novel approach to addressing food and nutrition insecurity, particularly in sub-tropical and tropical countries. Cockroaches, for example, have the potential to alleviate nutritional deficiencies, as well as the erratic supply of protein in feeds. They can also be reared on locally available organic substrates. This study investigated growth performance and survival of Blattella germanica reared on locally available organic matter substrates as treatments; - spent brewers' grain (Treatment A), Treatment B consisting of (40%: wheat bran: 40% spent brewers' grain: 20 % *Caridina nilotica*), wheat bran (Treatment C), and *C. nilotica* (Treatment D) set up in a completely randomised design (CRD). Each treatment was replicated four times, while in each replicate 20-30 nymphs were reared for forty-two days. Feed intake for all the treatments was not significantly different but there was significant difference in mature weight, average daily weight gain, live weight, and survival during rearing period. The highest mature weight, overall performance index, survival was 90.25mg, 197.35, 96% recorded in treatment B. Based on these findings, a single feed as used in this study was inferior to the composite (treatment B) in all parameters of growth performance and survival thus it could be suitable substrate for mass production of *B. germanica* for feed and food.

Keywords: *Cockroach, feed intake, Growth rate*

22. Evaluation of the potential of using camel meat to process meat sausages, meatballs and burgers

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Abstract

Due to the climate change, pastoralists in Northern Kenya are opting to replace other livestock with camels that can survive adverse climatic conditions when the other livestock succumb. Despite the resilience of the camels, there are limited processed camel meat products in the market. This leads to camel farmers to accrue very limited returns from the non-dairy camels. The objective of this study was to evaluate the potential of processing various meat products including; sausages, meat balls and burgers from camel meat managed under feed supplementation and those managed without feed supplementation. Ten camels were reared in two methods of management in Ngaremara, Isiolo county, Kenya. One set of five camels was through feed supplementation and the other set was conventionally fed through browsing only. After three months of management, the camels were slaughtered. The meat was processed into sausages, meat balls and burgers at the Centre of excellence in Camel Research at Meru University of Science and Technology. Their nutritional and sensory properties evaluated through focus group discussions (FDGs). From the study, it was possible to process spicy and non-spicy sausages, meat balls and burgers from camel meat. The products form supplemented camels recorded higher fat content compared to the conventionally fed camel meat products. Vacuum packaging of the products extended shelf-life without refrigeration for up to 3 months which presents great opportunity since Semi-Arid regions are off-grid.

Keywords: *Camel meat, Camel meat sausages, camel meat balls, camel meat burger, vacuum packaging*

23. Comparative evaluation of two DNA isolation protocols for PCR detection in processed fruit juices

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Abstract

Background: Fruits are relatively easy to authenticate morphologically when intact and fresh. However, the act of processing them into juice gives rise to the possibility of substitution with cheaper products. For this reason, processed food products authentication is primarily significant for consumers, industries, and regulatory agencies. Effective, reliable, and rapid food authentication methods are valuable tools for identification of natural fruit pulp in reconstituted fruit juices to ensure juice quality and safety hence mitigate adulteration and fraud. Molecular-based methods have recently acquired immense priority for their ability to pick food material source at any stage along the food supply chain. **Methodology:** This study focused on evaluation of two DNA isolation protocols from processed plant products specifically reconstituted juices. The robustness and sensitivity of the protocol for genomic DNA recovery from processed juices determined DNA quality and purity. This is because the degradation and chemical additives associated with processed fruit juice samples directly acted as PCR inhibitors. **Results:** Two genomic DNA extraction protocols; CTAB and SDS were tested for isolation of DNA from processed fruit juices. The CTAB and SDS methods were able to recover genomic DNA of high quality and purity appropriate for application in various PCR analyses with little limitations in the CTAB protocol. The concentration of the DNA was determined using the Nano-drop spectrophotometer in $\mu g/\mu l$ by calculating the absorbance at wavelengths (A260/A280nm: A260/A230nm). The quality of the extracted DNA was evaluated on 0.8% agarose gel electrophoresis stained with $1\mu l$ ethidium bromide and observation of bands integrity done in UV-trans-illuminator machine (Quantum ST4, France). PCR amplification was done using universal primers (rbcL-650 bp, psbA-323 bp) that target the plant chloroplast genome). DNA extracted from SDS method exhibited robustness and ease during PCR amplification process. The amplified bands quality and integrity were evaluated on 1.5% agarose gel stained with $1\mu l$ ethidium bromide. **Conclusion:** Results from the study show an innovative experimental methodology that efficiently extracts, amplify, and identify natural fruit juice pulp by utilizing universal biomarkers to test for quality and authenticity of reconstituted fruit juices in Kenyan markets.

Keywords: *rbcL, psbA, CTAB, Fruit-Juice, SDS, Biomarkers, PCR and DNA.*

24. Comparison of properties of deep-fried and microwaved potato chips

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Introduction: Potato chips is a snack which is taken mainly on-the-go or as a fast food. Deep frying is the method of choice of preparing chips since ancient times but it has been shown to produce high fat products associated with long preparation time, high energy requirements and a number of health risk factors. It's hypothesized that microwaving will produce a low-fat potato chip than deep frying. **Objective:** The aim of the study was to prepare potato chips through deep frying and domestic microwaving and to compare nutritional compositional and sensory properties. **Methods:** The potato chips slabs 1x1x4 cm were prepared in Food Science laboratories of Meru University of Science and Technology. A 180g of the chips were either deep fried or microwaved. The proximate analysis was carried out using Association of Official Analytical Chemists (AOAC) methods to determine fat content, ash, fiber, moisture content, and protein. Sensory evaluation was carried out using fourteen (14) untrained panelists. **Results**: Microwaving method of cooking produced chips low in fat (1.55%) compared to deep fried chips (9.87%). The frying took 12 minutes while microwaving took shorter time of 9 minutes. The microwaved chips had higher moisture content (61.74%) than deep fried chips (51.54%). Other nutritional components were not significantly affected by the method of preparation. Sensory panelist overall preferred the deep-fried chips than microwaved perhaps due to high fat content. Deep fried chips taste was rate highest while texture of microwaved preferred most. The colour of chips prepared by both methods was perceived to be similar. **Conclusions:** It is possible to prepare potato chips in a domestic microwave oven. Microwaving produces chips lower in fat than the deep frying. Microwaving also takes less time than deep frying thus saving time and money.

Keywords: *microwaving chips, microwave, deep frying, sensory evaluation*

25. Determinants of sensor-based irrigation system adoption by small-holder farmers in Tharaka-Nithi County, Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Sensor-based irrigation systems have the potential to revolutionize small-scale agriculture in water-deficient regions, yet their adoption rates remain low. In this study, we examined key factors that influence the adoption of sensor-based irrigation system (SBIS) by small-holder farmers in Tharaka-Nithi, Kenya. We conducted a cross-sectional survey of 50 small-holder farmers through purposive and convenient sampling in Mukothima and Nkondi in Tharaka-Nithi County to assess their demography, knowledge, attitudes, and practices related to the sensor-based irrigation system. The results showed that while farmers were generally aware of the benefits of sensor-based irrigation, including increased yields and water conservation, only 11.3% had adopted the technology. The majority of farmers (88.7%) had never heard of the SBIS before the KCSAP project. Our analysis revealed that socio-economic factors, such as age, education, and income, were significant predictors of adoption. The majority (77.8%) of SBIS adopters were those below 55 years having attained form four education and higher levels with a percentage of 68.2%. Additionally, farmers with greater technical capacity, such as experience with plumbing skills and access to extension services, were more likely to adopt. Finally, we found that produce market conditions were also important. Farmers who planted high-value crops and had access to reliable markets for their crops were more likely to adopt sensor-based irrigation, as they saw the technology as a way to increase their yields and meet market demand. Overall, our study highlights the need for targeted interventions to increase the adoption of sensor-based irrigation among small-holder farmers in Tharaka-Nithi County. Policies that address socio-economic disparities, improve technical capacity, and strengthen market linkages could help to promote the widespread adoption of this technology and improve agricultural productivity and food security in Kenya.

Keywords: *Sensor-based irrigation system, KCSAP, Small-holder farmer, Technical capacity*

26. Effect of fermentation on chemical and microbial properties of Liquid Organic Fertilizer from *Tithonia diversifolia*

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Tithonia diversifolia commonly known as mexican sunflower has been widely used as a green manure for soil fertilization and crop pests control. To facilitate efficient storage and transport, attempts have been made to extract Tithonia Liquid Organic Fertilizer (LOF). However, little is known about the properties of LOF during fermentation and storage. This study focuses on the effect of fermentation on the chemical and microbial properties of LOF from *Tithonia diversifolia*. The objectives were to investigate the impact of fermentation on the physical-chemical properties of Tithonia LOF, assess the microbial population in Tithonia LOF under different storage conditions, and evaluate the effects of Tithonia LOF on kale crop growth. The methodology involved fermenting 2 kg of Tithonia leaves in 20 liters of water for two weeks, maintaining a leaf-water ratio of 1:10. The fermented extract was filtered and divided into 36 one-liter specimen jars. Half of the specimens were fermented in a refrigerator at temperatures ranging from 0°C to 5°C, while the other half were fermented at room temperature (23°C). Various laboratory analyses were conducted to determine the nutritional chemical content of the LOF, including nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), and total reducing sugars. The study revealed that the pH of the LOF significantly changed during storage, with a stronger correlation observed in room temperature storage compared to fridge storage. However, there were no significant changes in the chemical properties of the LOF under both storage conditions. Notably, the room-stored LOF showed a negative correlation with storage time, suggesting a reduction in plant nutrients over time. The microbial count in the LOF remained relatively stable under both storage temperature experiments. Furthermore, the treatment of kale plants with LOF stored at room temperature exhibited greater growth variance compared to the fridge-stored and control treatments. In conclusion, this study demonstrates the influence of fermentation on the quality parameters of Tithonia LOF. The pH of the LOF changed significantly during storage, while the chemical properties remained relatively stable. The microbial count in the LOF did not change significantly under different storage conditions. These findings contribute to a better understanding of the effects of fermentation at different temperatures on liquid organic fertilizer derived from *Tithonia diversifolia*. A further study on the effect of varying concentrations of Tithonia LOF on vegetable crops is recommended.

Keywords: *Liquid Organic Fertilizer (LOF), Anaerobic fermentation, Chemical properties, Microbial properties*

27. Evaluation of the potential of producing sugarcane juice wine and determining physicochemical properties.

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Kenya is a major producer of sugarcane; however, the sugarcane is only processed into table sugar and other byproducts including molasses. Sugarcane juice is becoming popular with street vendors since it considered to be natural with perceived nutritional and healthy benefits. The objective of this study was to evaluate the potential of producing sugarcane juice from the and determining the physicochemical properties including pH, alcohol content, titratable acidity, brix and colour. Sugarcane juice was purchased from local vendors and transported to Meru University of Science and Technology, Department of Food Science laboratories for further processing. The juice was fermented anaerobically using saccharomyces cerevisiae at a rate of 2% for up to 16 days. The physico-chemical properties including brix, pH, titratable acidity (TTA), and specific gravity were monitored after every four days. All the analysis were carried out in triplicate.During the fermentation period, the pH decreased from 5.6 to 3.0. The titratable acidity increased from 0.005 to 0.04%. The specific gravity decreased from 1.05 to 0.98. Brix decreased from 20 to 3% while the alcohol content increased from 0.03 to 11. 57%. From the study, its possible to produce sugar cane wine with of acceptable quality and alcohol content of 11.57% within 14 days.

Keywords: *Sugar cane, Sugar cane wine, Alcohol content, Brix*

28. Livestock rearing along the Meru-Isiolo Migratory corridor: a case study of Muthara ward in Tigania East subcounty, Meru

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

The arid and semi-arid lands (ASALs) contribute up to 80% of Kenya's beef requirements in spite of the prevailing harsh climate which necessitates nomadic pastoralism production system. During droughts, pastoralists migrate with their cattle from place to place while searching for scarce water and pasture resources. Muthara Ward in Tigania East sub-County lies along the Isiolo-Meru cattle migratory corridor. This study was conceived to assess the views of the local Muthara ward herdsmen on the prevalence of tickborne diseases and other constraints to livestock production in the area. A cross-sectional survey was done involving 120 households/farms selected using simple random sampling. The farmers were interviewed using a structured questionnaire covering diagnosis, preferred veterinary service provider and control aspects of TBDs; they were also required to identify any other key constraints to rearing of livestock in the area. The results showed that the proportion of herdsmen who were able to correctly diagnose TBDs including anaplasmosis, East Coast Fever, babesiosis and heart water ranged from 32-48%; these farmers were also able to correctly identify the rainy season months of October- December and April- June as the periods in which the risk of cattle morbidity and mortality from TBDs was highest ($p < 0.05$). A total of 65% of the herdsmen reported that they did not seek diagnostic and treatment services from veterinary personnel in Government or Private practice, instead choosing to rely on themselves or village elders for these services. A sizeable proportion of the herdsmen. 35%, said that they had lost livestock and/or loved ones to cattle rustling. Cattle rustling was identified to be another significant constraint, affecting over 60% of the people. These results show that pastoralists need sensitization on danger of misuse of veterinary drugs, the need for regular and consistent control of ticks as well as animal health extension services and security in order to improve livestock production.

Keywords: *Tickborne diseases, cattle rustling, pasture, nomadic pastoralism*

29. Optimized polymerase chain Reaction (PCR) based method for authentication of processed fruit juices

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Background: Food identification and authentication is currently a subject of critical concern to food regulating authorities, industries, consumer and markets. The call for food authentication is due to increase in unscrupulous food processors and manufacturers who intentionally carry out incorrect labelling of foodstuffs for commercial gain at the expense of consumer health. Fruits are relatively easy to authenticate morphologically when intact and fresh. However, the act of processing them into juice gives rise to the possibility of substitution with cheaper products. The substitutions pose significant health risk such as food allergen to consumers. Increased fruit juice adulterations and, mislabeling has led to the search for advanced analytical techniques for fruit juice authentication. The PCR based methods have been proposed to be useful techniques for analysis of food ingredients. They are preferred for identifying origin of species in processed fruits, and food allergens. This research focused on optimization and validation of the PCR based protocol for the detection of adulteration in fresh and processed fruit juice due to their high sensitivity and specificity and rapid processing time. **Results:** The optimized PCR amplification protocol was carried out using universal primers (rbcL-650 bp and psbA-323 bp) that targeted the plant chloroplast genome). DNA extracted from the modified SDS protocol exhibited robustness and ease during PCR amplification process. The amplified bands quality and integrity were evaluated on 1.5% agarose gel stained with 1μl ethidium bromide. The protocol manifested high sensitivity and robustness in targeting and confirming the presence of natural fruit pulp in the processed fruit juices. **Conclusion:** Modified Sodium Dodecyl Sulphonate (SDS) protocol extracted quality and pure DNA which was subsequently used in optimizing an innovative experimental PCR based methodology that utilized universal biomarkers to test for quality and authenticity of natural and reconstituted fruit juices in Kenyan markets.

Keywords: *Adulteration, PCR, DNA, Primer, fruit pulp, Protocol*

30. Plant-based milk: are they healthier and more nutritious compared to animal-based milk?

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Background: Human nutrition trends are changing with consumers making more informed and conscious decisions regarding their diets. This has driven an unprecedented increase in the choice of plant-based milk as they are perceived to be healthier. Plant-based milk is extracted from milled plant raw material with water. Additional ingredients are usually incorporated to improve the flavor, stability and nutritional content of the milk. This study assessed the types of plant-based milk retailing in Kenya, their nutritional value and prices compared to animal milk products. Methods: An online search from Kenyan retailer websites and mobile based applications was conducted. Variety, composition regarding macronutrient and micronutrient composition, and price was analyzed quantitatively and qualitatively. The plant-based milk products, their nutrition data and their prices was tabulated. RESULTS: Plant-based milk were categorized as: nut-based (almond and hazelnut), coconut-based, legume-based (soya bean), grain-based (rice, quinoa and oats) or mixed category (oats and almond, and, coconut and almond milk). Cow milk had the highest protein content of ≥3% which was comparable to soya milk. Most plant based milk contained ≤1% protein. Coconut milk had the highest fat content followed by cow's milk. Cow milk contained more energy; carbohydrate; calcium, phosphorous, vitamins C, B2, and A than most plant-based milk. Quinoa milk was the most expensive (KShs. 700/litre) followed by hazelnut milk (KShs. 600/litre), with soya milk being the cheapest variant (KShs. 500/litre). Plant-based milk cost 4-5 times more than cow's milk, which retails at KShs 120/litre. Conclusion: Our results show that cow milk is more nutritious compared to the analyzed plant-based milk. Consumers may be paying a higher price for less nutritious products! Complete replacement of cow milk with plant-based milk without modifying overall diets may lead to nutritional deficiencies of some key nutrients.

Keywords: *plant-based milk, almond milk, soya milk, hazelnut milk, coconut milk*

31. Status of wheat production in selected Arid and Semi-Arid Areas of Narok County, Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Wheat (triticum Aestivum) is the second most important cereal crop in Kenya after maize. Narok county of Kenya is one of the leading counties in wheat production contributing over 80 % of the total produce however the crop has been threatened by low yields and reduced acreage, slow adoption or none at all of the improved wheat varieties developed for dry areas. Farming communities in Narok are predominantly pastoralists who rear sheep and goats as dry areas of Narok (60%) receive low rainfall. This study was carried out in in two sub counties of Narok South and Narok East which comprise of farmers who predominantly produce wheat. A baseline survey was done where information on land size, education level, yields, and varieties of wheat planted marketing, gender and group membership was captured. Sampling was purposive and a total of 60 farmers were interviewed by use of both structured and open-ended questionnaires. Five new wheat varieties were introduced to the farmers. From the findings it was noted that 93.2% of farmers from both sub counties complimented sheep rearing with wheat production, the rest 6.8% either rearing or planting wheat. Selling of wheat was mainly done by the farmers individually at the farm gate, with sheep being sold in open air markets on specific days of the week. Low input use and poor agronomic practices led to low yields. Wheat farming and livestock rearing was mainly done by the male headed household Head (MHH) with only 2% of the interviewed females owning livestock.

Keywords: *Gender, Marketing, Production, wheat production*.

32. The impact of feed supplementation and conventional feeding of camels on functional properties of spray dried camel milk powder

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

This study investigated the effects of two methods of camel feeding systems, i.e. feed supplementation and conventional feeding system on the proximate, yield and functional properties of spray dried camel milk powder. The supplementation and conventional camel feeding was carried out in Isiolo county, Kenya. Milk was spray dried at the Center of Excellence in camel research of Meru University of Science and Technology. The proximate analysis included moisture, ash, protein and fat while functional properties tested were dispersibility, loose and tapped bulk density, hausner ratio, carr's index, solubility, hygroscopicity and color. The proximate, yield and functional properties were compared between supplemented and non-supplemented camel milk. Significant differences ($P < 0.001$) were noted for mean values of ash, fat protein, yield, dispersibility, loose and tapped bulk density, carr's index and solubility. Milk powder processed using supplemented milk had higher levels of ash (6.79%), protein (25.25%) and fat (45.83%) compared to ash, protein and fat contents of non-supplemented camel milk powder which were 5.49%, 22.82 and 25.54% respectively. Non-supplemented milk powder had a higher solubility level of 83.21% compared to 76.60% noted for supplemented camel milk powder. The dispersibility of non-supplemented and supplemented milk powder was found to be 25.70% and 21.48% respectively. The loose densities for supplemented and non-supplemented camel milk powders were 0.34 and 0.2 g.cc-1 whereas the tapped densities were 0.53 and 0.43 g.cc-1 respectively. The variability in loose and tapped densities contributed to the differences noted in dispersibility of the powders. The study observed that feed supplementation of camels were associated with increase in the level of fat, protein and ash in the spray dried milk powder. This increment especially in the fat content increases the bulk densities and lowers the dispersibility and solubility of camel milk powder.

Keywords: *camel milk powder; camel supplemented camel feeding; camel milk powder solubility; camel feeds*

33. Use of plant-based milk to improve physico-chemical properties of camel milk yoghurt.

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

According to FAO, Kenya is the leading producer of the camel milk in the world. However, there are limited processed camel milk products in the market including yoghurt. Yoghurt produced from camel milk is considered to be of low viscosity; receiving poor consumer acceptability. The objective of this study was to evaluate the possibility of improving the viscosity and other physico-chemical properties of camel milk yoghurt by blending plant-based milk i.e. coconut milk with camel milk to process yoghurt and determine the physico-chemical properties. Four samples of yoghurt formulations were processed from camel and coconut milk as either 100% camel milk -control, 100% coconut milk, 70:30 and 50:50% camel to coconut milk respectively. The yoghurt was analysed for pH, Titratable acidity (TTA), Water Holding Capacity (WHC), syneresis and viscosity hourly for up to 6 hours during fermentation and after 7, 14 and 21 days under refrigerated storage. The pH of all yoghurts decreased with increasing fermentation time from 0-6 hours while TTA increased. The 100% coconut milk yogurt recorded lowest syneresis of 1.23 while camel milk recorded the highest of 11.4% indicating coconut milk improved the physicochemical properties of camel milk yoghurt. The 100% coconut milk yoghurt recorded the highest viscosity of 0.376 followed by 50:50 blend recording 0.239, 70:30 blend recording 0.157 while 100% camel milk yoghurt recorded lowest viscosity of 0.0391 Pa.s. Coconut milk aided in viscosity increase due to increase in total solids. From the study, coconut milk yoghurt can be used to improve the viscosity and other physico-chemical properties of camel milk yoghurt while conferring the nutritional benefits of being plant-based.

Keywords: *Camel milk yoghurt, plant-based milk, viscosity, Syneresis*

34. Validation study of the use of sensor based irrigation and biochar in Tharaka nithi county

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Sensor-based technologies have been applied in other parts of the world including Tanzania, Malawi, Australia and South Africa with impressive returns to investment in irrigation sub-sector. In addition, integrated research on soil parameters and water balance in drier parts of Kenya has the potential of increasing food security and nutrition and the share of irrigation value in the market. This collaborative research was therefore aimed at validating sensor-based irrigation and application of rice husk biochar in Tharaka-Nithi. Field trials with water melon (Citrullus lanatus), onion (Allium cepa), and tomato (Lycopersicon esculentum Mill.) were carried out at Mukothima between April 2021 and November 2022. The field trials were laid out in completely randomized block design (RCBD) for watermelon and tomato with three irrigation systems; sensor-based irrigation, drip irrigation and furrow irrigation. The onion field trials were laid out in split plot design in RCBD with the main plot being the three irrigation systems and sub-plot being 0, 100 and 200 g biochar/plant. The field trials had three replications and were repeated over three seasons. Data was collected on plant growth, yield, soil moisture and amount of irrigation water supplied. Vegetative growth of water melon was similar between the irrigation systems. Similarly, the fruit yield of water melon was statistically similar in the three irrigation systems. Soil moisture was significantly higher under furrow irrigation than sensor or drip in some instances. Significantly less water was applied under sensor irrigation. It was concluded that the sensor-based irrigation can be used during production of watermelon in Tharaka-Nithi and can save up to about 76% of the water used in drip irrigation. Overall, plant height and number and bulb weight of leaves of onion were similar between the irrigation systems. The sensor-based irrigation had the lowest volumes of water supplied while the furrow had the highest amounts. It was concluded that used of sensor-based irrigation in Tharaka-Nithi can save up to 73% of the irrigation water supplied during drip irrigation. Generally, growth and yield of onion was not significantly influenced by application of biochar. However, biochar application increased soil moisture in limited cases, and reduced the soil bulk density. Further long-term evaluations are needed to clarify the benefits of biochar application, especially in terms of soil moisture holding capacity and soil bulk density. Plant growth and yield of tomato was largely similar between irrigation systems. The sensor-based irrigation significantly reduced the volume of irrigation water applied. It was concluded that sensor-based irrigation during tomato production can save up to 75% irrigation used during irrigation in Tharaka-Nithi. These findings were supported by farmers' evaluations. The farmers indicated their readiness to apply the sensor-based irrigation. The County Departments of Agriculture, Irrigation, and Fisheries have pledged to support the farmers activities towards irrigation and fish rearing.

Keywords: *Sensor-based, Irrigation, Biochar*

35. Characterization of factors influencing dairy milk production in Nkomo Ward of Tigania West Subcounty, Meru.

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Cattle Milk is a highly nutritious food which contributes importantly to healthy diets, especially of the vulnerable low-income rural populations such as children, women, adolescents and the elderly. Although it constitutes a large proportion of the total world milk production, factors which determine its production and availability to rural households vary from area to area and therefore have potential to influence household food security. A cross-sectional study was therefore carried out in Nkomo Ward, Tigania west subcounty, Meru County to characterize the factors which influence cattle milk production and availability at farm/household level. A total of 44 farms were sampled using systematic random sampling where every 14th household was sampled. In each of the farms', structured questionnaires were administered to obtain information on various aspects of dairy production; feed samples were also collected for laboratory analysis. A majority of the residents, 39/44 (90.9%), confirmed that they kept cattle. However, the herd sizes comprised of only 1-4 cattle / farm in 29/39 (74.4 %) of these farms. A majority of the farmers, 65.1%, relied exclusively on extensive cattle production system in which cattle were allowed to graze freely in communal rangelands. Not surprisingly, therefore, the average milk production in Nkomo ward was only 3.1628 litres/farm /day. Growing of cultivated pastures made up of napier grass, lucerne and sweet potato vines was practiced by 35.9 % of the farmers and was positively correlated with the level of education attained, land sizes and number of years spent in cattle rearing. A total of 26.1 % of the residents of Nkomo ward relied on milk purchased from vendors or their neighbors for their household needs. In summary, more needs to be done to improve milk production in the area.

Keywords: *dairy production, productivity, crude protein, pastures*

36. 1-Octen-3-ol is formed from its primeveroside after mechanical wounding of soybean leaves

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Abstract

Key message: Hydrolysis of 1-octen-3-yl β-primeveroside implemented by a system with high structure-specificity is accountable for the rapid formation of 1-octen-3-ol from soybean leaves after mechanical wounding.

1-Octen-3-ol is a volatile compound ubiquitous in fungi; however, a subset of plant species also has the ability to form 1-octen-3-ol. Owing to its volatile nature, it has been anticipated that 1-octen-3-ol is associated with the effort of the emitter to control the behavior of the surrounding organisms; however, its ecological significance and the enzymes involved in its biosynthesis have not been fully elucidated, particularly in plants. We previously found that soybean (Glycine max) seeds contain 1-octen-3-yl β-primeveroside (pri). To elucidate the physiological significance and the biosynthesis of 1-octen-3-ol in plants, changes in the amount of 1-octen-3-yl pri during development of soybean plants was examined. A high 1-octen-3-yl pri level was found in young developing green organs, such as young leaves and sepals. Treatment of soybean leaves with methyl jasmonates resulted in a significant increase in the amount of 1-octen-3-yl pri; suggesting its involvement in defense responses. Although 1-octen-3-ol was below the detection limit in intact soybean leaves, mechanical damage to the leaves caused rapid hydrolysis of almost all 1-octen-3-yl pri to liberate volatile 1-octen-3-ol. Under the same conditions, the other glycosides, including isoflavone glycoside and linalool diglycoside, were hardly hydrolyzed. Therefore, the enzyme system to liberate aglycone from glycosides in soybean leaves should have strict substrate specificity. 1-Octen-3-yl pri might function as a storage form of volatile 1-octen-3-ol for immediate response against stresses accompanying tissue wounding.

Keywords: *1-octen-3-yl β-primeveroside, 1-octen-3-ol, isoflavone glycosides, methyl jasmonate, Glycine max*

37. Genotype x environment and yield stability of popular maize varieties in medium altitude climatic condition in Western Kenya

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Subtheme: Agriculture, Food Security, Safety and Bio-security

Abstract

Release of commercial maize varieties is based on their performance under optimal fertilizer and management regime. Maize varieties that can overcome the effects of climate change are those that perform well under diverse production niches. The objective of this study was to determine the performance of the commercial under diverse production conditions. Ten popular commercial maize varieties in medium altitude agro ecological zone (AEZ) were evaluated using mother-baby trials on-station and on-farm under optimum and no fertilizer application. Variety, fertilizer, site and year main effects and their interaction mean squares were significant ($P<0.05$). These indicate significant genotypic differences between the varieties, effect of fertilizer use, test location, year and genotype x environment interaction on grain yield. This imply selection of superior genotypes should not only be based on their mean performance but also on their stability across production niches. All varieties responded to fertilizer application with mean increase in yield ranging between 42% to 99% irrespective of site and year indicating the need of farmers to apply fertilizer in order to realize good yields. Three varieties H624 (5.5t/ha), KH600-14E (4.9t/ha) and H628 (4.6t/ha) produced above average mean grain yield while H624, KH600-14E, H628, H614D and H6218 in ascending order ranked top five overall across all production niches studied. H614D and H624 with bi value of 0.92 and 0.91 (closest to one) and with the lowest absolute (bi-1) values of 0.08 and 0.09, respectively are the most stable genotypes across all production niches studied. H624 was therefore both high yielding and stable variety. It is therefore climate change resilient and should be recommended to farmers.

Keywords: *Maize varieties, fertilizer use, genotype x environment interaction (G x E), stability*

SUBTHEME 2: Climate change: adaptation, mitigation, resilience

PRE-CONFERENCE PAPERS

38. The logging moratorium in Kenya and its impacts on community forests associations: a case study of Meru county state forests

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Subtheme: Climate change: adaptation, mitigation, resilience

Abstract

The Forest Sector is Key to Kenya's social and economic wellbeing since most of the economic activities rely on environmental based resources for their sustenance. The Forest Conservation and Management Act, 2016, provides for the conservation and management of public, community and private forests. This has brought a paradigm shift in forest management from central command to involving various stakeholders. Adequate stakeholders engagement in the management of forest resources, results into minimal conflicts. Local involvement promotes a sense of ownership to the Forest Adjacent Communities Consequently, reducing conflicts in the management of the forest resources. This dissertation focuses on the impacts of logging moratorium on Community Forest Associations in our state forests, with a focus of two CFAs in Meru County. It uses both quantitative and qualitative research design. In depth literature review was, used to enrich the research findings. Data was collected from 289 Mucheene and Ruthumbi CFA residents. Their views on the impacts of logging moratorium to the CFA were also documented. The study found out that forest conservation cannot be delinked from livelihood improvement by the Forest Adjacent Communities. There lies difficulties by the area population of the study area to support their life demands with moratorium in place owing to the fact that they highly depended on the forest to support their livelihoods pre moratorium. The study found out that 93.4 % of the respondents believes that legal logging promotes job creation in the sawmill value chain circular economy. Findings are expected, to inform policy on forest conservation in collaboration with the FAC. The study recommends that the Government should adapt a regulation mechanism that safeguards logging in the extension forest of the community whenever there is an ongoing logging moratorium in the public forest.

Keywords: *Communities, Forests, Logging, Moratorium, Livelihoods, Stakeholders engagement.*

39. Evaluation of soil physico-chemical properties and biodiversity on conservation and conventional smallholder farms in Kenya

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Subtheme: Climate change: adaptation, mitigation, resilience

Abstract

Background: Soil biodiversity is essential for maintaining good soil for sustainable crop production. However, different farming practices may have differing effects on soil biodiversity and the physicochemical characteristics of the soil. Conflicting information exists about the effects of conservation and conventional farming practices on soil biodiversity and soil physicochemical properties. Knowledge on the impact of soil biodiversity, and physicochemical properties to soil health aids in developing suitable farming methods for sustainable agriculture. Objective: This study evaluated soil physicochemical properties and biodiversity on conservation and conventional small holder farms in Meru, Tharaka Nithi, Kirinyaga, and Laikipia counties in Kenya. **Methods:** Samples were collected from 20 conservation and 20 conventional farms in the four counties. Soil sampled at 0–30 cm depth was analyzed for physical and chemical properties. Soil organisms' species richness and organisms' diversity was analyzed using Margalef's Diversity Index and Shannon's Index of Diversity respectively. Plot quadrats in combination with transect line sampling design was applied in all farms. Pitfall-traps and heat extraction were used to extract earthworms, termites, and ants from the soil. Different analytical techniques were used to determine the soil physicochemical properties. One-way (ANOVA) was used to determine the significant differences between the two farming systems in the regions. **Results:** Our findings show the percentage carbon, phosphorus, potassium, and pH values to have significant difference between the conservation and conventional farms studied, but no significant difference in the percentage nitrogen. A total of 5947 soil organisms were recorded in all the farms in the four counties. Out of the total soil organisms encountered 83.6% was recorded in conservation farms while 16.4% was recorded in conventional farms. The results of soil organisms on Shannon's Index of Diversity, Shannon's Evenness Index, Species Richness Diversity Index show no statistically significant difference, except for the species abundance which was significantly higher in conservation farms than conventional farms. **Conclusion**: Overall, conservation farms had higher soil biodiversity and soil nutrients than conventional farms. Laikipia county conservation farms exhibited the highest soil biodiversity and soil nutrients among the farms studied

Keywords: *Soil conservation, Soil biodiversity*

40. The impact of conservation farming on the biodiversity of plants species in small holder farms in Kenya

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Subtheme: Climate change: adaptation, mitigation, resilience

Abstract

Loss of biodiversity is a major environmental problem affecting the world. In a quest to feed the growing world population, several techniques of agricultural production including mechanization of agriculture have been employed. Commercialization of agricultural production in both developing and developed nations has ensured food security. Unfortunately, the environment has also suffered. Clearance of natural forests for mono-cropping reduces biodiversity. Conservation Farming (CF) is one of the farming methods introduced to mitigate the negative effects on the soil, animal and plant biodiversity that are affected negatively by the conventional commercial farming methods. There have been very few comparative studies focusing on conservation and conservative agriculture and also in the quantification of plant biodiversity between the two agricultural practices in small holder farm. The study covered four counties in the Mount Kenya region, Meru, Tharaka Nithi, Laikipia and Kirinyaga. Purposive sampling was used to collect data from conventional and CF small scale farms for quantification of plant biodiversity from the 32 farms selected. 384 quadrats for herbaceous vegetation and 64 transects for woody vegetation were used in the seven months' study from April to October 2022. Parameters studied were species numbers, frequency, vegetation cover, tree height, canopy cover and diameter at breast height (DBH) The results obtained indicated that the species richness of woody species in CF farms were on average 38% more. Species numbers and density of commercially beneficial herbaceous vegetation were higher in CF farms. An average of 43% more species in the counties studied was recorded in CF farms. Deliberate efforts by extension workers, monetary gain from carbon credits trading and lessons from past experiences are some of the reasons for this difference.

Keywords: *Small holder farms, Plant biodiversity, Conservation Agriculture, Species Richness, Species Density, Woody species, Herbaceous Species, Transect, Quadrat.*

41. Drivers of water pollution in Kuuru River, a tributary of Tana River, in Meru County

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Subtheme: Climate change: adaptation, mitigation, resilience

Abstract

Water pollution is a significant concern because it affects the quality and availability of water resources essential for various purposes. Kuuru River is a tributary of the Tana River that serves as a source of drinking water, irrigation, and other domestic uses in Meru County. This study aimed to assess the drivers of water pollution in tributaries of the upper Tana River catchment within the Kuuru River. The study determined the water quality, land use, and environmental conservation activities in the riparian zone of the Kuuru River from the source to the Kathita River, a tributary of the Tana River, and evaluated the contribution of institutions provided by the legislative framework to the conservation of the Kuuru River. Standard methods were used to analyze turbidity, total dissolved solids (TDS), pH, temperature, electrical conductivity (EC), nitrates, and nitrites from 18 water samples collected along the Kuuru River. A descriptive survey using semi-structured questionnaires was administered to 384 household heads to obtain data on land use and environmental conservation practices. Key informants from relevant institutions were also interviewed using semi-structured questionnaires to gather insights into their interventions and oversight of river protection activities. The water quality of the Kuuru River met the standards set by the World Health Organization (WHO), the National Environmental Management Authority (NEMA), and the Kenya Bureau of Standards (KEBS) for drinking water. However, levels of EC and turbidity were elevated, indicating the presence of pollutants. Anthropogenic activities in Maskani, Kanthiari, and Kimachia markets were identified as the main drivers of pollution. A lack of awareness regarding riparian conservation was noted and was attributed to insufficient stakeholder involvement and inadequate technical and financial support for conservation efforts. A periodic assessment of the water quality in the Kuuru River is recommended to determine the overall impact of the anthropogenic activities in the study area. Effective stakeholder involvement to raise awareness of riparian conservation is essential.

Keywords: *Water pollution,, pollutants, anthropogenic activities*

42. Development of a sensor system for indoor Particulate Matter (PM) exposure limits detection for different cooking fuels

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Subtheme: Climate change: adaptation, mitigation, resilience

Abstract

Indoor particulate pollutants are small particles suspended in enclosed spaces. The particles can come from a variety of sources like cooking sources (gas cookers, fireplaces, tobacco smoke, vehicle emissions), which release fine particulate matter (〖PM〗 _2.5) and other harmful particles. Long-term exposure to these pollutants can lead to respiratory and cardiovascular problems, like chronic bronchitis, lung cancer, and heart disease. The WHO recommended annual average concentration limit for 〖PM〗 _2.5 be 10 micrograms per cubic meter (µg/m ^ 3), and daily average concentration at 25µg/m ^ 3. Whereas, the recommended annual average concentration limit for 〖PM〗 _10 is 20µg/m ^ 3 and the daily average concentration at 50µg/m ^ 3. In developing countries, cooking fuels are a significant source of indoor particulate pollutants because of reliance in traditional solid fuels, such as wood, charcoal, and dung. These fuels not only emit high levels of PM and other harmful pollutants such as carbon monoxide (CO), nitrogen oxides (〖NO〗 _x), and sulfur dioxide (〖SO〗 _2) when they burned. To reduce indoor particulate pollutants from cooking fuels, switching to cleaner and more efficient cooking fuels, such as liquefied petroleum gas (LPG), biogas, or electricity is being adopted. However, there is a need for compressive data on the evaluation of the indoor PM concentrations from these cooking sources. In this work, we report the development of a sensitive, low-cost miniaturized sensing node for detecting particulate pollutants up to diameters of 1µm. The obtained hourly PM average concentration detection results reveals that during the cooking hours, the indoor PM concentrations for LPG, electricity and charcoal fuels exceeds the established WHO thresholds, with 〖PM〗 _10 trends leading 〖PM〗 _2.5. The finding are key in informing the policy makers on the mitigation measures that can be taken to reduce the effect and probable redesigning of houses to allow sufficient ventilation.

Keywords: *Particulate matter, sensing node, pollutants, PM concentrations, Long-term exposure*

43. Dust as a buffer to Solar Radiation

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Subtheme: Climate change: adaptation, mitigation, resilience

Abstract

Climate change is an existing threat to terrestrial life. Increased entrapment of the solar energy drastically effects changes in composition of the earth's atmosphere and consequently, on the quality of life on Earth. Thus, there is need to make strategies of combating climate change. Space-based approaches for solar radiation management provides an alternative. Objects in large screen placed in space or a swamp of small artificial satellites well placed at strategic points between the sun and earth provides shade to our planet Earth thus mitigating climate change. In this work, we examine the impact of space-based approaches to mitigation of climate change. In particular, we revisit the use of dust as a solar shield between the sun and the Earth. We assess shadows produced by various types of dust and proceed to determine the appropriate orbit taking care of the impact of radiation pressure and solar wind. Our main result shows a connection between quantity and quality of dust. Furthermore, it is observed that sunlight extinction is orbit dust dependent and is effective in solar shielding. In conclusion, use of dust to reduce the impact of solar effects is a potential solution to climate change and hence, there is need to invest in space technology.

Keywords: *Dust, Solar Radiation, artificial satellites, radiation pressure, orbit*

CONFERENCE PAPERS

44. Development of biodegradable plastics using dialdehyde cellulose and polyvinyl alcohol incorporated with cellulose nanofibrils as reinforcing elements.

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Subtheme: Climate change adaptation, mitigation, resilience

Abstract

This study is aimed at the development of biodegradable plastics using polyvinyl alcohol (PVA) incorporated with cellulose nanofibrils. The main reason to conduct this project is because the conventional plastics have posed a great danger towards the environment through divergent instances of pollution (i.e., air, water, and also soil pollution). Apart from the realm of environment protection and management, the use of biodegradable plastics is also cost effective and thus can be of great importance in the both industrial and domestic use. The use of nanocellulose that will be extracted from banana fibers and incorporated with carrageenan from sea weed (i.e., Eucheuma denticulatum and Kappaphycus alvarezzi) is indispensable because of increasing ultimate tensile strength, elastic modulus, and yield of the required microplastic. Additionally, for the purpose of quality analysis and quality control, nanocomposite films, water vapor permeability (WVP), UV-vis spectra, and characterization using IR, XRD, TGA, SEM, DMA will be carried out and their data collected and recorded. A soil burial test will also be conducted in order to determine how fast the moisture accelerated the process of degradation of the polyvinyl alcohol nanocomposite films. Moreover, this test will also be indicative of whether soil moisture is either a good or a bad catalyst in the biodegradation of polyvinyl alcohol nanocomposite films. There will be also need to have a comparison between commercially available biodegradable plastic bag (Bio-PB) with the originally developed polyvinyl alcohol nanocomposite films in this project. The two will be assayed on the efficacy and superiority in mechanical performance and the aspect biodegradability.

Keywords: *Biodegradability, cellulose nanofibrils, nanocomposite films, mechanical performance.*

45. The effect of climate change on school's feeding programme in Mwala Sub County.

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Subtheme: Climate change adaptation, mitigation, resilience

Abstract

Climate change is a growing concern worldwide, and its impact on various sectors of society is becoming increasingly apparent. One such sector is the education system, particularly school feeding programs which have been highly affected by low production of food and consequently exacerbating the food scarcity levels globally. Mwala sub county is one of the highly affected regions of Machakos County by climate change. The study sampled three wards in the subcounty, namely Masii, Makutano and Wamunyu. In each of the wards, five schools were sampled with deployment of questionnaires and a focus groups. The population sample comprised of two respondents per school and one focus group per school. A total of 30 respondents and 15 focus groups were thus utilized. The study established that floods and drought largely affect the school feeding programme, as well as undermining balanced daily portions for the school diet. 78% of the sampled population agreed that climate change has undermined nutritive value of the school feeding programme portions within the subcounty. The study recommended that policymakers and stakeholders in the education sector be prioritized in the development of climate-resilient school feeding programs in Mwala sub-county. The study opined that this can be achieved through the adoption of sustainable agricultural practices, investing in climate-smart infrastructure, and promoting awareness campaigns on the effects of climate change on school feeding programmes.

Keywords: *Climate change, school's feeding programme, undermined nutritive*

46. Validation and dissemination of Climate Smart banana technologies, innovations and management practices using the farmer field school approach in Kenya.

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Subtheme: *Climate change adaptation, mitigation, resilience*

Abstract

The overall goal of this study was to increase banana productivity, build resilience to climate change impacts on smallholder farmers, and contribute to food and nutrition security in Kenya. Banana (Musa sp.) is an important fruit crop in Kenya, accounting for 35% of the total value of fruits. Despite the crop's great potential to reduce poverty in rural areas, its productivity has progressively declined. Whereas yields under research range between 30-70t/ha, smallholder farmers realize less than 10t/ha. The challenges facing farmers include the unavailability of clean planting materials of high-yielding varieties, low and declining soil fertility, high incidence of pests and diseases, high postharvest losses, limited information on agronomic management practices, erratic weather patterns due to climate change and poor marketing channels contributing to low prices leading to reduced household income. The National Agricultural Research Systems in Kenya have developed Technologies, Innovations and Management Practices (TIMPs) along the banana value chain to mitigate against these challenges. Although validation and dissemination of research findings are vital in increasing the visibility of research outputs and society's confidence in research, this has yet to be achieved for Banana TIMPs in many suitable growing areas in Kenya. This study used Farmer Field School (FSS) approach to validate and disseminate the TIMPs to Banana Farmer Common Interest Groups (BFCIGs) in Bomet and Tharaka Nithi Counties. These counties had identified banana value chain for upscaling in their County Interpreted Development Plans. The TIMPs comprised clean planting material; improved banana varieties; planting; water; pest and disease management practices; harvest and postharvest handling. Farmers who participated in BFCIGs recognized and appreciated the importance of using recommended good agricultural practices and reported higher yields, increased farm income and food availability. The FFS approach provided training sessions and farmer-to-farmer learning, essential in validating and disseminating research findings.

Keywords: *Validation, Dissemination, FFS Approach, Climate Smart Banana, Food Security, Income.*

47. Climate change a prime threat to Agricultural Productivity: The role of arbuscular mycorrhizal fungi and plant growth promoting rhizobacteria in plant adaptation to stresses and soil fertility management. Review

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Subtheme: Climate change adaptation, mitigation, resilience

Abstract

Climate change has led to increased environmental stress, which is a prime threat to the sustainability of agricultural production and soil fertility management. Environmental Stresses alter normal metabolism and induce generation of toxic effects which ultimately downregulate growth and productivity. Environmental stresses hamper photosynthesis, mineral uptake and assimilation, and damage major cellular structures and their functioning. This greatly affects growth and development of plants drastically, limiting their yield to considerable extent. Soil microbes specifically arbuscular mycorrhizal fungi (AMF) and plant growth promoting rhizobacteria (PGPR). Both AMF and PGPR are believed to enhance plant growth by mediating several benefits to hosts plants. Mineral solubilization and availability, water content maintenance, modulation of root morphology and physiology, regulation of enzyme activity and sequestration of toxic ions, metals etc. are some of the key functions attributed to these beneficial microbes. Moreover, in sustainable agro-ecosystems, soil, a dynamic living resource, plays an active role for both production of food and fibre and to global balance and ecosystem function. This frame-work of interactions amongst soil microbial populations is known to affect agricultural production and soil quality. Consequently, a suitable management of the microbiological component of soil could be the most effective and sustainable way to increase soil fertility and/or control several soil-borne pathogens. Therefore, this review paper focuses on detailed role of beneficial microbes, mainly AMF and PGPR, in improving different plant stress tolerance and sustainable soil fertility management.

Keywords: *Environmental stress, Arbuscular mycorrhizal fungi (AMF), Pant growth promoting rhizobacteria (PGPR), Plant functioning, Climate Change, Soil fertility*

SUBTHEME 3: Reimagining pure and applied sciences for the post pandemic future

PRE-CONFERENCE PAPERS

48. Investigating the error detection and correction efficiency in container numbers and determining the size of dictionary of the check-sum calculation code

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Abstract

The container number is an 11-digit code used to identify a specific container. Constantly the world relies on containers to transport goods: like machinery cars and so on. Time to time people have imported goods and their cargos erroneously delivered in different places. A container check digit-calculator is used to determine if the 11 digits in the code are correct using the check digit. The container code format is divided into 4 parts. The owner code consists of three capital letters of the Latin alphabet to indicate the owner or principal operator of the container. Such code needs to be registered at the Bureau International des Conteneurs in Paris to ensure uniqueness worldwide (per ISO 6346). The equipment category identifier consists of one of the following three capital letters of the Latin alphabet: U for all freight containers; J for detachable freight container-related equipment; Z for trailers and chassis. The serial number consists of 6 numeric digits, assigned by the owner or operator, uniquely identifying the container within that owner/operator's fleet. The check digit consists of one numeric digit providing a means of validating the recording and transmission accuracies of the owner code and serial number. An example of the container number is MRKU9530406. This is how the error is detected in the container number code. An equivalent numerical value is assigned to each letter of the alphabet, beginning with 10 for the letter A (11 and multiples thereof are omitted): The individual digits of the serial number keep their numeric value. Each of the numbers calculated in step 1 is multiplied by 2position, where position is the exponent to basis 2. Position starts at 0, from left to right. Sum up all results of step 2 and find modulus 11 of the Sum. This is the check digit. If the check digit is not the same as the last digit then the container number is wrong, therefore detected. This code however doesn't correct the error. This paper investigates loopholes in the detection of errors in the current check digit calculator for container numbers and create a versatile algorithm that detects, corrects all the errors identified in full measure and create a code with a large size of dictionary..

Key Words: *Container numbers, Check-sum calcultation*

49. Modelling Effects of Helicobacter Pylori to Stomach Cancer and Assessing the Implication of Antibiotic resistance

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Subtheme: Reimagining Pure and Applied Sciences for the Post pandemic Future

Abstract

Helicobacter pylori (H. pylori) is a bacterium that causes global health problems, leading to high morbidity and mortality rates among the human population. However, H. pylori infections pose a serious threat to public health, especially in third-world countries. As a result of poor dosage during treatment, the emergence of drug-resistant strains has become a major impediment in the control of infections. The deterministic mathematical model developed outlines conditions for a successful campaign against H. pylori and its effects on antibiotic resistance. Systems of ordinary differential equations were deduced from the model and analyzed. The basic reproduction and control reproduction numbers were obtained using the Next-Generation Matrix (NGM) method. In addition, the free and endemic equilibrium points were determined using the Centre manifold approach. The model's local stability and global stability analysis were determined using the Jacobian matrix and Lyapunov function respectively. Also, the model thresholds, sensitivity analysis, and backward bifurcation was determined in order to establish the condition for the spread of the disease. Numerical simulation was done using MATLAB and presented graphically in order to determine the most cost-effective intervention strategy to be adopted for a successful campaign against the H. pylori infection. The numerical results obtained showed that prevention and treatment strategies were the best cost-effective strategies to eradicate the infection. Furthermore, the results obtained give insight to health officials in order to implement the best preventive measures and treatment strategies to control the transmission of H. pylori infection globally.

Keywords: *Mathematical Modelling, Next-Generation-Matrix, Jacobian Matrix, Helicobacter pylori*

50. A Mathematical Model of Tuberculosis incorporating Asymptomatic Component

Erick Mutwiri Kirimi[1], Grace Gakii Muthuri[1], Stephen Karanja[1], Cyrus Ngari

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Subtheme: Reimagining Pure and Applied Sciences for the Post pandemic Future

Abstract

Pulmonary tuberculosis is among the leading cause of deaths worldwide, despite effective treatment and affordable prevention strategies being put in place to halts its transmission. Thus, there is a need to scale-up efforts that significantly controls its spread across the globe. This will be achieved through accurate description of the disease transmission dynamics. In this study, we extend the standard SEIRS epidemiology model of tuberculosis to include the asymptomatic component, since asymptomatic infections people contribute to transmission in the population. As such, we considered human population divided into the following compartments: susceptible, vaccinated, latent infected, asymptomatic infectious, symptomatic infectious, latent treated, asymptomatic infectious treated, symptomatic infectious treated, and recovered. We modeled the interactions among these populations, and the effects of both screening and treatment of asymptomatic infectious individuals were determined. The control reproduction number, was determined using the next generation matrix method. The stability of disease free equilibrium and endemic equilibrium points were determined using Jacobian matrix and Lyapunov function methods respectively. The results of analysis shows that there exists local and global stable disease free equilibrium points when . Further results showed that there exists local and global disease free equilibrium points when . Numerical simulation of the model shows that screening and treatment of asymptomatic infectious people reduces cases of active tuberculosis disease significantly in the population. The results of this study will stimulate discussions and review of the current assumptions with respect to pulmonary tuberculosis transmission dynamics. This will in turn strengthen decision making among health care officials in regard to targeting asymptomatic infectious pulmonary tuberculosis patients in an effort to fight epidemics of this disease.

Key words: *Tuberculosis, Asymptomatic infectious, Reproduction number, Disease free equilibrium, Endemic equilibrium, Stability.*

51. A new formulation of a set of odd numbers

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Subtheme: Reimagining Pure and Applied Sciences for the Post pandemic Future

Abstract

We present a new definition of an Odd number as an integer, O, of the form O=((n_1+n_2+n_3+1)+[(n_3-n_1)^n+1]+[(n_2-n_1)^n+1]) . We have proved that the new definition of odd numbers will be true for all natural numbers. This new definition will initiate a different approach to the solution to the Weak Goldbach Conjecture. The results obtained here will make it possible to partition an odd number greater than 7 into at least one set containing three odd numbers.

Key words: *Weak Goldbach conjecture, Even numbers, odd numbers, Prime numbers, natural numbers*

52. Analyzing the properties and patterns of perfect numbers using Euler's factorization method to get an extension of the generative functions

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Subtheme: Reimagining Pure and Applied Sciences for the Post pandemic Future

Abstract

This paper explores the properties and patterns of perfect numbers using Euler's factorization method to extend generative functions. Perfect numbers are defined as positive integers that are equal to the sum of their proper divisors, excluding themselves. While even perfect numbers can be expressed in a specific form, the properties and patterns of odd perfect numbers remain largely unknown. The proposed research aims to extend Euler's generating functions for even perfect numbers to potentially uncover new insights into the characteristics of odd perfect numbers. The lack of an efficient algorithm for identifying potential odd perfect numbers that satisfy Euler's factorization pattern is also addressed. The research contributes to the development of such algorithms, specifically by analyzing how machine learning techniques can be used to identify patterns in the factorization of composite numbers, and how these patterns can be used to identify potential odd perfect numbers that satisfy Euler's factorization pattern. The paper discusses notations and definitions used in the content and the objectives of the study, which include investigating existing properties and patterns of perfect numbers using Euler's factorization method, extending Euler's generating functions, and contributing to the development of an algorithm for identifying potential odd perfect numbers. The research on perfect numbers has significant theoretical and practical significance in advancing the field of number theory, including enhancing the understanding features of rare odd perfect numbers

Keywords: *Perfect Numbers, Euler's factorization*

CONFERENCE PAPERS

53. Isolation and functionalization of carrageenan produces a composite with increased swelling capacity

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Synthetic hydrogels are non-biodegradable and an environmental pollutant which contribute to presence of microplastics found along the food chain with undocumented health effects. This project seeks to synthesize high swelling hydrogels from biopolymers as a mitigating strategy against petroleum-based hydrogels. It seeks to isolate carrageenan from Eucheuma cottonii and Eucheuma spinosium through alkaline treatment using NaOH, and esterification using monochloroacetic acid to obtain carboxymethyl carrageenan (CMC). CMC was formed as a result of the formation of intermolecular bonds occasioned by the presence of C=O groups. Characterization using FTIR, a spectra vibrational frequency of the carbonyl functional group was observed at 1652 cm-1. TGA/DSC thermograms were done to show a degree of crystallinity. Also XRD was carried out and thermal stability was observed from powder diffractograms and in which there was loss of water and also degradation. From SEM micrographs, it was observed that the composite comprised multiple layers stacked together in a repeating pattern. These highly porous and interconnected multiple layers were as a result of strong ionic and electrostatic interactions. In conclusion, the swelling capacity of the CMC was higher compared to that of carrageenan alone. Further investigation should be done by crosslinking CMC with other biopolymers by using organic crosslinking agents and a comparison be made.

Keywords: *Biopolymer, hydrogels, carrageenan, carboxymethyl carrageenan, biodegradable, swelling capacity*

54. Antifungal activity of chitosan-metal organic frameworks against *Aspergillus niger* and *Candida Albicans*

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Subtheme: Reimagining Pure and Applied Sciences for the Post Pandemic Future

Abstract

Antifungal resistance and the health hazard associated with the use of synthetic fungicides necessitate the need to develop new antifungals. This study, therefore, sought to develop a chitosan metal-organic framework (Cs-MOF) containing copper and zinc particles with antifungal activity. The Cs-MOF was prepared by first isolating chitosan (Cs) from Hermetia illucens (black soldier fly) followed by periodate oxidation to introduce carbonyl groups (C=O) in its structure for complexing copper and zinc ions. Metal salts were then heated with terephthalic acid in dimethylformamide followed by Cs loading after which glycine (Gly) was anchored to unreacted C=O groups in Cs-MOF to obtain Cs-MOF-Gly. The functional groups present and morphology of Cs, Cs-MOF, and Cs-MOF-Gly were monitored using Fourier-Transform Infrared Spectroscopy (FTIR), X-ray fluorescence (XRF), and Scanning Electronic Microscopy (SEM). From XRF data, the elemental composition of CS indicated the removal of extractives, while C=O vibrational bands in IR spectra were proof of Cs oxidation. SEM images of Cs-MOF and Cs-MOF-Gly revealed spherical particles with sizes ranging between 30-150 μm. Using the disc diffusion assay, Cs-MOF-Gly showed more antifungal activity against Aspergillus niger and Candida albicans than Cs-MOF and also when compared to Cs and Pirimiphos-methyl as standards. Glycine hastens the interaction with fungal membrane amino groups via covalent bonds. This interaction combined with the synergistic antimicrobial effect of Cs, Gly, and metal ions compromises the integrity of the fungal membrane as a protective layer. The Cs-MOF and Cs-MOF-Gly showed effective antifungal activity via a "pronounced killing effect" caused by the gradual release of the metal ions as the framework structure slowly biodegrades. This release resulted in the diffusion of metal ions through the fungal membrane hence the activity of Cs-MOF and Cs-MOF-Gly which implies they can control this fungus during postharvest thereby preventing losses.

Keywords: *Chitosan, Oxidized chitosan, Metal-organic framework, Biopesticide, Glycine*

55. Versatility of cellulose stimuli responsive membranes in the detection of dimethylamine

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Subtheme: Reimagining Pure and Applied Sciences for the Post-pandemic Future

Abstract

This work demonstrates our effort to develop stimuli responsive cellulose membranes for the detection of amines. Herein, we demonstrate that thin layer deposition of polydiacetylene-zinc oxide nanosheets (PDA-ZnO) on cellulose (CE) membranes yields a stimuli responsive composite. The Zn2+ ions play an essential role on achieving reversible thermochromism while covalent interactions promote adsorption of PDA-ZnO on cellulose membranes. X-ray diffraction and infrared spectroscopy reveal that the Zn2+ ions intercalate with PDA bilayer and strongly interact with carboxylate headgroup. Furthermore, the reversible thermochromism persist when the nanosheets are deposited on cellulose (CE) membrane when assembling PDA-ZnO-CE membranes. In addition, PDA-ZnO-CE displayed selective solvatochromism allowing the utilization of the membranes in the detection of dimethyl amine as it displayed a distinct and remarkable purple to orange colour transition. In particular, response of the PDA-ZnO-CE membranes in several other organic solvents was poor as no transitions were observed hence its selectivity towards dimethylamine.

Keywords: *Stimuli responsive, cellulose, thermochromism, solvatochromism*

56. Multi-analytical Approach (FTIR, XRF, XRD, GC-MS) Characterization of Source Rocks from the Anza Basin, Kenya

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Prospective source rocks from three wells (Chalbi-3, Sirius-1, and Ndovu-1) in the Anza basin, North-Eastern part of Kenya, have been analyzed by use of carbon-hydrogen-nitrogen elemental analysis and mineralogy characterization using X-Ray Diffraction (XRD), X-Ray Fluorescence (XRF), Fourier Transform Infra-Red (FTIR) spectroscopy, and Scanning Electronic Microscopy (SEM-EDX). To throw light on the organic matter source, a Gas Chromatography-Mass Spectrometry (GC-MS) analysis of the saturated aliphatic biomarkers was carried out. The analytical results revealed that the source rocks have moderate to high total organic carbon (%TOC) content, suggesting there exist conditions in the Basin that favored organic production and preservation. The Hydrogen Indices (HI: 0.19–0.60 atomic ratios) typify a predominance of mixed type II/III (oil/gas-prone) with more type III (gas-prone) and less II (oil-prone) kerogens. The FTIR, XRF, and XRD results reveal that the studied source rock samples comprised mainly of quartz, followed by silicate-clay minerals and calcite minerals. The study of the solvent-extractable organic matter has shown Biomarker distributions of n-alkanes and isoprenoids (pristane/ phytane ratios) suggesting that the source rocks are derived from algae and bacteria deposited under weakly anoxic and weakly oxic environmental conditions, with a minimal contribution from terrestrial organic matter sources. As a consequence, all three wells have hydrocarbon generation potential, particularly Ndovu-1, which displays sufficient organic matter content to produce oil and gas. The hydrocarbon potential is good and capable to make expulsions of oil and/or gas from the wells at sufficient depths.

Keywords: *Hydrocarbons; inorganic matter; petroleum; sedimentary rocks; source rocks.*

57. Application of cyanamide downregulates the flower inhibitor gene in wild strawberry

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Strawberry (Fragaria spp.) is a perennial rosette which requires short days and low-temperature conditions in autumn to form flower buds and flowers in spring. In the Japanese standard cultivation system, growers force the flowering by putting the plants in cold chambers during the summer to meet the high demand/price in the Christmas season in December. As the cold chambers in summer consume more energy and thus are not an environment-friendly solution, other techniques that require less energy have been required. As cyanamide has been used to break the dormancy and force flowering in temperate Rosaceous fruit trees, we examined the applicability of the chemical to a model strawberry species, Fragaria vesca, and analyzed the expression of flowering genes. Runner cuttings of F. vesca were raised in a growth chamber (20°C, 16h light/8h dark) until 5 to 6 leaves before use. Cyanamide containing agrichemical (CX-10; Nippon carbide industry Co., Inc., Japan) were diluted to 0.2% (g/v) and 25mL was sprayed for each plant. Plants were placed under non-flower inducible conditions (22°C, 16h light/8h dark) and four shoot apices were sampled 1 and 2 weeks later. The expression of FvTFL1, which is expressed in the shoot apical meristem and inhibits flowering, was statistically significantly downregulated in plants sprayed with 0.2% cyanamide compared to the mock (water sprayed) plants while the upstream gene of FvTFL1, FvSOC1, was not influenced. Our results indicate the possibility of chemical application to control flowering without energy consuming instruments, as well as the point of the molecular network at which cyanamide intercepts to down regulates the flowering inhibiting gene.

Keywords: *dormancy break, flowering, Fragaria, FvTFL1, global warming, sustainable agriculture*

58. Extending the photoacoustic imaging depth using a pump probe setup

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Photo-Acoustic (PA) imaging is limited by the shallow depth of light penetration in tissue. Both optical absorption and scattering rapidly attenuate the intensity of the incidence light beam used in non-imasive PA deep tissue imaging. This study is geared at investigating the possibility of extending the PA imaging depth by irradiating a sample with a secondary optical beam during PA imaging. The experiment entailed photoacoustic probing of a tissue phantom embedded with optical markers (tubings filled with hemoglobin) positioned at different locations along the phantom depth. Two sets of photoacoustic depth profile measurements were taken. One set involved probing the sample while under illumination with a secondary light source. The second experiment involved probing the sample in the absense of a secondary light source. The time of flight photoacoustic signals acquired from the two experiments analyzed to determine the effect of the secondary optical beam to the acquired PA images. It was observed that introduction of a secondary beam considerably enhanced the imaged depth of a tissue sample.

Key words: *Photo-Acoustic, Tissue Phantom, Pump probe*

59. Use of generalized linear models in modelling the risk factors of Type II diabetes –the case of Meru town residents

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Type 2 diabetes is a type of illness that results in a high concentration of blood sugar. The long term of type 2 diabetes results in too much sugar (glucose) circulating in the blood leading to disorders of the circulatory, nervous and immune system. Type 2 diabetes was known to be onset diabetes but both type 1 and type 2 diabetes can begin at childhood and adulthood. In Kenya, the number of persons diagnosed with type II diabetes is increasing. Therefore this study sought to model the risk factors for type 2 diabetes using the generalized linear models The specific objectives of the study were to formulate a mathematical model for modelling type 2 diabetes risk factors, establish the significance of the risk factors to incidences of type 2 diabetes and establish the intervention strategies in curbing the increasing risk of type 2 diabetes. Generalized linear models (GLM) were used where the logistic regression model which is a type of GLM was most appropriate. Logistic regression model has been widely used in most medical field as well as in social sciences. Many medical scales used to assess severity of a patient have been developed using logistic regression. They are used to predict the risk of developing a given disease based on observed characteristic of the patient. The link function take a canonical form where the systematic component is the sum of the product of parameters with covariate scales. The parameters were then estimated computationally using R software by fitting data to the logistic model. The study concluded that the risk factors observed were positively and significantly increasing the risk of diabetes and recommended more intensive awareness campaigns on their interventions. Also treatment of obesity and hypertension must be coordinated with good glycemic control for reduction of total mortality in type 2 diabetes.

Keywords: *Mortality, Link function, Systematic component, Severity, risk factors, glycemic*

60. Molecularly Imprinted Polymers for pre-concentration and detection of polychlorinated biphenyls

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Pollution of the environment by polychlorinated biphenyls (PCBs) continues to be a global concern because of their toxicity, persistence, long-range transport properties, and ability to bioaccumulate in fatty tissues. PCBs are classified as probable human carcinogens as well as endocrine-disrupting compounds, and, therefore, their presence in the environment is a threat to human and animal health. Their monitoring in the environment requires novel techniques to achieve detection at very low concentrations that demonstrate harmful effects on the ecosystem. Here we report an affordable sample pre-concentration method as well as a novel sensor based on molecularly imprinted polymers (MIPs) for detection of PCBs in aquatic environment. MIPs were synthesized from 4-vinyl pyridine (4-VP) as the functional monomer and 4,4'-dihydroxybiphenyl as the dummy template and ethylene glycol dimethacrylate (EGDMA) as the cross-linker. Non-imprinted polymers (NIPs) as controls were synthesized the same way but in the absence of the template. The synthesized polymers were characterized by SEM, BET, FTIR, TGA and batch rebinding assays. These polymers were applied for pre-concentration of water samples spiked with PCB 52 followed by detection on electropolymerized molecularly imprinted polymers (e-MIPs) sensor based on screen-printed gold electrodes. The sensor was sensitive to PCB 52 providing recoveries of 104.4% while demonstrating selectivity to PCB 52 over a closely related compound. Based on these results, there is a promise for the adoption of this sensor for screening PCBs towards routine monitoring of the PCBs in the environment which will result in the increased protection of our population and contribute to a healthy workforce.

Keywords: *Molecularly imprinted polymers, MIPs, Electrochemical sensor, Polychlorinated Biphenyls, PCBs, Environmental pollution*

61. Wastewater or Used Water? Debunking Extant Terminology Subliminal for Water Reuse in Kenya.

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Over 70% of water consumed ends up as wastewater. The prevailing growth and water consumption trends are based on a linear system. Whereas reuse can help alleviate the water crisis and help deal with climate change, its uptake has been very low. Here we show that subtle shifts in terminology portends a significant shift in behaviours for water reuse. The biggest barrier to reuse is the perceptions and emotions that waste evokes, whether real or imagined. We explored the use of noun waste on various items from common languages against referring the same items by a different noun on the emotion it elicited. This was related with possible behaviours and established paradigms. Waste water as a noun has terminal implication, while verb treatment evokes negative emotion. These were found to subliminally bar reuse. Usedwater as a noun in place of wastewater is more aligned to reuse and reuse embraced can alleviate water stress.

Keywords: *Wastewater, Reuse, Water treatment*

62. Mathematical modeling impact of blood groups and treatment in the dynamics of cholera (a case of blood group O phenotype)

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Subtheme: Re-imagining Pure and Applied Sciences for the Post-pandemic future

Abstract

Cholera is an infectious disease caused by the bacterium Vibrio cholerae rampant in countries with inadequate access to clean water and proper sanitation. In this work, mathematical modeling the impact of blood groups and treatment in the dynamic of cholera (a case of blood group O phenotype) is analyzed. Vibrio cholerae are acid labile and thrive well in alkaline medium. Individuals with type O blood are the most susceptible while those with type AB are the most resistant. Between these two extremes are the A and B blood types with type A being more resistant than type B. The objective is to determine the effect of blood group on the transmission dynamics of cholera. The existence and stability of the equilibrium points is established. Analysis of the model show that the disease-free equilibrium is both locally and globally asymptotically stable when the basic reproduction number is less than unity, while the endemic equilibrium is locally asymptotically stable when the reproduction number is greater than unity. Numerical simulations are done using MATLAB software to show the effect of blood group on the spread of cholera and individuals with these blood group suffer severe infection during cholera outbreak

Keywords: *Cholera, Mathematical model, blood groups, blood group O phenotype, Stability analysis, Numericalsimulation*

SUBTHEME 4: Disruptive technologies for sustainability in the circular economy

PRE-CONFERENCE

63. A systematic review of search strategies in Artificial Intelligence: techniques, applications, and future directions

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

Artificial Intelligence (AI) encompasses a wide range of techniques and methodologies aimed at creating intelligent systems capable of solving complex problems. AI entails is the design and implementation of effective search strategies that enable intelligent systems to explore and navigate problem spaces efficiently. This paper presents a systematic review of search strategies in AI, focusing on the techniques, applications, and future directions of search-based approaches.The review covers a comprehensive collection of search strategies used in AI, including optimization algorithms, heuristic methods, and metaheuristics. Optimization algorithms such as genetic algorithms, particle swarm optimization, and simulated annealing are explored, highlighting their principles and characteristics. Heuristic methods, such as greedy search, hill climbing, and constraint satisfaction, are examined for their ability to guide the search towards optimal or near-optimal solutions. Metaheuristics, including evolutionary algorithms, ant colony optimization, and tabu search, are discussed in terms of their ability to efficiently explore large and complex problem spaces. The review presents a diverse set of applications where search strategies have been successfully applied in AI. These applications span various domains, including machine learning, robotics, natural language processing, image processing, and computer vision. The review explores how search strategies have been tailored to address specific challenges and improve the performance of AI systems in these domains. The paper outlines future directions and emerging trends in search strategies for AI. It discusses the integration of search strategies with other AI techniques, such as deep learning and reinforcement learning, to enhance the capabilities of intelligent systems. Additionally, the review addresses challenges and opportunities in the development of hybrid search strategies that combine multiple techniques to achieve better performance and scalability. The paper concludes by a comprehensive analysis of search strategies in AI, covering techniques, applications, and future directions. It serves as a valuable resource for researchers, practitioners, and students seeking to understand the state-of-the-art in search-based approaches and their potential for advancing AI systems across various domains.

Keywords: *Artificial Intelligence, Search Strategies, Optimization Algorithms, Heuristic Methods, Metaheuristics, Applications*

64. A Systematic Review of Semantic Web and Ontologies in Artificial Intelligence

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

The Semantic Web is a vision of the World Wide Web where data is interconnected and semantically enriched, allowing machines to understand and reason about the meaning of information. One of the core technologies enabling the Semantic Web is ontologies, which provide a formal representation of knowledge and its relationships. This paper presents a systematic review of the use of Semantic Web and ontologies in Artificial Intelligence (AI), focusing on the applications, challenges, and future directions of this field. The review covers a broad range of AI applications where Semantic Web and ontologies have been utilized, including knowledge representation and reasoning, natural language processing, information retrieval, and machine learning. The paper examines how Semantic Web and ontologies have enabled AI systems to overcome the limitations of traditional knowledge representation methods, by providing a flexible and scalable framework for representing and reasoning about complex and diverse knowledge domains. The paper explores the challenges and limitations of using Semantic Web and ontologies in AI, including the difficulties in creating and maintaining ontologies, the heterogeneity of data sources, and the scalability of reasoning methods. The review presents various techniques and approaches that have been proposed to address these challenges, including ontology engineering methodologies, ontology alignment and mapping techniques, and distributed reasoning methods. The paper discusses the emerging trends and future directions in Semantic Web and ontologies for AI. It examines the integration of Semantic Web and ontologies with other AI technologies such as machine learning and deep learning, to enable the development of more intelligent and autonomous systems. Additionally, the paper highlights the potential of Linked Data, a key technology for the Semantic Web, in enabling the integration and sharing of data across different domains and applications. The paper concludes by providing a comprehensive analysis of the use of Semantic Web and ontologies in AI, covering applications, challenges, and future directions. It serves as a valuable resource for researchers, practitioners, and students seeking to understand the state-of-the-art in this field and its potential for advancing AI systems across various domains.

Keywords: *Semantic Web, Ontologies, Artificial Intelligence, Knowledge Representation, Linked Data*

65. Suitability of Learning Management Systems for online assessment: a systematic review

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

The rapid growth of online learning has necessitated the widespread adoption of Learning Management Systems (LMS) to facilitate various educational activities, including online assessments. This paper presents a systematic review that evaluates the suitability of Learning Management Systems for conducting effective and efficient online assessments. The review explores key elements of LMS functionality and design, assessment types, and their impact on student learning outcomes, while also considering the challenges and limitations associated with LMS-based assessment practices. The findings provide valuable insights into the potential benefits and considerations of utilizing Learning Management Systems for online assessment purposes. The analysis also revealed that Learning Management Systems offer a diverse range of features that support online assessment, including question banks, automated grading, and feedback mechanisms. These features provide flexibility and convenience for both educators and learners. LMS platform provides, various assessment types, such as multiple-choice questions, essays, and interactive simulations. The LMS plays an important role in integration of multimedia elements, such as videos and interactive content, enhances the engagement and interactivity of online assessments. The LMS positively impact student learning outcomes, including knowledge acquisition, critical thinking skills, and problem-solving abilities. However, the review also identified several challenges and limitations associated with LMS-based assessment practices. These include concerns regarding cheating and plagiarism, limited customization options for assessment design, and technical issues related to system reliability and compatibility. Overall, this systematic review provides valuable insights into the suitability of Learning Management Systems for conducting online assessments. The findings highlight the potential benefits of LMS-based assessments in promoting effective and efficient learning experiences. Educators and institutions can utilize these findings to inform their decision-making processes when selecting and utilizing Learning Management Systems for online assessment purposes.

Keywords: *Learning Management Systems, online assessment, e-learning, educational technology, Student learning outcomes, assessment types, engagement, system reliability, cheating, plagiarism*

66. A predictive blood donor retention rate model using machine learning: a systematic review

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

Demand for blood and blood products is increasing due to population growth, medical advances, and increased disease. Availability of a stable blood supply is critical for healthcare organizations and requires effective donor recruitment and retention strategies. This systematic review paper examines the development and implementation of predictive models using machine learning techniques to classify and predict blood donor retention rates. The aim is to analyze the existing literature and provide insights into the design, performance and potential of such models. Through a systematic search of relevant databases, 30 articles were selected for inclusion in this review. These studies include a variety of machine learning approaches and algorithms used to predict blood donor retention rates. The review demonstrates the importance of machine learning models for improving blood donor retention strategies. These models use various demographic, behavioral, and historical donation data to predict the likelihood of a donor returning to donate blood. The utilization of machine learning techniques, such as decision trees, logistic regression, support vector machines, and neural networks, enables accurate predictions and enable healthcare organizations to implement targeted donor retention interventions to increase blood supply. The models' predictive performance reveals their capacity to recognize donors who are not likely to return and donate blood and target retention strategies appropriately, improving donor engagement and fostering long-term commitment. Several challenges and limitations face the identified existing models. They include the need for comprehensive and high-quality data, interpretability of complex models as well as the requirement for regular model updates to accommodate changing donor behaviors. There is need for development of versatile and comprehensive models with improved accuracy that can reduce the need for constant recruitment of new donors, which is costly and time-consuming enabling blood agencies to accurately predict donor retention rates, inform donor retention strategies, and prioritize resources appropriately and ultimately saving lives.

Keywords: *blood donor retention, machine learning, predictive model, healthcare, blood donation, prediction.*

67. Systematic mapping of trends in software engineering

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

Software engineering is a rapidly evolving field with numerous trends and research areas. To gain insights into the current landscape, this paper presents a systematic mapping of trends in software engineering. Through a comprehensive review of relevant literature, key themes and research areas were identified. The study also examined the methodologies, technologies, and tools employed in software engineering research. The findings revealed prominent trends, including the adoption of agile development frameworks, the integration of DevOps practices, the utilization of cloud computing and virtualization, the incorporation of artificial intelligence and machine learning techniques, and the application of big data analytics. The identified research areas encompass emerging software development methodologies, advancements in software testing and quality assurance, software maintenance and evolution, software requirements engineering, software project management, software metrics and measurement, and software security and privacy. This systematic mapping study contributes to the understanding of current trends in software engineering and provides valuable insights for researchers and practitioners. The findings highlight the need for collaboration, efficiency, and data-driven decision-making in software engineering practices. The study also offers recommendations for future research, emphasizing the importance of investigating the effectiveness and impact of agile development frameworks, exploring the potential of artificial intelligence and machine learning, and addressing ethical and societal implications. By focusing on these findings and recommendations, the software engineering community can advance the field and address current challenges.

Keywords: *Software engineering, trends, systematic mapping, research areas, agile development, DevOps, cloud computing, virtualization, artificial intelligence, machine learning, big data analytics.*

68. Internet of Things based model for hydro power generation and management: a systematic review

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

The Internet of Things (IoT) has revolutionized the way various industries operate, and the energy sector is no exception. This review paper focuses on the application of IoT in the context of hydroelectric power generation and management. The objective of this study is to present an IoT-based model that optimizes the generation and management of hydroelectric power. By employing IoT technologies, this model enables real-time monitoring, data acquisition, formation of an hydrological dataset and control of key components in a hydroelectric power plant. Through a systematic review of the existing literature, this paper explores the components and functionalities of the IoT-based model, along with its potential benefits in terms of improved efficiency, reliability, and sustainability. The findings highlight the advantages of leveraging IoT in hydroelectric power generation, such as predictive maintenance, fault detection, and remote monitoring. Furthermore, this research paper discusses the challenges associated with implementing IoT in the hydroelectric power sector, including data security and privacy, interoperability, and integration with existing systems. The study concludes by suggesting future research directions, such as the development of standardized frameworks and protocols for IoT implementation in hydroelectric power plants. Overall, this research paper provides valuable insights into the IoT-based model for hydroelectric power generation and management, paving the way for enhanced operational efficiency and sustainable energy production in comparison to the existing models on the power grids.

Keywords: *Internet of Things, Remote Monitoring, Hydro-Power, Power Plant, Frameworks, Protocols, Sustainable Energy, Power Grids.*

69. Security intrusion monitoring model for Internet of Things (IoT) using sniffing tools on WLAN

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

The Internet of Things (IoT) has revolutionized the way devices interact and share data over wireless networks, enabling seamless connectivity and automation. However, the proliferation of IoT devices has raised serious security and privacy risks concerns due to their inherent vulnerabilities. This paper proposes a model for security intrusion monitoring by analyzing the existing literature and providing insights into the design, implementation, and effective deployment of the proposed model to detect intrusion in IoT using sniffing tools for network traffic analysis in real-time within WLAN. The model passively monitors network traffic and identifies anomalous patterns, unauthorized access attempts, and abnormal device behavior.The review findings highlight the significance of the proposed model in enhancing the security of IoT systems. By detecting anomalous behavior and potential security breaches. The model enables timely response and mitigation actions to ensure the confidentiality, integrity and availability of IoT devices and data. The model includes consideration of network architecture, deployment of intrusion detection algorithms, and establishment of response mechanisms. It identifies various types of security threats, such as unauthorized access attempts, data breaches, and device tampering, thereby providing response mechanisms that include generating alerts, isolating compromised devices, or blocking suspicious network traffic. The model incorporates a feedback loop to continuously update the detection mechanisms and adapt to evolving security threats in real-time.Series of experiments and simulations conducted using various IoT devices and network scenarios to evaluate model effectiveness. The results demonstrate the model's ability to detect a wide range of security intrusions with high accuracy and minimal false positives. In conclusion, the model offers a proactive approach to safeguard IoT deployment. By leveraging sniffing tools and advanced analysis techniques, the model enhances the detection and response capabilities, enabling efficient protection against emerging threats in IoT. However, challenges associated with the model are identified, including the complexity of network monitoring and potential privacy concerns.

Keywords: *Internet of Things (IoT), wireless local area network (WLAN), Security Intrusion Monitoring, Sniffing tool, Network Traffic Analysis, Intrusion Detection, Anomaly Detection.*

70. Data-Driven Motorbike Accident Analysis and Prediction Model: A Systematic Review

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

Numerous injuries and fatalities result from accidents involving motorcycles, which pose a significant hazard to public safety. This study aims to enhance road safety by resolving the need for a data-driven method to analyze and forecast motorcycle incidents. The objectives of the study are described, with the necessity of an accurate prediction model. Data acquisition and analysis techniques are well represented in the research methodology. The research uses a data-driven approach to compile and analyze pertinent information regarding motorcycle incidents. In addition, the limitations of the study are acknowledged, guaranteeing the reliability of the research procedure. The study's key findings are presented alongside descriptive statistics and statistical data. The results reveal accident patterns, contributing factors, and possible correlations within the dataset. These findings offer crucial insights into motorcycle accidents and serve as the foundation for the development of the prediction model. The primary emphasis is placed on the prospective implementations of the developed prediction model in the disciplines of Data Science and transportation safety. This study contributes to a better understanding of motorcycle accidents and provides a solid foundation for accident prevention and mitigation strategies. There are recommendations for future research in the field, with an emphasis on areas that merit further study. The current study identifies prospective avenues for refining the prediction model and increasing its accuracy, as well as enhancement suggestions. By casting light on accident patterns and facilitating the implementation of preventive measures, the research contributes to the development of road safety. Data gathering, analysis, model building, raising awareness, enhancing emergency response, and policy development are all part of the implementation plan. The study is anticipated to produce a data-driven motorbike accident analysis and prediction model, more awareness of the need for improved road safety, and policy suggestions for Kenya.

Keywords: *Data-driven, Motorbike accidents, Analysis, Prediction model, Road safety, Data collection, Statistical analysis, Correlation, Accident prevention, Future research.*

71. Influence of digital logistics systems on supply chain performance of tea factories in Meru county

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

Digitalization is the use of Digital technologies to change a business model and provide new revenue and value-producing opportunities. It is the process of moving to a Digital business. Digitalization has impacted our way of life, including how we do business. The Logistics sector is one of the industries that has experienced an intense revolution when it comes to matters of Digitalization. Digital Logistics uses the following applications: Artificial Intelligence (AI), the Internet of Things (IoT), Machine Learning (ML), and Blockchain techniques. The concept of digital Logistics has been brought about by the Fourth Industrial Revolution, characterized by progressive connectivity, novel assistance systems, and decentralized decision-making. However, many tea factories in Kenya, including those in Meru County, have lagged in embracing the Digitalization of Supply Chain processes, especially in the Logistics Sub-sector. The purpose of this study is to analyze the influence of Digital Logistics Systems on Supply Chain Performance of Tea Factories in Meru County. The study will be guided by the following theories; Material Flow Theory, Theory of Constraints, Six Sigma Inventory Management Theory, and Supply Chain Operational Reference Model. The study will use a cross-sectional research design to collect data from a target population of six factories in Meru County. Stratified Sampling method will be used to select 290 participants out of the 1050 participants.

Keywords: *Digital Logistics Systems, Supply Chain Performance, Tea Factories, Meru County*

72. A deep learning depression prediction model from social media posts: a systematic review

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

Depression is a major mental health disorder that affects millions of people worldwide. The use of social media data for depression prediction has gained attention in recent years. The objective of this systematic review is to identify and analyze existing literature on the development of a deep learning depression prediction model from social media posts. The study seeks to identify the features and attributes that can be mined from social media posts to predict depression. The study performed a comprehensive search of electronic databases, including ScienceDirect, SpringerLink, and PubMed, using relevant keywords. The key findings suggest that deep learning methods receive more attention and perform better than other classifiers for depression detection. The existing model demonstrates robust predictive capabilities and holds promise for aiding in early detection and intervention for individuals experiencing depression symptoms. The model can be integrated with mental health support systems so as to enable timely interventions and personalized assistance for individuals that are at risk. In conclusion, deep learning methods can be used to develop accurate and reliable depression prediction models from social media posts. It is recommended that more research on the use of social media data for mental health diagnosis and the development of explainable models.

Keywords: *Depression, social media, deep learning, machine learning, natural language processing, and mental health*

73. Assessing the usability of University Websites in meeting the expectations of student customers. a survey of the literature

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Subtheme: Disruptive technologies for sustainability in the circular economy

Abstract

University websites are gateways to display resources offered by an institution [1]. As such first impression, attractiveness, controllability, helpfulness, efficiency and learnability as defined by Website analysis and measurement inventory (WAMMI) [2] is critical in the design of websites. Unfortunately, most Universities Websites design are often driven by technology, organizational structure, or institution's objectives, rather than by its usability from the perspective of students [3]. This reduces chances of converting a prospective student into a current student after failing to get inquiries into enrollment opportunities in the university. To increase the usability of University websites it is necessary to increase the visibility and accessibility of all website related content. This result into the need of evaluating university websites a process that is very vague and a times usually unknown to most developers, which adversely then impacts the student experience when visiting such websites. To address this problem, standard usability metrics need to be considered to examine the university websites to analyze whether these websites are able to meet the requirements of customer number one who is the student. These metrics comprise of ease of use (simplicity), design (layout), navigation, organization, communication and content. Qualitative and quantitative approaches were used by different researchers to evaluate processes involved by analyzing questionnaires responded to by students after browsing several university websites. In addition, various technological innovations aimed at increasing and improving the web presence were used which involved re-designing of websites using the latest state of the art technologies so as to improve its usability as well as use of automated tools like Web Accessibility checker, HERA and WAVE. After evaluating results majority of the students are satisfied with the usability attributes but unfortunately most of the universities failed to meet basic standards of usability as expected by the students..

Keywords: *Website analysis and measurement inventory (WAMMI), Website Usability*

74. Suitability of Mobile banking interfaces for elderly users: A review of literature

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Abstract

As technology advances, mobile banking interfaces have become integral to modern banking systems. However, their suitability for elderly users, who often face unique challenges, remains a concern. This abstract explores the benefits and challenges of mobile banking interfaces for the elderly. Mobile banking interfaces offer convenience and accessibility, allowing elderly users to perform financial transactions from home. This is particularly beneficial for those with limited mobility or in remote areas. Furthermore, these interfaces often provide features like large fonts, adjustable contrast, and voice options, catering to the visual and auditory needs of elderly users. Despite these advantages, elderly users may encounter challenges when using mobile banking interfaces. Learning to use new technologies can be a major obstacle for those less familiar with smartphones and applications. Additionally, issues such as dexterity limitations, cognitive decline, and visual impairments can further hinder their effective use of these interfaces. To address these challenges, mobile banking interfaces can incorporate user-friendly design principles. Simplified layouts, intuitive navigation, and clear instructions enhance usability for elderly users. Integration of accessibility features like text-to-speech and adjustable font sizes greatly assists those with visual or hearing impairments. Additionally, providing comprehensive support through tutorials, online assistance, or dedicated helplines empowers elderly users to overcome technological barriers. In conclusion, mobile banking interfaces have the potential to benefit elderly users by providing convenient and accessible banking services. However, it is crucial to consider the unique challenges faced by this demographic. By incorporating user-friendly design and accessibility features, mobile banking interfaces can be better tailored to suit the needs of elderly users, enabling them to navigate the digital banking landscape with confidence and ease.

Keywords: *mobile banking, eldersly users, human computer interaction*

CONFERENCE PAPERS

75. A systematic review of Machine Learning Models for early detection of diseases in crops

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Subtheme: Disruptive Technologies for Sustainability in the Circular Economy

Abstract

Early detection of diseases in crops is critical for mitigating the adverse effects on crop yield and ensuring food security. In recent years, machine learning models have emerged as powerful tools for accurate and timely disease detection in crops. This systematic review aims to provide a comprehensive analysis of the existing literature on machine learning models for early detection of diseases in crops, A systematic search of relevant databases is conducted to identify studies that meet the inclusion criteria. These studies encompass a diverse range of crops, diseases, and machine learning algorithms employed for disease detection. Data extraction and quality assessment are performed to analyze the characteristics and methodologies of the selected studies. The findings of this review demonstrate the effectiveness of machine learning models in early disease detection in crops. Various types of machines learning algorithms, including supervised, unsupervised, and deep learning methods, have been utilized to analyze diverse datasets. Furthermore, the review highlights the performance metrics used to evaluate the models, such as accuracy, precision and recall. The results indicate that machine learning models consistently outperform traditional methods in terms of disease detection accuracy and efficiency. However, challenges exist in implementing machine learning models for crop disease detection, including the dependency on the plant village dataset, and lack of dynamic models that are scalable across different crop species and geographic regions. The review proposes potential solutions, such as development of hybrid models, creation of more datasets for model validation and collaboration between researchers and farmers to collect and share data. Machine learning models have demonstrated significant potential for early detection of diseases in crops. Addressing the existing challenges and further advancing the field will unlock the full potential of machine learning models in enhancing crop health management and ensuring global food security.

Keywords: *Crop Diseases, Machine Learning, Hybrid Models, Validation, Metrics*

76. Adoption of Internet of Things for advancing knowledge management in Kenyan University Libraries: a case study of Catholic University of East Africa, Kenya

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Subtheme: Disruptive Technologies for Sustainability in the Circular Economy

Abstract

The Internet of Things (IoT) has been recognized for its potential to enhance operational efficiency and effectiveness across various sectors. However, university libraries have been slow to adopt this technology. This study seeks to identify factors hindering adoption of IoT with a view of providing best practice to facilitate knowledge management in university libraries. Specifically, the study aims to assess the use of IoT for knowledge management at the Catholic University of East Africa, identify success factors related to IoT adoption in university libraries, evaluate the competency of university librarians in using IoT, and examine the relationship between IoT and knowledge management. The study is guided by the Unified Theory of Technology Acceptance and Use and Adaptive Structural Theory, and is conducted at the Catholic University of East Africa university libraries. Data is collected through interviews, focus group discussions, and document analysis, and is analyzed using content analysis and thematic categories. The study's findings are presented in a comprehensive report that outlines the study's methods, benefits and drawbacks, implications, summary, and conclusions based on the initial objectives. The study recommends best practices that will facilitate IoT adoption in university libraries, enhance their knowledge management capabilities, and contribute to the development of a best practices framework.

Keywords: *IoT, Knowledge Management, Libraries, Technology, Adoption, Best Practices*

77. Online University suggestion box system

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Subtheme: Disruptive Technologies for Sustainability in the Circular Economy

Abstract

An online student complaint system is a platform designed to provide students with an efficient and effective way of reporting any complaints they may have regarding their education. This system provides a centralized location for students to submit their complaints, which can be easily accessed and managed by school administrators. The platform is designed to streamline the complaint process and ensure that students receive prompt and appropriate responses to their concerns. Features of the system include a user-friendly interface, automated tracking and reporting, and the ability to track the status of complaints in real-time. The use of an online student complaint system promotes transparency and accountability, allowing for a more efficient resolution of complaints, and ultimately enhancing the overall student experience.The presented model for the Student Complaint Management System will have the ability to minimize students' dissatisfaction and on the other hand it can encourage students to participate in controlling the quality of the service provided. We try to improve the relationship between Students and the University by presenting a new model of e-Complaint web service based. The Proposed model aims to develop a Service-Oriented framework for e-Complaint Web-based that targets the incremental life cycle. The cycle starts with requirements and solutions evolve through collaboration between self-organizing, cross functional teams. It promotes adaptive planning, evolutionary development, early delivery, continuous improvement and encourages rapid and flexible response to change. Therefore, a need for a system that could detect student's problems and provide them with suitable feedback is raised. Also, this paper describes the Complaint Management System oriented by Web-application which will be used by students in order to make complaints about their dissatisfaction on provided services. This system will be able to handle complaints by recording and giving feedback for each raised complaint. Results of the study can be a good reference to find out users' needs from e-complaint and the handling process of this complaint in the body of any organization.

Keywords: *e-suggestion box, Complaints, SDG's. Student Information System, Complaint Management System*

78. A review of blockchain technology applications in academic libraries

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Subtheme: Disruptive Technologies for Sustainability in the Circular Economy

Abstract

Introduction: Blockchain technology has emerged as a disruptive force across various industries, holding immense potential to revolutionize transaction processes and secure information storage. Academic libraries are increasingly exploring the applications of blockchain technology to enhance efficiency, security, and transparency within their operations. **Objectives**: This review aimed to systematically investigate the latest applications of blockchain technology in academic libraries. The primary objectives were to identify blockchain technology applications, library-specific blockchain applications, examine the challenges associated with implementing blockchain, and explore the potential benefits of blockchain in academic library contexts. **Methodology**: A comprehensive literature review was conducted using the following academic databases: Google Scholar, EbscoHost, Emerald Insight, and IEEE Xplore using appropriate keywords. Relevant scholarly articles, conference proceedings, and grey literature published since 2018 were synthesized to gather insights into the applications and challenges of blockchain technology in academic libraries. Thematic analysis of the literature was conducted using MaxQDA. **Findings:** The review reveals significant applications of blockchain in academic libraries, including the creation of special collections using Non-Fungible Tokens (NFTs), its use in the publishing industry, and its application in information literacy initiatives. NFTs could enable libraries to authenticate and preserve digital artifacts, enhancing library prestige and offering opportunities for engagement and fundraising. Blockchain-based publishing platforms could ensure transparent peer review processes, incentivize quality contributions, and foster trust in scholarly publishing. Integration of blockchain technology in information literacy initiatives promotes the verification of trustworthy sources and facilitates the evaluation of user-contributed content. Additionally, it could new ways to incentivize users through blockchain metaverse powered games as well as enable award of digital merits that can be authenticated and displayed. Challenges associated with blockchain implementation in academic libraries include its nascent stage, scalability concerns, energy consumption, and the need for standardized protocols and regulatory frameworks. Further research and development are necessary to address these challenges and maximize the benefits of blockchain technology. **Conclusion and Recommendations:** Blockchain technology holds immense potential for transforming academic libraries, To fully realize the benefits, it is recommended that academic libraries actively engage in research, collaboration, and industry-wide discussions to address challenges, establish standards, and develop best practices for blockchain implementation. Furthermore, policymakers and funding agencies should support initiatives to explore and experiment with blockchain applications in academic library contexts. By embracing blockchain's unique features, academic institutions can enhance their operations, strengthen trust in scholarly endeavors, and foster innovation and collaboration within the academic community.

Keywords: *Blockchain, Non-Fungible Tokens (NFTs), Academic Libraries, Metaverse*

79. A systematic review of machine learning-based sensor-enabled techniques for soil quality analysis

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Subtheme: Disruptive Technologies for Sustainability in the Circular Economy

Abstract

Soil plays an important role in supporting growth of both plants and animals. In order to manage environmental practices as well as sustainable agriculture, it is crucial to analyze the nutritional quality of the soil. Over the years, there have been diverse conventional procedures and techniques that have been used to determine the chemical biological, and physical aspects of soil. Even though these methods have been effective, technological advancement has led to introduction of Sensor Technologies and Machine Learning Algorithms (MLA) in the development of prediction models that can determine soil quality in a manner that is easier, quicker and more cost effective while producing results that are more accurate. This paper presents a thorough analysis that explores how sensor technology might be used to analyze soil quality using MLA. The primary goal of the study is to provide an in-depth analysis of existing architectures from available literature to enhance more knowledge about the soil composition through use of sensor technologies. A systematic search of pertinent databases resulted in the selection of 35 peer reviewed articles published in 2019 to 2023. The detailed study was carried out to expose methods and procedures applied using sensor-based technology as well as machine leaning for soil quality assessment. Results from the study revealed the significance of such technologies in the analysis of soil quality. The integration of Sensor Technology and Machine Learning Algorithms enabled design of a robust model with prediction capabilities that enhanced data-driven decisions made by farmers on improving soil quality. The study faced a number of difficulties and restrictions, including the necessity for sensor calibration, use of data preprocessing methods and need to deal with the heterogeneous nature of spatially varying soil attributes.

Keywords: *Soil quality analysis, machine learning, sensor technologies, Algorithm*

80. Text Mining: advancements, challenges, and successes in natural language processing and the semantic web

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Abstract

Text mining has emerged as a crucial facet in the fields of natural language processing (NLP) and the semantic web, enabling the extraction of valuable insights from vast amounts of unstructured textual data. This paper presents a comprehensive overview of text mining, focusing on its advancements, challenges, and notable successes in the past decade. The paper begins by introducing the concept of text mining and its significance in NLP and the semantic web. It provides an understanding of how text mining works, covering key steps such as text preprocessing, representation, information extraction, and classification. Various methodologies, including text preprocessing techniques and representation methods such as bag-of-words and word embeddings, are discussed. The challenges in text mining are examined, encompassing data quality, noise, ambiguity, and contextual understanding. The paper highlights the complexity of handling noisy and ambiguous textual data and the importance of addressing these challenges to ensure accurate and meaningful results. Scalability and performance issues related to processing large volumes of text data are also explored. Furthermore, the paper discusses notable successes in text mining over the past decade. It showcases advancements in sentiment analysis, enabling businesses to gain insights into customer sentiment and make data-driven decisions. The development of question-answering systems capable of understanding and answering questions in natural language is highlighted. Additionally, improvements in named entity recognition, topic modeling, and text summarization are discussed, emphasizing their contributions to information retrieval, knowledge extraction, and content recommendation. In conclusion, text mining has demonstrated significant advancements, paving the way for extracting valuable insights from unstructured textual data. However, challenges related to data quality, ambiguity, and scalability persist. The successes achieved in sentiment analysis, question-answering systems, named entity recognition, topic modeling, and text summarization underscore the potential of text mining in enhancing NLP capabilities and advancing the semantic web ecosystem. Further research and development in text mining methodologies and algorithms are crucial to address these challenges and unlock the full potential of text mining in various domains.

Keywords: *Text mining, natural language processing, semantic web, information extraction, sentiment analysis, question-answering systems, named entity recognition, topic modeling, text summarization.*

81. Algorithms Architectures and Data Structures in Distributed Ledger Technologies

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Subtheme: Disruptive Technologies for Sustainability in the Circular Economy

Abstract

The ability of Distribute Ledger Technologies (DLTs) to provide a distributed and decentralized environment with no central trusted control authority has led to the application of DLTs in different sectors. DLTs are protocols and technological infrastructures that are maintained by a network node based on an architecture and setup where each of the nodes has a copy of the ledger, allowing simultaneous access, validation and record updating a networked database. DLTs are categorized in terms of their data structures, algorithms, permissioned, permissionless, hybrid, public, private and whether they are mined or not. Blockchain, Directed Acyclic Graph, Hashgraph, Holochain and Tempo (Radix) are the common types of DLTs. This paper employs exploratory research design with an objective to review various literature on different algorithms and data structures applied in DLTs. The study revealed proof-of-work, proof-of-stake, proof-of- authority, proof-of-elapsed time, proof-of-importance, proof-of-capacity, proof-of-identity, proof-of-activity, byzantine fault tolerance, delegated proof-of-stake, delegated byzantine fault tolerance, stellar consensus protocol and practical byzantine fault tolerance as some of the common consensus algorithms used in DLTs. In addition, the review shows that DLTs use either linear or linked, complex and hybrid data structures. The findings also indicated that DLTs architectural design is constructed of three layers Protocol, Network, and Data. The findings of this study will contribute to policy and the body of knowledge in Distributed Ledger Technologies. Future work can focus on review of Application areas of DLTs.

Keywords: *Distributed ledger, Technologies, Algorithms, Data Structures, Blockchain*

82. State of Smart Homes deployment in Kenya

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Subtheme: Disruptive Technologies for Sustainability in the Circular Economy

Abstract

A smart home refers to a residence that is furnished with a communication network, sensors, household devices and appliances that can be remotely identified, accessed, monitored, and controlled. Smart home technology is considered to be a combination of independent applications, automation controls and network technologies rather than a cutting-edge technology product. Investment in a whole product will make it complex and difficult to operate and burden the users. The objective of this paper is to assess the state of deployment of smart home technology in the Kenyan Market, based on an approach of identifying discrete devices deployed in smart homes. The methodology adopted in this paper is on collection of observation, interviews and collection of secondary data. A purposive sampling method is used in data collection where qualitative and quantitative data was collected. The findings from the respondents generally were subdivided into Geographical distribution, Cost, Communication infrastructure which is fairly done within residential areas in the country, Wireless network technologies such as Wi-Fi which have continued to drop in costs, Power distribution, Lighting, Environmental related controls, Home Entertainment and Security sensors which are available in the market for use in homes. Each of the devices have been evaluated. The conclusion made was that, home owners have not embraced smart home technology largely due to limited knowledge in the existence of the technology. The total cost of ownership of the technology is also a major issue involved in deployment of smart homes. Users are not sure of what the smart home brings associated with privacy, an enabling environment to allow exploitation of smart home opportunities is not yet conducive and that there is a lot of opportunity for smart home device markets.

Keywords: *Smart Home, Internet of Things*

SUBTHEME 5: Education for sustainable development for the world in the time and beyond pandemics

PRECONFERENCE

83. The traditional beliefs inhibiting uptake of education in Kajiado community during the 21st century

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Subtheme: Education for sustainable development for the world in the time and beyond pandemics

Abstract

Are there particular cultures that are more adequate than others in the sense that they are more relevant during the 21st century of globalization? If so, which are the possible criteria to determine that certain cultures are adequate and have the power to change peoples' identities? The study sought to address issues on traditional beliefs inhibiting uptake of education in Kajiado community during the 21st century. The objectives were to: establish cultural beliefs affecting education among the Kajiado community members and find out the youths' attitude towards various cultural practices affecting their contemporary ways of life. Survey design with 90 respondents obtained using cluster random sampling responded to questionnaires and interview schedules. Female genital mutilation (42%), early marriage (30%) and child labour (23%) were cited as the most retrogressive culture. The study concluded that sensitization of community members against negative cultural beliefs be done through public barazas, community based organizations, churches, schools, local television and radio stations, socio media and print media platforms. It was recommended that Nyumba Kumi initiative monitor homes under their jurisdiction to prevent female genital mutilation practitioners and consumers of their services from taking place.

Key Words: *Cultural beliefs, education, cultural practices, attitudes*

84. College agricultural student's training skills competencies influence on their career progression prospects

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Subtheme: Education for sustainable development for the world in the time and beyond pandemics

Abstract

The study focused on vocational college's agricultural student's training skills competencies influence on their career progression prospects. Agriculture is the backbone of several economies world over, with regards to food production, providing market for farm inputs, raw materials for industries, income, source of foreign exchange and employment. The benefits come as a result of teaching agriculture in primary, secondary schools and in colleges of agriculture. The objectives were to: establish learner's learning achievement in practice with respect to frequency of practical lessons; determine outcomes of field trips on students' interest in farming as an additional job and find out students interest in agriculture as a professional career. The sample size was picked randomly from teachers and students pursuing agricultural course. Through survey design, questionnaires, interview and observation schedules were used to collect data. 55% of the students were interested in Agriculture as a career while 83% said they would take up farming as an additional source of income. The study concluded that although the students had high interest in agriculture, it's recommended that these learners needed more of 21st century skills and competencies to enable them pursue agriculture efficiently in the farm.

Keywords: *skills, competencies, career, learning achievements, practical lessons, field trips.*

85. Shared experiences on implementation of competency based curriculum in primary schools in Vihiga sub-county

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Subtheme: Education for sustainable development for the world in the time and beyond pandemics

Abstract

To align the Kenyan education system to the 2010 constitution, the Odhiambo report recommended the Competency Based Curriculum (CBC) system. This CBC system focuses less on summative assessment, and maximizes on the 21st century skills of assessment that enables a learner to acquire right competencies. so the study sought to establish shared experiences on implementation of competency based curriculum in primary schools in Vihiga sub-county. The study objectives were to: find out the teachers preparedness in implementing CBC curriculum, implementation; determine availability of CBC teaching and learning materials and assess parent's roles in implementing competency based curriculum. The study used survey design employing descriptive technique to randomly sample 200 respondents from parents, teachers and learners. Questionnaire, focus group discussion and observation schedules were used in collecting data. The study established that the in-service training teachers got from the government trainers was insufficient to cover the required aspects of the CBC curriculum such as lesson plan preparation, schemes of work, assessment and evaluation. It was concluded that majority of the interviewed parents were aged and had no knowledge about CBC. The few parents who had form four level of education and above said they paid fess for their children and decanted on being involved in doing their children class assignments as they had no time for that.it was concluded that Some children under the custody of their grandparents/ guardians especially the old age had no ability to assist these children in doing home assignments. The study recommended serious engagements with parents in public forums, television, radio, print media and social media educating them on the need to be closer to and monitoring the learning of their dear children.

Key words: *Teachers' preparedness, implementation, competency based curriculum, teaching and learning, parent's roles*

86. Role of information communication technology in enabling management of day secondary schools

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Subtheme: Education for sustainable development for the world in the time and beyond pandemics

Abstract

World over, the teaching and learning institutions have been redesigning their methodologies of service delivery using the modern and efficient platform if information technology propelled by the forth industrial revolution paradigm shift. The study sought to establish the role of information communication technology as an enabler in the management of secondary school affairs. The study sought to: Establish the availability of information communication technology (ICT) used in the day to day teaching and learning services at day secondary schools; Find out the status of day secondary schools' principal's current awareness on the use of ICT in the day to day running of their schools' affairs; and assess the extent of ICT employability in the management of school records. The study employed descriptive survey and systematic random sampling drawing a sample of 110 respondents who responded to interview schedules and questionnaires. The study established that 49% of the teaching force in day secondary schools were had bachelor's degree. On ICT integration, 87% of the sampled academic and examination departments conducted their activities through ICT processes. The study concluded that information communication technology is as an indispensable tool in the daily management of secondary schools, teaching and learning process during the 4th industrial revolution era of information technology. Finally the study recommended that schools should endeavour to retool teachers on ICT skills and competencies as enablers for 21st century pedagogies for teaching and learning

Key words: *Information Communication Technology, use of ICT, management of school records*

87. Public secondary schools' preparedness on implementation of Competency Based Curriculum in Tigania West Sub-county, Kenya

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Subtheme: Education for sustainable development for the world in the time and beyond pandemics

Abstract

Competence based techniques are different from knowledge based content and focusing instead on what students learn to do with knowledge rather than on the knowledge itself. It is imperative for secondary schools to clearly identify the competencies that a student must master and aim at meeting different abilities that lead to efficient student's career outcome. This study aimed at examining the information communication technology preparations instituted in readiness for competency based curriculum implementation; establishing the secondary school's management levels of exposure of teachers to training on competency based training pedagogies and finding out the competencies possessed by trained teachers to implement the competency based curriculum at secondary schools. The literature was drawn from existing experiences across Africa and the rest of the world. The study employed descriptive research design because it emphasizes on what exists in actual sense such as current situations, practices and conditions. It established that more than half of secondary schools within Tigania West sub-county were not ready for implementation of CBC, while only 5 secondary schools had functional computer labs used to teaching and learning of information communication technology. The study concluded that most of the secondary school participants were not ready for CBC roll out at the time of study due to a number of factors such as inadequate space, inadequately in-served teachers and lack of requisite resources liked books, ICT facilities among others. It was recommend that as a matter of priority, secondary schools should embark on retooling teachers on CBC pedagogical skills and competencies.

Keywords: Information communication technology, training pedagogies, competencies, and competency based curriculum

CONFERENCE PAPERS

88. Webometrics Ranking of Universities: fallacy or reality?

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

Introduction: Students and parents all over the world have come to regard university education as an important tool for career advancement. Therefore, academic progression choices are often based on publicly available ranking data. The Webometrics Ranking of World Universities is one such critical tool. It serves as a prominent benchmark for evaluating institutional performance and global influence. It aims to promote the quality of research and education in academic institutions through visibility that showcases research activities and enriches knowledge. The relationship between webometrics ranking and quality of education is that webometrics ranking promotes the quality of education and research in academic institutions through visiblity. However, it is important to note that webometrics ranking is not a comprehensive measure of the quality of education and research in academic institutions. Concerns have arisen regarding its fairness, particularly in relation to universities in the global south, including those in Kenya. **Objectives:** This desk review sought to a)critically examine the biases and inequities present in the Webometrics Ranking of World Universities, with a specific focus on the global south and Kenya. b) explore the challenges faced by universities in the global south, particularly in Kenya, in achieving equitable rankings within the Webometrics system. c) analyze the consequences of biased rankings on the recognition, funding, and overall development of universities in the global south, exemplified by the case of Kenya. d) Propose recommendations for enhancing the fairness, transparency, and inclusivity of the Webometrics ranking system, as well as suggesting alternative ranking approaches that better capture the unique characteristics and challenges of universities in the global south. **Methodology:** The study employs a literature review methodology, conducting systematic searches across scholarly databases and sources. Relevant scholarly articles, reports, and other published literature focusing on the Webometrics ranking system, biases in rankings, global south universities, and the case of Kenya are analyzed and synthesized to uncover insights regarding the shortcomings of the Webometrics ranking system and its impact on universities in the global south. **Findings:** The last webometrics ranking (January 2023) has 9 out of the top 10 universities from the United States of America (USA). USA further occupies 54% of the top 100 slot. The top African university is placed at position 246 globally. Within Kenya, the best university is ranked position 1,076. Meru University of Science and Technology is ranked position 19 in the country, and 7103 globally. Substantial differences exist among institutions, making it unfair to place them on the same ranking list. Biased rankings perpetuate disparities in funding allocation, hinder recognition and reputation-building efforts, and impede research collaboration opportunities for universities in the global south, particularly in Kenya. **Recommendations:** a) Enhance the transparency and fairness of the Webometrics ranking system by incorporating diverse indicators that capture the multidimensional nature of institutional performance and influence. b) Encourage collaboration between ranking agencies and universities in the global south to ensure their unique challenges and achievements are adequately represented. c) Promote alternative ranking approaches

Keywords: *Webometrics Ranking, global south, Kenya, biases, inequities, literature review, institutional performance, transparency, alternative ranking approaches*

89. Challenges of inclusive higher education in Tanzania: the struggles of female students with disabilities during Covid-19 pandemic

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Abstract

Challenges to inclusiveness of female students with disabilities have been documented worldwide. This study explored the challenges to inclusive education among female higher education students with disabilities during COVID-19 Pandemic in Tanzania and how they struggled to overcome them. The study employed a qualitative approach that was informed by the phenomenological design. A total of 158 research participants including 28 Academic staff, 28 wardens who were simple randomly sampled, and 4 deans of students, 80 students with disabilities, 2 students' leaders with disabilities, 8 personal assistants of students with disabilities and 8 heads of academic departments who were purposively and simple randomly sampled from four higher learning institutions in Tanzania. The sample size was however, determined by point of saturation. Data were collected through interviews, Focus Group Discussion, and direct observation where thematic analysis was used for analysis. The findings revealed that inadequate water supply, unhygienic hostels, lack of changing and nursing rooms, difficulties of access to preventive facilities and inadequate counselling services were one of the challenges to inclusive higher education among SWD during COVID-19. The paper reveals ways which were used by female students to overcome the challenges such as befriending students without disabilities so that they could fetch water for them. This paper recommends that the government, higher learning institutions and other stakeholders should prioritize issues related to disabilities and female students in particular.

Keywords: *Challenges, Inclusive Higher Education, COVID-19 Pandemic, Female Students with Disabilities*

90. Factors influencing students' achievement in technical education programs in Kenya. a case study of Nyandarua National Polytechnic, Kenya

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Abstract

Kenya's Vision 2030 blueprint expects a country that has achieved middle income status supported by five key sectors of the economy namely Agriculture, 1CT, Manufacturing/Industry, Education and Finance (Nelly,2007). This will improve provision of education to students in technical institutions and hence achieve the vision 2030 of making Kenya an industrialized nation by 2030. The purpose this study is to investigate the factors influencing students' achievement in technical education programs in Kenya: a case study of Nyandarua National Polytechnic, Nyandarua County, Kenya. The objectives of the of the study were to establish the effect of availability of teaching personnel on achievement of students in technical education programs, determine the influence of learning facilities and resources on students' achievement in technical education programs, determine the influence of instructional methods on students' achievement in technical education programs and identify how finances influence students' achievement in technical education programs. The study used a descriptive survey design and the theoretical framework of this study was derived from the human capital theory. The target population of the study was 1000 and a sample of 100 was picked. This sample was picked using stratified sampling and proportionate sampling. Questionnaire were used to collect data. Data analysis was done using Statistical Package for Social Sciences, descriptive statistics computed and data presented using tables. The findings of the study indicated that most of teaching staff (50.0 %) had degree level of education; the institution has mechanic course and tools, equipments and materials used for training as indicated by (38.4%) of respondents. Demonstration is an effective method of instruction in technical institutions as indicated by (52.0 %) of respondents. Students (52.5%) relied on their parents for their fees and upkeep since only (17.2%) of respondents received scholarship funds. The study findings will be useful to future scholars as it will add to the existing body of knowledge and this will improve provision of education in technical institutions and hence achieve the Vision 2030. Technical institutions should have well educated and experienced teaching personnel, suitable and adequate learning facilities and resources, use a variety of instructional methods to improve students' achievement.

Key words: *academic achievement, technical education, polytechnic, Kenya.*

91. The perceptions of the teacher trainees on the implementation e-assessment in the selected Teacher Training Colleges in Kenya

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Abstract

The Kenya National Examinations Council (KNEC) is currently implementing the integration of technology in conducting assessments so as to replace the traditional mode of paper and pen. The purpose of this study is to examine the perceptions of the teacher trainees towards the implementation of e-assessment in the upgrade course of Diploma in Primary Teacher Education (UDPTE). The study adopted a descriptive research design and was carried out in two (2) public teacher training colleges with a target population of two hundred and forty (240) teacher trainees for UDPTE programme. All the trainees were purposively selected to participate in the study. An online Teacher Trainees Questionnaire (TTQ) was used to collect information relating to trainees perception of e-assessment. The reliability coefficients alpha (α) of TTQ was found to be 0.78 from the pilot study making the instrument valid for data collection. The data collected was analyzed using both descriptive and inferential statistics by the use of SPSS software version 26.0. The study findings show that the majority of teacher trainees had positive attitude towards the adoption of e-assessment but a significant number of them felt that the colleges were not yet prepared for e-assessment due to lack of necessary technology infrastructure. It was further noted that the teacher trainees need more training on computer basic skills in order to improve on the typing skills for responses. The Ministry of Education needs to equip the teacher training colleges with the necessary technology infrastructure and continuously retool tutors on how to integrate technology tools in the assessment procedures.

Keywords: E-assessment; Teacher Trainees, Technology; Training; Perception

92. Reengineering University Library orientation and training for fresh students: a case of Meru University of Science and Technology

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

Introduction: Library orientation plays a pivotal role in empowering students with the necessary skills to navigate and utilize the vast resources available within a library. It not only familiarizes students with the physical layout of the library but also introduces them to various research tools and techniques, enabling them to conduct effective and efficient information searches. By equipping students with these essential competencies, library orientation promotes academic success, critical thinking, and lifelong learning. This paper reports the results of a reengineering process for orientation of first year students at Meru University of Science and Technology for the Academic year 2022. **Methodology**. The library traditionally would conduct its orientation and subsequent library training period within two weeks after students reporting to campus. The effect of this was that students were still grappling with settling down at campus, with many of them not properly settled. Additionally, the training did not involve any form of assessment, and student attendance was dismal. The result of this was missed opportunities for students in exploring and using library resources. The library therefore consciously chose to delay the library training, only conducting minimal orientation during the first week. Three weeks after the academic semester, the training was scheduled. It was split to small sizes accommodating a School capacity. The librarians were retrained beforehand on what to cover. Minimal and critical areas were focused on including the basics of book searches, e-book searches, off-campus access and access for past-examination paper searches. In the past, the training was crowded leading to information overload. The students were then required to do an assessment test that was set in Moodle as a pre-requisite for their library accounts activation. **Results:** There was a significant improvement in attendance to the library sessions, and increased booking for individual library instruction. There was marked improvement in e-resources use. The students performed well in the assessment, showing an improved level of concentration in the sessions. Students however still struggled with basic Information Technology skills such as setting up emails, and use of the Moodle platform. However, there is still need to conduct graduated Information Literacy training to gradually equip the learners with Information Literacy skills. **Conclusion:** The findings suggest that a well-structured training program can positively impact students' academic performance and their engagement with library services and resources.

Keywords; *Services reengineering, library orientation, Information literacy, Structured training program*

93. Examining the Role of Spatial Thinking

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Subtheme: Education for Sustainable Development for the World in the Time and Beyond Pandemics

Abstract

Research on spatial "visualization" and other "spatial reasoning" aspects has been extensive in recent years. The popularity of such research owes to the relevancy of spatial reasoning to diverse fields of human endeavors. Of particular interest to mathematics educators, research shows a direct relationship between "spatial reasoning" skills and general mathematics achievement. This qualitative study investigated the use of block-building activity by high school students in the southern states of the USA. This study suggests that high Students need help relating isometric-type drawings to the rectangular solids they represent. Items of the sort "How many cubes does it take to build a given (pictorially presented) rectangular solid" were used. The errors made by students were analyzed, and the effect of instruction in "spatial visualization" activities on the performance of High School Students was assessed. The result showed that the activities support the development of students' spatial ability in understanding 3D representations. During the implementation, these activities gave students a chance and guided them to explore the views of 3D objects and their representations.

Keywords: *Spatial thinking, spatial reasoning, 3D*

94. How Teachers in Tanzania Understand Phonics Instructional Approach for the Teaching of Reading in Early Grades

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

This study examined how teachers in Tanzania understand and implement Phonics Instructional Approach (PIA) in the teaching of reading among early grade learners. The study assessed teachers' pedagogical knowledge of the use of Phonic Instructional Approach (PIA). It employed questionnaires, interviews, and observations in collecting data. The study was conducted in 25 public primary schools in Mbeya Region and involved 83 Early Grade Teachers (EGTs), 180 STD I-II pupils, and 2 Primary School Quality Assurers (PSQAs). The quantitative data were analyzed using Statistical Package for Social Sciences (SPSS) whereas the qualitative data were analyzed through thematic analysis. The findings indicated that teachers do not have sufficient knowledge on the 3Rs (Reading, Writing, and Arithmetic). It is recommended that more teachers are trained on the 3 Rs.

Keywords: *Phonetics instructional approach, teachers' pedagogical knowledge, early grade learners*

95. A review of recommender models for career pathway selection in competency-based education

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

In Competency-based Education (CBE), learners acquire skills and knowledge through a personalized and flexible learning path, based on their prior knowledge and skills. To support learners in selecting career pathways that match their interests and competencies, recommender models are widely used. Recommender models (RM) analyze learners' competencies, interests, goals and factors, such as labor market trends, to suggest career pathways that are best suited for them. This review article provides an overview of various recommender models used for career pathway selection in CBE through desk study. First, it explains the role of career pathway selection in CBE. Secondly, discusses the different types of recommender models used, such as content-based filtering, collaborative filtering, demographic based, knowledge based and hybrid filtering models highlighting their strengths and limitations. The review further explores machine-learning algorithms used to improve the accuracy and effectiveness of the recommender models. Lastly, this paper specifies challenges associated with designing and implementing recommender models for career pathway selection that includes lack of data on learner competencies and interests, the need to balance personalization with flexibility, the need for continuous updating of the model to reflect changing job market trends and the potential for bias in the recommendation process. The findings from the review reveals that hybrid recommender models are the most popular compared to other types of models because they integrate two or more models to improve performance by combining their strengths and eliminating their shortcomings. Overall, this review article contributes to the growing body of literature on recommender models and provides practitioners and researchers interested in utilizing recommender models for career pathway selection in CBE with valuable insights. In addition, the review emphasizes the need for future research to address the challenges associated with designing and implementation of recommender models for career pathway selection in CBE.

Keywords: *Recommender Model, Content Based Filtering Recommender Model, Collaborative Filtering Recommender Model, Hybrid Recommender Model, Knowledge Based Recommender Model, Competency-Based Education.*

96. The Influence of Family Background on Academic Performance of Persons with Disabilities (PWDs) in Special Schools in Meru County, Kenya

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Abstract

This abstract presents a focused examination of the influence of family background on the academic performance of Persons with Disabilities (PWDs) in special schools within Meru County, Kenya. By analyzing existing research and data, this study aims to shed light on the role of family factors in shaping the educational outcomes of PWDs in this specific regional context. The academic performance of PWDs in special schools is influenced by a range of factors, including family background. By studying the specific case of Meru County, Kenya, this research seeks to explore the unique challenges and opportunities that PWDs face in this region and how their family environment can impact their academic achievements. Family support and involvement have been identified as crucial determinants of academic success for PWDs. Positive family environments, characterized by supportive parents and engaged family members, create a conducive atmosphere that fosters self-esteem, motivation, and academic self-efficacy among PWDs. Conversely, negative family backgrounds, such as limited resources, low socioeconomic status, and lack of familial support, can hinder the academic progress of PWDs. The cultural context and familial beliefs about disability play a significant role in shaping the educational outcomes of PWDs in Meru County. Cultural attitudes, societal stigma, and discrimination towards disabilities can impact the educational opportunities and experiences of PWDs, consequently affecting their academic performance. Understanding the influence of family background on the academic performance of PWDs in special schools in Meru County is vital for designing effective interventions and support systems. By recognizing the importance of family involvement, providing targeted resources and support services, and promoting positive attitudes towards disabilities, educators, policymakers, and stakeholders can work towards creating an inclusive educational environment that maximizes the academic potential of PWDs in Meru County, Kenya.

Keywords: *Family background, academic performance, persons with disabilities (PWDs), special schools, Meru County, Kenya*

97. Adaptive personalized learning model using graph bayesian network

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

Online learning is increasingly becoming an essential form of instruction globally. Consequently, recent research has reported that growth of information and communication technology (ICT) results to hastened creation of a variety of e-learning platforms which make it simpler to minimize the limitations of traditional learning approaches in terms of time and space. Most e-learning platforms however, are teacher-centered and apply a one-size-fits-all approach, just as traditional physical learning. In order to minimize the challenges resulting from traditional learning methods, a more effective strategy for learning that's learner centered is required. Research on the technology-enhanced interventions is required that minimizes information overload caused by the generalization of learning content availed to the learner. This study applies an adaptive personalized learning model using Graph Bayesian Network Algorithm to address the issue of generalization of learning content to learners. This is a probabilistic graphical model that is used to express the interactions between different variables in a learning environment. The probabilistic model uses prior data of the learner in order to tailor a learning path according to the specifications of an individual learner hence personalizing the learning process. The model is used to successfully forecast the student's paths from learner's knowledge levels and learning styles. The learning styles considered in this study are video, audio and kinesthetics. This is able to suggest individualized learning strategies based on these paths. With the distinct characteristics of learners, this may affect the engagement of learners and commitment to learning. Personalized learning helps to improve the process of learning by distinctively identifying learner's paths for appropriate recommendations and decision making in the learning process. This study will contribute to the body of knowledge in ICT and enhance Education Policy to adopt to the changing learning landscape as a result of Technological advancements.

Keywords: *Personalized learning, Bayesian Networks, e-learning, ICT, EdTech*

98. Virtual teaching and learning in universities beyond covid-19. Implications for future sustainability in Kenya.

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

This study aimed at investigating the parameters involved in the sustainability of e-learning pedagogy among faculty members and students in the Universities way after stringent COVID-19 measures and lockdowns. During the COVID-19 pandemic periods, institutions of higher learning shifted to e-learning as a way of completing academic calendars. There were continuous workshops, seminars and trainings to equip academic staff and students on the application and effectiveness of virtual classes as a means to lessen effects of COVID-19 and any other future similar pandemics, like the current outbreak of Marburg virus disease. With such significant preparations, it was expected that even in the post-COVID-19 era, blended approaches in teaching should be applied to avoid the total loss of e-learning in many institutions, upon resumption of normalcy. This study was therefore designed to assess various parameters on whether virtual teaching and learning is still sustainable in universities, using the case of Maasai Mara University. The objectives of the study were to find out the categories of virtual teaching and learning in use, the attitudes towards the use of virtual pedagogy, its effectiveness, challenges and recommendations. The study utilized descriptive research design, and the sample consisted of lecturers and students totaling to 277, who conveniently responded to the online questionnaire. The data was analyzed using descriptive statistics. The findings denoted the following; there was diminished use in the types of e-learning categories (video conferencing, 30%, learning management system, 34.3% and social media, 24.5%); there was less level of attitudinal agreeability towards e-learning (mean percentage of 16.46); and, there was less level of agreeability of effectiveness parameters (12.91 mean percent). Additionally, many challenges, for example, internet connectivity and infrastructure, hampered continuous effective implementations of e-learning. Finally, the study concluded and recommended a need for capacity building and governmental support for e-learning activities in universities.

Keywords: *Virtual Learning, Teaching, COVID-19, Universities, Future Sustainability*

99. The relationship between signature pedagogy, subject knowledge, and pedagogic knowledge in promoting good teaching in social work education: a case study of role-playing and the flipped classroom

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

Social work education is crucial in preparing students for the complexities of the profession. Good teaching practices are therefore essential for social work educators. This study explored the relationship between signature pedagogy, subject knowledge, and pedagogic knowledge in promoting good teaching in social work education, with a focus on role-playing and the flipped classroom approach. The study also aimed to identify the challenges, advantages, and disadvantages of these pedagogical approaches and their implications on social work students' learning outcomes. The study used a case study approach, and the data were collected from social work lecturers, students, and practicing social workers through in-depth interviews and focus group discussions. The sample size was 30 participants, and the data were analyzed thematically. The study found that social work educators who incorporated signature pedagogy, subject knowledge, and pedagogic knowledge in their teaching using role-playing and the flipped classroom approach had a positive impact on students' learning outcomes. However, social work educators encountered challenges in implementing these pedagogical approaches, such as inadequate resources, resistance from students, and time constraints. .The findings suggest that the flipped classroom and role-playing approach are effective pedagogical approaches for teaching social work students. The study recommends that social work educators should receive training on how to effectively integrate signature pedagogy, subject knowledge, and pedagogic knowledge in their teaching using role-playing and the flipped classroom approach. Additionally, social work education institutions should provide adequate resources to support the implementation of these pedagogical approaches. The study provides insight into the relationship between signature pedagogy, subject knowledge, and pedagogic knowledge in promoting good teaching in social work education. The findings can inform social work educators, institutions, and policymakers on how to improve social work education and promote good teaching practices.

Key words: *Social work education, signature pedagogy, subject knowledge, pedagogic knowledge, role-playing, flipped classroom*.

100. Understanding the causes and consequences of missing marks in Kenyan Universities: a qualitative analysis

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

Missing marks is a prevalent issue in Kenyan universities that has significant implications for both students and the institutions. Missing marks occur when grades or scores for a student's coursework or exam are not recorded or are lost, leading to confusion and frustration for both the student and the university. The consequences of missing marks are significant, including delays in graduation, academic penalties, financial implications, and damage to the university's reputation. Given the importance of accurate grading in ensuring academic integrity and fairness, it is essential to explore the causes and consequences of missing marks and to identify measures to prevent and address them effectively. This study aimed to investigate the causes and consequences of missing marks in Kenyan universities and to provide recommendations for policy and practice. The study used a qualitative research design and conducted focus group discussions with university students and examination officers. Purposive sampling was used to select participants, and data was collected through audio recording and transcription of the Interviews and FGDs conducted. Thematic analysis was used to analyze the data, and ethical considerations were observed throughout the study. The findings revealed that common causes of missing marks include administrative errors, technical issues, and academic misconduct. The study recommends that universities should implement measures to prevent missing marks and adopt best practices for addressing missing marks when they occur. The findings of this study contribute to the existing knowledge on missing marks in Kenyan universities and provide insights for policy and practice.

Keywords: *Missing marks, Academic integrity, Academic misconduct, Administrative errors, Technical issues and Consequences.*

101. Determinants and prevalence of drug abuse among athletes in selected university competitive sports in Kenya

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

To investigate the prevalence of drug abuse as it relates to psychosocial patterns (that include peer pressure, social environment, emotional state and depression) among university athletes involved in selected competitive sports.According to the World Drug 2019 Report, an approximately 271 million people, or 5.5 % of global population aged 15–64, did drugs in 2017, and the drug problem had reached alarming levels for both sexes. A research done by the National Authority for the Campaign against Alcohol and Drug Abuse (NACADA 2017) indicated that substance use among people aged 15 to 65 years old was 12.2% for alcohol, 8.3% for tobacco, 4.1% for khat, 1.0% for bhang, and 6.0% for various substances. Denham (2011) observed that juvenile sportsmen who competed in baseball, football, or weightlifting consumed more alcohol than their contemporaries. Substance abuse among college and university students remains an important area of research due to the implications of early substance dependence on the future of the youth (Atwoli et al, 2011). However, little or no empirical evidence is available on the prevalence and the specific factors that influence athletes in the university sports to indulge in drug abuse. This study will also inform the intervention strategies to prevent use of drugs in sports, more so among university athletes. One objective, (To investigate the prevalence of drug abuse as it relates to psychosocial patterns (that include peer pressure, social environment, emotional state and relationships) among university athletes involved in selected competitive sports at the universities in Kenya) was selected for this presentation from among three others. This study used a mixed methods research design with an intention to capture and utilise both qualitative and quantitative data. The study sample comprised 302 respondents who are players in selected competitive sports at the universities in Kenya. The researcher used stratified sampling by using simple random sampling method to select 10 universities proportionately (4 private and 6 public). The method was the most appropriate to capture universities with women rugby in addition to the five other selected sports. The study sought to investigate the prevalence of drug abuse due to factors such as psychosocial, medicinal and competition. SPSS computer version 20 was used to process data. In reference to psychosocial factors, results revealed that university athletes have been abusing drugs due to various psychological and social reasons. Future studies are needed regarding drug abuse and its prevalence especially among university athletes in other sports like board games. This would be for comparison purposes so as to make informed decisions on curbing the vice.

Keywords: *determinants of drug abuse, prevalence, psychosocial factors, university athletes*

102. Recovery programs and quality of education in day schools after pandemic: a case of Tigania West Sub-County, Kenya.

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Subtheme: Education for Sustainable Development for the world in the time and beyond Pandemics

Abstract

COVID 19 caused a serious disruption between 2020 and 2021 in the education sector world over. A need to develop and implement learning recovery programs and prepare for future shocks in schools became necessary. This study set out to investigate recovery programs employed by school managers in Tigania West region to ensure sustainability of quality secondary education. Schools were encouraged to employ innovative ways of keeping education processes ongoing. Sixty per cent of secondary schools in Tigania west are studying in day schools while 40% are learning in boarding schools. There was a 9% performance drop in the sub-county between 2020 and 2021 KCSE examinations. Thirty-two-day secondary school managers were interviewed on varied days between September and November, 2022.Qualitative and quantitative data were obtained from the 32 schools. Descriptive statistics was analyzed by help of SPSS. Key challenges included poor syllabus coverage (Mean 3.8) due to shortened term dates by the ministry. There was Poor staffing levels where 52% of trainers were BOM hired teachers. Abrupt changes in staffing (2.8), and increase in learner dropout (17%) within two years surveyed. Late disbursement of government fees subsidy(capitation) led to strained relations with school partners. Drought and consequently a devastating crop failure aided poor fees collection. Day schools failed to utilize teaching and learning technologies during and after COVid 19. It was observed that 83% of surveyed day schools had fees arrears ranging between 20 and 48% in two years. Virement of project funds to provide other essential services was utilized by 65% of school managers, hiring additional teaching staff by BOM to support syllabus coverage (54%) and acquisition of goods on credit from suppliers and other friendly partners (51%) were key strategies that kept the schools afloat after the pandemic.The study recommends use of innovations in teaching and learning processes including remote learning technologies to hasten completion of syllabus and reduce cost of education. Collaboration with sister schools and organizations of interest in the education sector to help boost education standards in day schools is also recommended.

Keywords: *Day schools, Remote learning, recovery programme, education processes, Collaboration.*

103. Benefits of international exchange between Meru University of Science and Technology, Kenya and University College Dublin, Ireland.

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Subtheme: Integrating the Social Sciences in Pandemic Preparedness and Response

Abstract

Introduction: An European Union funded exchange programme under the umbrella of Erasmus+ has for many years benefitted university staff and students. In particular, the student and staff exchange between Meru University of Science and Technology (MUST) and University College Dublin (UCD) Institute of Food and Health has played a key role in training staff and students from MUST. On the other hand, UCD staff were exposed to the Kenyan Education and had an opportunity to work on African food samples. Objective: The objective of this work is to report the benefits derived through Erasmus+ International Credit Mobility programme between MUST and UCD. **Methodology:** MUST and UCD have won two Erasmus+ exchange programmes. Through these exchange programmes, staff members from UCD visited MUST in 2022 while members of staff from MUST visited UCD in 2019 and 2023. A Doctorate student spent six months in UCD in 2020 while two MSc and a Doctorate student spent 29 days in UCD in 2023. **Results:** The Erasmus+ exchange was the first for MUST to participate in. Through the exchange programme, two PhD students, and two MSc students were trained at UCD Institute of Food and Health. Two joint peer reviewed articles have been published by the partners and a joint postgraduate module titled 'Food Sustainability from an European and African perspective' has been developed. During the visit to Kenya, 23 staff members were trained on initiating international collaborations and applying for funding. Fifteen (15) undergraduate students were trained by UCD staff. The exchange programme has opened up opportunities for MUST to collaborate with other international universities to enhance its research capacity.

Keywords: *International educational exchanges, international collaborations, Erasmus+*

SUBTHEME 6: Integrating The Social Sciences In Pandemic Preparedness And Response

CONFERENCE PAPERS

104. Figurative Mistranslation in The Bible: a study of The Kĩkamba Bible Translation

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Subtheme: Integrating the Social Sciences in Pandemic Preparedness and Response

Abstract

This paper examines the figurative mistranslation in the Bible. Translation is a process that necessities a complex and discourse processing for it to be successful. It is a decision-making process which is under constraints such as time, space, quality of information, context and culture among others. The translation is the mediation between the writer and the target language reader in order to relay the message of the source text into the target text successfully. Mistranslation is the unsuccessful transfer of the source message into the target text. A descriptive research design was used to obtain information from a sampled population. The Bible is divided into two sections; the Old and the New Testament. It is further categorized into seven sections. Purposive sampling was used to select one book from each group that used figurative language and one chapter from each text to form the sample for the study. Data was collected through careful study of the English Revised Standard Version Bible to identify figurative use of language and the Kĩkamba Bible to analyse how they were handled. The study established three types of figurative use of language; fixed expression, metaphors and similes. The main cause of mistranslation in this study is the use of idiomatic expressions in the source text. The study recommends that the translator needs a good background on the metaphorical language use in the Bible. It is hoped that the research will be a contribution to applied linguistics in the area of translation, specifically on figurative language.

Keywords: *figurative language, mistranslation, source text, target text, the Bible and Kĩkamba.*

105. Gĩkũyũ romance and cultural aesthetics: a description of the positive Gĩkũyũ romance pattern in selected Gĩkũyũ popular songs.

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Subtheme: Integrating the Social Sciences in Pandemic Preparedness and Response

Abstract

This paper is an analysis of the positive Gĩkũyũ romance pattern as depicted in selected Gĩkũyũ popular songs. The study of contemporary folklore, is an important strategy in the enhancement of social preparedness for undesirable global eventualities such as the Covid19 Pandemic. The paper focuses on the character of Gĩkũyũ romance by analyzing the positive romance mode and assessing its aesthetic implications on individual and communal stability. The positive romance pattern in Gĩkũyũ is the conventional romance mode from which society derives aesthetic fulfilment because the couples involved enjoy satisfactory happiness as a cultural indicator of conventional marital success. The data for analysis has been obtained from selected Gĩkũyũ popular songs and the selection has been done using purposive sampling. The analysis has employed qualitative research design. It has been guided by three theoretical precepts of narratology proposed by Genette (1983). They are story, narration and narrative. The analysis reveals that conventional romance practices are valued in Gĩkũyũ as sources of individual and communal aesthetic fulfilment. In this case, romance is an integral element of the Gĩkũyũ cultural frame and members are expected to procure, protect and promote productive romance unions for social cohesion and aesthetic stability of the individual and the whole community. The study recommends that positive romance patterns should be promoted in the communities using social-cultural, economic and political platforms as a strategy to enhance preparedness for irregular realities such as the Covid 19 Pandemic.

Keywords: *Gĩkũyũ, Narration, Narrative, Popular song, Romance, Text*

106. Euthanasia: exploring the social work perspective on ethical, legal, cultural, and religious considerations in end-of-life care.

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Subtheme: Integrating the Social Sciences in Pandemic Preparedness and Response

Abstract

Euthanasia is the act of intentionally ending a person's life to relieve them of their pain and suffering, usually due to a terminal illness or a condition that cannot be cured. Euthanasia can be classified as either voluntary, where the person has requested it, or involuntary, where it is carried out without the person's consent. This study examines euthanasia from a social work perspective, including ethical and legal considerations, cultural and religious beliefs, and the role of social workers in end-of-life care.The study used a qualitative research design to explore the perspectives of social workers on euthanasia in Kenya. Semi-structured interviews and Focus Group Discussions were used to to collect data.The findings indicate that Euthanasia is a contentious issue that raises ethical and legal concerns. From an ethical standpoint, euthanasia is viewed as a violation of the sanctity of life principle, while proponents argue that it is a fundamental human right. Social workers play a crucial role in end-of-life care, providing emotional support and assisting with decision-making while navigating complex ethical and legal issues. However, social workers must balance their ethical obligations with their clients' needs and desires. Ultimately, the decision to pursue euthanasia is deeply personal and requires careful consideration of a wide range of factors.

Keywords: *Euthanasia, End-of-life care, legal considerations, Cultural beliefs, Religious beliefs, Decision-making.*

107. The Rationale behind Naming of Persons: The Stepwise Method among the Tigania Sub Tribe of Meru Community

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Subtheme: Integrating the Social Sciences in Pandemic Preparedness and Response

Abstract

The history of naming persons is primordial but the beginning or systems adopted to name people throughout the World is not clear. Globally, naming is deeply embended in peoples' cultures. The history and culture of the Tigania people, has been passed to the current generations through oral literature, sages and folklore. Unfortunately, important traits and tenets of that rich culture may have been considerably lost to the advantage of foreign values and ideologies that are detrimental to our character and morals. This study documents the spectacular stepwise method of naming persons in the Tigania community. We explore the importance of naming and recommend rentention and preservation of positive sociocultural ideals for intergrity and moral confidence of our society. The study adopted a descriptive research design and a qualitative approach to data analysis. Two respondents were purposively selected based on age and experience. Snowballing was then used to identify other respondents across Tigania Sub-Counties (Tigania West, Tigania East and Tigania Central). The researchers identified Key Informants (KI) and Focus Group Discussion (FGD) members from the respondents selected through snowballing. Data were collected by interviewing the key informants and conducting FGDs.The data were then analysed and presented in prose form and tables. The study reveaved that once a baby was born, its sex was announced by the birth attendants through three and four ululations for a baby girl and a baby boy respectively, but could only be named temporarily. Later, the person whom the child was to be named after, gave the real name to the child in a ceremony called Kuiyura. The child grew up with that name into adolescence. During adolescence, a boy child was given an additional transitory name by his age mates after joining "elder boys" band. Later after circumcision, a new permanent name starting with a prefix M'… followed by the name given by the father of the person initiated into warrirorhood or nthaka was given. A woman's name also changed after marriage and started with a prefix "Cia" or "Cio" followed by the name given by the father of the woman, depending on locality. Naming was a way of shaping character, encouraging hard work, good morals, values and responsibility in the community at all developmental stages of a person. A male in Tigania community acquired at least two tempory names. He also got one name during childhood and adulthood respectively. However, naming is fast evolving due to urbanization, trans-racial and inter-ethnic marriages and international migration. Nevertheless, it is important to understand our cultures and borrow positive aspects from past practices in a society fast loosing its morals and values to corruption.

Keywords: *Naming persons; Stepwise method; Tigania sub tribe*

SUBTHEME 7: Health Interventions for Global Pandemics through Innovation

PRE-CONFERENCE PAPERS

108. Metagenomics Characterization of the Cervical Microbiome of HIV-infected women in Meru County, Kenya

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Background: Cervical cancer, caused by Human Papillomavirus (HPV), is a global burden affecting women. Vaginal microbiome contributes to the development of immunity. Immunocompromised HIV infected women with a weakened immune system are susceptible to persistent HPV infections. The relationship between the microbiome, HPV status, and immunity is not well understood. The aim is to characterize vaginal microbial communities in HIV-infected women using 16s rRNA metagenomics and to investigate their relationship with an individual's HPV status. **Methods**: This is a cross-sectional study involving 304 HIV-infected women (30-49 years) in Meru. A questionnaire will be administered to collect socio-demographic and clinical information. A self-sampling procedure will be utilized to collect cervical samples. After DNA extraction, HPV screening will be done by DNA amplification using HPV-specific primers. Vaginal microbial communities will be identified by PCR amplification using 16S rRNA primers followed by library preparation with Nextera kits and sequencing on Illumina Miseq platform at Meru University Medical and Research Centre Laboratory. Data analysis : The microbiota composition will be determined by sequence assembly and alignment to reference genomes. BLASTn and BLASTx will be carried out against nucleotide databases to identify bacterial pathogens present in samples. Phylogenetic analysis will determine the genetic diversity of detected bacteria. Differential diversity analysis will be performed to compare relative abundance of individual bacterial species using LEfSe, DESeq2, or EdgeR methods. HPV genotype analysis will involve comparing the prevalence of different HPV genotypes between different groups of participants. **Expected outcomes**: The study seeks to elucidate the interplay between vaginal microbiome and HPV subtypes in HIV-infected women in Meru, Kenya. As well as , identify bacterial species that may play a role in development of HPV-related disease. This knowledge will help in development of a vaginal microbiome-based signature diagnostic tool for screening HPV subtypes in HIV-infected women or HPV-associated diseases.

Keywords: *Cervical microbiome, Cervical Cancer, Human Paillomavirus (HPV), HIV*

109. Evaluation of antimicrobial susceptibility of Escherichia coli isolated from contaminated areas of Majengo slum in Meru County, Kenya

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Background: Antimicrobial drug resistance is of great concern today. Infections by the antimicrobial resistant strains of Escherichia coli, including enteropathogenic as well as enterotoxigenic strains have been reported as a major cause of deaths, especially among young children in low- and middle-income countries. This has been augmented by antimicrobial misuse, over the counter availability and poor sanitation especially in low income areas. This study aimed at characterizing antimicrobial resistant strains of Escherichia coli isolated from sanitation environments of the Majengo slum in Meru County, Kenya **Methods:** A cross-sectional study was conducted on 61 samples from soil, water and drains swabs. These were tested against five antimicrobial drugs by the Kirby disk diffusion method. **Results:** A total of 42 (69%) of the samples had Escherichia coli. These recorded antimicrobial drug susceptibility as follows: Out of the five antimicrobial agents used, ceftazidime 28 (66.67%) showed the highest sensitivity followed by ciprofloxacin 26 (61.90%) and imepenem 25 (59.52%) respectively. cefotaxime and cefoxitin showed least sensitivity at 14 (33.33%) and 13 (30.95%) respectively. In intermediate imepenem and ciprofloxacin were the highest with 12 (28.57%) followed by cefotaxime 10 (23.81%). The least intermediate was observed in ceftazidime and cefoxitin both at 7 (16.67%). The highest resistance was observed in cefoxitin 22 (52.38%), followed by cefotaxime at 18 (42.86%). Ciprofloxacin, imepenem and ceftazidime had the lowest resistance 4 (9.52%), 5 (11.91%) and 7 (16.67%) respectively. The p-value <0.05 was considered significant to the study. **Conclusions:** This study showed that Escherichia coli isolated from Majengo is pathogenic and resistant to antibiotics. Detection of Escherichia coli poses a great risk in the spread of resistant strains in human. Proper sanitation and hygiene awareness practices should be provided through education to the residents of this area.

Keywords: *E. coli, Susceptibility Testing, Antimicrobial Resistance, Multidrug Resistance, Ciprofloxacin, Ceftazidime, Cefotaxime, Imepenem, Cefoxitin*

110. The effects of presence of Wuchereria bancrofti in mosquito vectors in Mreroni village, Jomvu Sub-county to transmit Lymphatic filariasis

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Due to the limited vector studies on the parasite responsible for the infection of lymphatic filariasis, it makes it difficult to have vector control measures. This has led to the debilitating disease becoming a major source of morbidity and permanent disability due to long term chronic nature of the infection which leads to irreversible damages in endemic populations. The social stigma and discrimination associated with visible disfigurement creates significant barriers to accessing healthcare and support services thus exacerbate poverty. Due to this, there has been several interventions especially in the endemic regions including Mass Drug Administration and the use of insecticide treated nets. However, even with the interventions, vector control strategies and measures have not been conducted. Nevertheless, a study to determine the presence of *Wuchereria bancrofti* in mosquito vectors collected in Mreroni village in Jomvu will be used to inform lymphatic filariasis control strategies in the area to reduce the incidence of the disease as the prevalence still remains high. The study objectives are; to test the prevalence of Wuchereria bancrofti parasites in mosquito vectors collected, to identify the dominant lymphatic filariasis mosquito species and to determine the prevalence of *Wuchereria bancrofti* in mosquito vectors collected. The study will be conducted in Mreroni village in Jomvu Sub-County a former lymphatic filariasis hotspot along the coastal Kenya. Mosquitoes will be collected using CDC light traps and gravid traps. Trapping will be conducted over two consecutive nights in each study site and mosquitoes collected in the morning and stored in labeled cups transported to the laboratory for identification and screening for lymphatic filariasis parasites using PCR. The data will be analyzed using descriptive analysis to determine the prevalence of W. bancrofti in the mosquito vectors. The study will provide important data on the transmission potential of *Wuchereria bancrofti* in Mreroni village and can be used to inform lymphatic filariasis control strategies in the area to reduce the incidence of the disease.

Key Words: *Lymphatic filariasis, Vector control measures, Wuchereria bancrofti, Transmission*

111. Metagenomic Analysis of gut microbiota profiles of children with mild to severe diarrhea

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Background: Diarrhea is one of the leading causes of mortality among children in Africa. It is estimated that 25% of deaths in children are associated with diarrheal disease in Sub-Saharan Africa. Even though bacteria such as *Escherichia/Shigella*, and *Granulicatella* species, and *Streptococcus mitis/pneumoniae* groups have been positively identified through traditional culture methods (TCMs) as causative agents of diarrhea in children, some bacterial pathogens associated with diarrhea have not been identified. This study proposes to investigate the composition of gut bacterial microbiome of children with mild and severe diarrhea. Next Generation Sequencing (NGS) of 16S rRNA gene will be employed to perform metagenomic analysis to profile fecal microbiome in children with moderate to severe diarrhea. Metagenomics is the advanced way of investigating any part of the body's microbiota being that it is more sensitive than traditional culture methods. **Methods**: This is a cross sectional study. The study will recruit children less than 5 years at Meru Teaching and Referral Hospital in Kenya with mild and severe diarrhea. Informed consent will be obtained from parents or guardians of the children. Ethical approval for the study will be obtained from Meru University of Science and Technology Ethical Review Board and Meru Teaching and Referral Hospital Ethical Review Board. Fecal samples will be obtained, examined and stored at 2 to 8°C at the Meru University Medical and Research Center Laboratory. DNA will be isolated, quantified and 16s rRNA sequencing libraries generated. Oxford Nanopore Technology MinIon will be used for sequencing.**Data analysis**: The composition of the microbiota will be done by assembly and also alignment to reference genomes. In addition, BLASTn and BLASTx will be carried out against nucleotide databases to identify the pathogens present in the samples. Phylogenetic analysis will also be carried out to determine the genetic diversity of the detected pathogens.**Expected Outcome**: This study will provide insight on bacterial pathogens associated with mild to acute diarrhea in children thus aiding prevention, diagnosis and treatment efforts of the disease

Key Words: *Gut bacterial microbiome, Diarrhea, Child, gut microbiota*

112. Molecular characterization and antibiotic susceptibility profiles of bacteria isolates from raw retail meat in Meru and Isiolo counties, Kenya

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Antimicrobials are routinely used in human and veterinary medicine. With repeated exposure, antimicrobials promote antibiotic resistance, which poses a threat to public health. In this study, we aimed to determine the prevalence, susceptibility patterns, and molecular characterization of bacteria isolates from raw retail meat in Meru and Isiolo counties, Kenya .Samples were collected, standard culture methods were used for identification of isolates and susceptibility to antimicrobials was determined by disk diffusion method. PCR was used to study genetic diversity. We analyzed 250 samples and 98.4% (246/250) were positive for bacteria . All the plates were positive for *Staphylococcus spp* while only 74.4 % (186/246) of the plates were positive for *E.coli*. Out of a total of 246 *Staphylococcus spp* isolates were tested for susceptibility to nine antimicrobials, only 18.6% bacterial isolates were susceptible to all antimicrobials with Ampicillin (81%), Azithromycin (72 %), Ciproflaxin (70 %), Tetracycline, Chloramphenicol and Cefotaxime each (69%) Cotrimaxazole (68 %), Nalixidic acid (66%) and Gentamycin (58%). Out of a total of 186 *E.coli* isolates, antimicrobial susceptibility was Ampicillin (75 %), Cefotaxime (58 %), Ciproflaxin 56 %, Tetracycline and Nalixidic acid each (53 %), Azythromicin (51 %), Cotrimaxazole (44%), Gentamycin and Chloramphenicol (43 %) (80). PCR results of g-DNA of the bacteria isolates on a 1kbp ladder spread to 1500bp which was further used for identification of both of the bacteria. Bacteria isolates with pathogenic potential and multi-resistance may represent an important source of dissemination and a risk to consumers.

Keywords: *Bacteria, PCR, Antimicrobial, Resistance, Consumer safety*

113. Genetic Diversity, Prevalence, Cost and Risk Factors Associated With HPV Infections among HIV-Infected Women in Meru, Kenya

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Abstract

Background: Globally cervical cancer caused by human papilloma virus (HPV) is the leading cause of preventable deaths among women. HIV-infected women, have an increased risk of persistent HPV infections attributed to a weakened immune response. HPV test is highly sensitive and thus recommended for early identification of those at risk of cervical cancer by detecting the high-risk HPV genotypes. This study aims to determine the circulating high-risk HPV genotypes among HIV-infected women in Meru, to identify the risk factors associated with HPV infection and perform cost analysis of implementing HPV DNA PCR testing within resource-limited settings. **Methods**: This is a cross sectional study targeting 303 HIV-infected women receiving antiretroviral treatment at Meru Teaching and Referral Hospital. Data on sociodemographic and clinical characteristics was collected using an administered questionnaire. Cervical specimen was collected using a self-sampling technique followed by HPV DNA extraction and PCR to detect high risk HPV. A time and motion study was used to collect data on costs of all laboratory procedures including sample collection, DNA extraction and PCR amplification during the duration of study by interviewing key laboratory and management personnel. **Data analysis:** Descriptive statistical analysis was used to provide a summary of baseline characteristics with categorical variables depicted in form of frequency tables and continuous variables analyzed using standard deviation, median, mean, and percentiles. HPV prevalence and genotype distribution was tested using chi-square test while the relationship between the risk factors and HPV status was assessed by logistic regression and univariate analysis by determining the odds ratio at 95% confidence interval. A probability value of $p<0.05$ was regarded statistically significant. Data on the costs of conducting HPV DNA tests was analyzed in Microsoft Excel and presented in form of tables and graphs

Keywords: *Human Papilloma Virus (HPV), HIV*

114. Association of anemia with health-related quality of life among HIV-infected adults attending Meru Teaching and Referral Hospital in Kenya

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Background: Anemia is a common hematological complication in HIV patients, impacting their quality of life, morbidity, disease progression, and mortality. This study aimed to determine anemia prevalence, associated factors, and its impact on health-related quality of life (HRQoL) among HIV-infected individuals attending MeTRH. **Methods**: A cross-sectional study involving 354 adults at MeTRH was conducted between May and August 2022. Demographic and clinical data were collected using a standardized questionnaire. Hemoglobin levels were analyzed, and HRQoL was assessed using the WHOQoL tool across physical, psychological, social, and environmental domains. Logistic regression identified factors associated with anemia, while linear regression analyzed the relationship between HRQoL domains and anemia. **Results:** Among 354 participants (76.1% women, 24.9% men), the overall anemia prevalence was 12.43% (11.36% in men, 12.78% in women). Anemia was defined using WHO criteria (hemoglobin <11.5 g/dL for non-pregnant women, <12.5 g/dL for men). Factors significantly associated with anemia included age, marital status, education level, and duration of HIV positivity ($p < 0.02$). Anemia status showed a statistically significant association with CD4 count ($p = 0.002$), with CD4 >400 associated with lower odds of anemia. Anemia was also significantly associated with lower scores in the Physical Domain of HRQoL ($p = 0.0002$). **Conclusion**: Anemia negatively impacts the physical domain of HRQoL in HIV patients, highlighting the need for comprehensive management. Addressing anemia and its associated factors, such as age, marital status, education, and HIV duration, can improve patient outcomes. Implementing a holistic approach to enhance the physical well-being and environmental conditions for these individuals is crucial.

Keywords: *Anemia, HIV, Prevalence, Quality of life, AIDS*

115. Modelling the impact of screening, treatment and underlying health conditions on dynamics of Covid-19

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Coronavirus disease is an infectious disease triggered by severe acute respiratory syndrome coronavirus 2 that belongs to the family of viruses that cause viral pneumonia. Despite the spreading of the COVID-19 in Kenya with a positivity of 12.9% as at 26 August 2021 with the number of confirmed cases being 232,869 and fatalities of 4,635, there was no reliable deterministic Mathematical model that described the dynamics of COVID-19 incorporating impact of screening, treatment and underlying health conditions. This study formulated a SIRS classical mathematical model which is modified to incorporate the exposed and the treated individuals where COVID-19 is modelled. The model stratifies the population into two categories depending whether they have underlying health conditions or not, and describes disease transmission within or between the groups. Five compartments are considered in each group that is; Susceptible individuals, exposed population, Infected individuals, treated population and the Recovered population. The objectives were to; Formulate a mathematical deterministic model based on classical SIRS model incorporating screening, treatment and underlying health conditions on covid-19 dynamics. Determine the Reproduction number and use it to analyze the model. Determining sensitivity analysis and Bifurcation. Simulating the model using data from the ministry of health. The Next generation matrix method was used to determine the basic reproduction number denoted 〖R〗_o of the proposed model. The results of the simulation indicated that the Disease Free Equilibrium is locally asymptotically stable whenever $R_o^*<1$ and globally asymptotically stable if $R_0^*\leq 1$. Endemic Equilibrium was globally asymptotically stable if $R_o^*>1$.The results obtained showed that increasing the rate of screening and treatment on the exposed population and weakening the disease transmission route between the susceptible, exposed and infected population are crucial to curb the spread of COVID-19 virus. We recommend studies to be done incorporating impact of screening, treatment, underlying health conditions and vaccination.

Keywords: *Covid-19, screening, treatment, underlying health conditions , Next Generation Matrix, Mathematical modelling*

116. Hepatitis B Virus Transmission Dynamics with passive immunity, screening, and vaccination among pregnant mothers in rural setting in Kenya: a mathematical approach

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Hepatitis B virus infection is a viral infection that attacks the liver, a vital organ in the human body. It exists in two phases, acute and chronic stage. Chronic HBV infection causes liver cirrhosis and cancer and is a major public health threat in Kenya. The Primary route of HBV transmission is through unprotected sexual intercourse with an infected person and through mother to Child Transmission during delivery or breastfeeding. Pregnant mothers and their unborn babies are at risk of HBV infection if not screened. It is also assumed that HBV is transmitted horizontally, that through person to person through sexual contact. The susceptibility screening is a key step in preventing and managing Hepatitis B infection in the general population. Many adults are unaware of their status in Kenya since screening and immunization program against HBV is not common practice in rural setup. As a result, the pregnant mothers transmit the infection to their infants as well their partners unknowingly. Moreover, inadequate antenatal, perinatal, and post-natal maternal care services are very limited in rural Kenya. This even becomes worst in the devolution of health services to counties, making many pregnant mothers to give birth in the villages. Information regarding HBV infection is very rare in Kenya, especially in the rural setting. However, from the existing literature, the overall prevalence of HBV infection in Kenya is estimated at 7.8%. A person with Acute HBV infection can recover with treatment or with natural immunity. If not treated immediately, then it leads to chronic Hepatitis, which requires lifelong treatment thus a burden to the country's economy. So far vaccination has been proven to be an efficient means of controlling viral infection. Therefore, a deterministic mathematical model with Kenyan data attributes is formulated to get an understanding of the HBV burden among pregnant mothers in Kenya. A better understanding of HBV infection prevalence and dynamics among the pregnant women population will help the government implement efficient strategies for controlling and eliminating the infection.

Keywords: *HBV, Screening, Vaccination, passive immunity, mathematical model, numerical simulation*

117. Enhancing Quality of Life for HIV-Positive individuals: a Markovian Analysis of long-term effects of ART among HIV patients attending Meru Teaching and Referral Hospital

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

The advent of antiretroviral therapy (ART) has revolutionized the management of HIV/AIDS, significantly improving the survival and quality of life (QoL) of HIV-positive individuals. Numerous studies done in the past focused on the negative side effects associated with long term ART particularly among the aging people living with HIV (PLWH). This prompted further studies in the late ART era which have shown that survival rates have improved and one of the major reasons is the transition to less toxic antiretroviral drugs, improved adherence just to mention a few. Furthermore, most studies focus on areas where HIV is prevalent. Limited research, however, has focused on assessing the long-term effects of ART on the QoL of HIV-positive individuals outside the aging bracket in Meru, Kenya. This study seeks to bridge the gap by employing a Markovian analysis in the impact of long term ART on the QOL of HIV- Positive patients at the Meru Teaching and Referral Hospital (MeTRH) in Kenya. This will be a descriptive cross-sectional study will be employed, utilizing data from medical records of HIV-positive individuals who have been attending MeTRH for at least five years. A sample size of approximately 384 will be selected using open epidemiology and Fleiss method. The study will analyse variables such as age, gender, duration of ART, CD4 cell count, viral load, and ART adherence. The World Health Organization Quality of Life-BREF (WHOQOL-BREF) questionnaire will be used to assess the QoL of participants. Markov modelling will be applied to analyse transitions between different health states and estimate the impact of long-term ART on QoL.
The findings are expected to show that long-term ART has a positive effect on the QoL of HIV-positive individuals attending MeTRH. Markovian analysis shall reveal that individuals on long-term ART show significant improvements in physical, psychological, social, and environmental domains of QoL. Additionally, higher CD4 cell counts and viral load suppression are associated with better QoL outcomes. Adherence to ART is also a crucial factor in sustaining QoL improvements over time. This research shall highlight the importance of long-term ART in enhancing the QoL of HIV-positive individuals attending MeTRH. The study intends to prove that sustained viral suppression and adherence to ART are essential for long-term QoL improvements. Findings from this research will be useful in informing healthcare providers and policymakers on the significance of ensuring continuous access to ART and promoting adherence to maximize the QoL benefits for HIV-positive individuals. Furthermore, this study will contribute to the growing body of evidence supporting the effectiveness of ART in improving QoL among HIV-positive individuals in resource-constrained settings.

Keywords: *HIV/AIDS, antiretroviral therapy, quality of life, Markovian analysis, MeTRH, Kenya.*

118. A survival analysis approach to identifying leading causes of Mortality in Adult HIV/ AIDS patients following antiretroviral therapy: a case of Meru CountyTeaching and Referral Hospital

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Subtheme Health Interventions for Global Pandemics through Innovation

Abstract

The HIV virus is a retrovirus that affects a patient's immune system by replicating through the host's DNA system. The virus has been a global public health concern for a considerable amount of time, leading to the development of ARVs (antiretroviral) medications which have helped reduce morbidity and mortality. However, understanding the disease's prevalence is necessary for better healthcare planning. This can only be done by examining how long individuals survive while taking their medicine and key risk factors leading to mortality. The study aims at modeling a survival analysis approach to identifying leading causes of mortality in adult HIV/ AIDS patients following antiretroviral therapy: a case of Meru county teaching and referral hospital. Research has shown that despite the introduction of ART, HIV related deaths are still high in Meru County. With the many deaths as a result of the disease, many children have been orphaned. The prevalence rate in the study area is also high, especially among the youth. The study's general objective will be a survival analysis approach to identifying the leading causes of mortality among adult HIV/AIDS patients attending Meru Teaching and Referral Hospital. The study's specific objectives will be identifying the demographic, socioeconomic, and clinical factors associated with increased mortality among the patients. The Secondary data that will be used for the study will be obtained from Meru Level 5 Hospital for the follow-up period between 2018 and 2022. Kaplan-Meier method will be used to compute the survival over time of the patients. Cox proportional Hazard will be used to compare the leading causes of death: demographic factors, socio-economic and clinical factors. Data analysis will be carried out using R.

Keywords: *HIV/AIDS, Kaplan-Meier, Cox PH, Leading cause, R-Studio*

119. Mathematical modelling of effects of non-clinical strategies in combating transmission of Covid-19 in Kenya

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Subtheme Health Interventions for Global Pandemics through Innovation

Abstract

Covid-19 is a serious problem in Kenya today. It has put an unprecedented burden on worldwide economy and public health. The rapid spread of COVID-19 has been driven predominantly by aerosol transmissions. The objectives of this study were to formulate mathematical models on the spread of coronavirus disease 2019 and incorporating the effects of nonclinical strategies like screening, facemask usage, hand washing and social distancing, determine well posedness of the model, validate the developed model and finally predict the effects of nonclinical strategies on the dynamics of the spread of COVID-19 in Kenya. The Mathematical model was based on SIRS epidemiological classical model. In developing the model, the population was divided into six human compartments; Susceptible, Exposed, Infected, Isolated in hospital, Isolated at home and Recovered. The basic reproduction number was determined using Next Generation Method. The model was analyzed through the determination of the model steady states. The stabilities of steady states analyzed based on reproduction number using: signs of Jacobi Matrix evaluated at steady state, Lyapnov Criteria, Centre Manifold theorem, Metzler matrix and Routh-Hurwitz. Numerical simulations were carried out using MATLAB inbuilt ODE solver based on Runge Kutta Method. Sensitivity analysis of the model parameters was carried out using partial differentiation of the reproduction number and also using Normalized sensitivity analysis. From this analysis, findings showed that adherence to the containment measures and contact tracing had the greatest negative impact on the reproduction number. It was found that adherence to the COVID-19 containment measures by 75.42% of the population would reduce the reproduction number to below 1 hence containing the pandemic. The findings of this study show the extent to which the nonclinical can be used to contain the spread of COVID-19 in Kenya. We recommended strict adherence to containment measures and vaccination.

Keywords: *SIRS Epidemiological classical model, Next Generation Method, Mathematical Modelling*

120. Modelling the efficiency of Human Papilloma Virus Vaccination in Meru County

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Subtheme Health Interventions for Global Pandemics through Innovation

Abstract

The Human Papilloma Virus (HPV) is one of the most common sexually transmitted viruses worldwide and is associated with cervical cancer. With around 14 million instances per year, cancer is one of the main causes of morbidity and mortality in the globe. After cardiovascular and infectious diseases, cancer is the third leading cause of mortality in Kenya. Cancer cases have increased to frightening levels in Meru County. 15% of cases needing cancer treatment sent to Kenyatta National Hospital in Nairobi came from Meru County. The primary goal of this research is to develop a mathematical model for determining the efficiency of human papilloma virus vaccination, in Meru County. The mathematical model will be based on the SIRS epidemiological classical model, and the analysis of this model will be on determination of the model steady states. The SIR model (Susceptible-Infected-Recovered) is a commonly used mathematical model in epidemiology to study the spread of infectious diseases. To determine the efficiency of HPV vaccination using the SIR model, this paper focuses on reviewing the transition rates mentioned above based on available data and research. These rates will then be used to simulate the dynamics of HPV infection and compare outcomes between vaccinated and unvaccinated populations. By analyzing the model outputs, we will assess the impact of vaccination on reducing HPV infections, and potentially evaluate the effectiveness of different vaccination strategies.

Keywords: *SIRS Epidemiological classical model, Human Papilloma Virus (HPV), Mathematical Modelling*

CONFERENCE PAPERS

121. Diagnostic Accuracy of FluoroCycler® XT MTBDR assay for detection of Rifampicin and Isoniazid resistant *Mycobacteria tuberculosis* in Clinical Isolates from Kenya

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Background: Drug-resistant TB (DR-TB) poses a major global challenge to public health and therapeutics. Lack of adequate diagnostic equipment for detection and monitoring of DR-TB leads to delayed diagnosis and subsequent inappropriate treatment. Molecular techniques are highly sensitive and offer timely and accurate results for TB drug resistance testing. The commonly used assay for detection of rifampicin (RIF) and isoniazid (INH) resistance in Mycobacterium tuberculosis (M.tb) is GenoType MTBDRplus. The FluoroCycler® MTBDR is a real-time polymerase chain reaction assay that detects M.tb and at the same time identifies mutations in rpoB, katG and inhA genes that are associated with RIF and INH resistance. **Methods** :The study was carried out at the National Tuberculosis Reference Laboratory (NTRL) in Kenya in the period between January to October 2022. A total of 243 M.tb clinical isolates were included in the study. These isolates comprised of 50 isolates with mutations in rpoB, 51 isolates with katG mutations, 51 isolates with mutations in inhA. and 91 M.tb isolates lacking mutations in these genes based on Genotype MTBDRplus results. DNA from the isolates was extracted using the FluoroLyse extraction kit. Real-time PCR targeting the rpoB, InhA, and katG genes was performed using the FluoroType MTBDR amplification mix. Isolates with discordant results between Genotype MTBDRplus and FluoroCycler® MTBDR assays underwent targeted sequencing for the respective genes, then sequences were analyzed for mutations using Geneious version 11.0 software. **Results**: The sensitivity of the Fluorocycler XT MTBDR assay for detection of mutations that confer drug resistance was 86% (95% CI 73.0,94.0) for rpoB, 96% (95% CI 87, 100) for katG and 92% (95% CI 81, 98) for inhA. The assay's specificity was 97% (95% CI 93, 99) for rpoB, 98% (95% CI 96, 100) for katG and 97% (95% CI 93, 99) for inhA. Discrepancy between Genotype MTBDRplus and FluoroType MTBDR results were observed in 28 (11.5%) isolates with rpoB, katG and inhA genes having 26% (13/50), 10% (5/50), and 20% (10/50) isolates with discrepant results respectively. Sequencing results that were in agreement with FluoroType MTBDR results were 77% (10/13) for rpoB, 80% (4/5) for katG, and 70% (7/10) for inhA compared to 23% (3/13), 20% (1/5), and 30% (3/10) for Genotype MTBDRplus assay. Conclusion The diagnostic accuracy of FluoroType MTBDR for the detection of mutations conferring resistance to RIF and INH was high compared with that of Genotype MTBDRplus, and demonstrates its suitability as a replacement assay for Genotype MTBDRplus.

Keywords: *MTBDR assay, Isoniazid resistant Mycobacteria*

122. Extent of disaster risk preparedness in informal settlements of Nyeri Town, Nyeri County, Kenya.

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Informal settlements are growing in the world everyday due to poverty and inadequate land to settle. Most informal settlements are faced with a myriad of problems ranging from inadequate infrastructure, poor sanitation, noise and water pollution, B. Yuen, A. Kumssa 2011. This study determined the extent of disaster risk preparedness in the informal settlements of Nyeri town. A sample of 384 residents was used. Data was collected by use of researcher-administered questionnaire and key informant interview guide. Data analysis was done using SPSS version 21. Univariate analysis for each variable was done so as to yield descriptive statistics that was used to analyze the variables. Presentation of the findings was done through prose, tables and figures. Residents of the four informal settlements will benefit by raising their knowledge on disaster preparedness in their area. The county government of Nyeri may use the findings to come up with policies to enhance disaster risk awareness and preparedness. The survey administered 384 questionnaires to the respondents, all of them were filled and returned for analysis. The specific objectives of the study are to assess the level of awareness on the types of disasters and policies, to establish disaster mitigation measures in place, to identify the role of stakeholders in disaster management, to identify the challenges encountered during disaster risk reduction initiatives in Majengo Witemere, Ngangarithi kwa Mwaura, Mathari "transformer", and Ruring'u Muslim village informal settlements. This research applied descriptive cross-sectional study design. The study targeted residents of Majengo Witemere Ngangarithi,mathari and Ruring'u Muslim village. This translated to 100% response rate from all the locations. The total number of female respondents was 200(52.1%) and that of men was 184(47.9%). This indicates that, gender inclusion was considered by the researcher. The study also shows that, majority of the respondents 196 (51.0%) are aware of existence of a disaster reduction policy rule, it was further revealed that majority of the respondents 220(57.3%) felt that, the assistance received when a disaster occurs was adequate. It was also revealed that majority of the respondents 93.0% was aware of the disasters that can affect them in their area of residents. The results also indicated that there was a significant association between the area of residence and the level of compliance of policy rules concerned with disaster risk reduction [X2 (3) = 11.446,p-value =0.010<0.05]. However, the results indicated that there was no significant association between the area of residence and level of awareness of the disasters that could affect them [X2 (3) = 2.99, p-value =0.393>0.05]. However, the results indicated that there was no significant association between the area of residence and level of awareness of any policy rule concerned with disaster risk reduction [X2 (3) =7.026, p-value =0.071>0.05].It was concluded that Risk assessment as a step for successful disaster reduction measures will ensure that the community members are aware of the possible hazards. National and County government should incorporate the national and international policies and guidelines in their policy. The Government should be keen on learning on previous disasters that have affected other informal settlements and other parts of the country by having disaster management well kwon by the communities living in informal sectors..

Keywords: *Disaster preparedness, Informal settlement*

123. Intersection of social determinants of symptomatic breast cancer presentation in a rural setting: a critical ethnographic study

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Aims: To explore the determinants of time to presentation of women with breast cancer symptoms within a rural setting in Kenya. **Problem:** There exist female breast cancer inequality where over 80% of women diagnosed with breast cancer in low-and medium income countries present at stage 3 or 4 compared as low as 15% in high income countries. Majority of studies on determinants of timeliness to presentation of women with breast cancer symptoms have been done in high income counties, and have viewed determinants from a siloed prism, missing the complex and multidimensional intersections that shape symptomatic women's help-seeking behaviour. **Design:** A critical ethnographic study. **Methods:** Data were collected between July 2019 and April 2020 using semi-structured interviews and focus groups with 12 women and 23 disclosure recipients respectively. Interviews and focus group discussions were audio recorded, transcribed verbatim, translated into English, and thematically analysed. Further analysis using an intersectional lens added new insights into the data. Ethics approval was obtained in both Kenya and United Kingdom. **Results:** Participants narrated their experiences from the time they self-discovered breast cancer symptoms to the time they first came into contact with a healthcare professional. The core themes identified included local cancer knowledge, embodied experience, women's responses, social networks, cultural cancer schemas, gendered social structures, and healthcare system experiences. **Discussion:** This study has identified several proximal and distal intersecting structural determinants that shaped women's timeliness to presentation. Contrary to previous studies, the intersectional lens underpinning this study, has broadened the evidence base for the development of intersectional interventions to promote timely symptomatic breast cancer presentation. **Conclusion:** The findings revealed that symptomatic women predominantly faced multiple intersecting barriers to timely presentation. The key drivers of timeliness to presentation of women with breast cancer symptoms were identified. Several proximal and distal determinants, including economic, social, psychological, and cultural determinants intersected to shape women's timeliness to symptomatic presentation. Application and recommendations: This study identified intersectional structural determinants to timely symptomatic presentation of women with breast cancer symptoms. The findings have global health implications for social inequalities in female breast cancer, and may inform the development of intersectional interventions to promote timely symptomatic presentation.

Keywords: *Symptomatic, female breast cancer, critical ethnography, determinants, intersection, presentation*

124. The contribution of research and innovation in the advancement and development of health technologies for addressing global pandemics

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

The emergence of global pandemics such as COVID-19 has highlighted the need for the development of innovative health technologies. Research and innovation play a critical role in advancing health technologies to address global pandemics. The purpose of this study was to explore the contribution of research and innovation in advancing health technologies to combat pandemics. Despite the importance of Research and innovation in promoting sustainable development in Kenya, the development of innovative health technologies to address global pandemics remains a significant challenge. This study aimed to investigate the role of research and innovation in addressing these gaps. The objectives of the study were to; Examine the role of research and innovation in developing health technologies for addressing global pandemics, Identify the opportunities of using research and innovation to develop health technologies for global pandemics, Identify the key health technologies that can be been as a result of research and innovation efforts, Analyze the impact of health technologies in managing the COVID-19 pandemic and other global health crises and Provide recommendations for policymakers and stakeholders on how to foster research and innovation in the development of health technologies for global pandemics. A quantitative research design was used in this study. The researcher used the simple random, Purposive, and Convenient technique of Trainers and trainees from TVET Institutions who added up to 200 trainees and 100 trainers as respondents. Questionnaires were used as the research instrument. The relationship between the variables was established through correlation analysis. Regression analysis and ANOVA were used. The respondents were asked to state whether research and innovation are critical in the development of health technologies for addressing global pandemics 65% agreed, 25% strongly agreed, 5% strongly disagreed, 4% disagreed and only 1% was neutral. As to whether research and innovation contribute to the development of health technologies for addressing global pandemics 10% agreed, 12% strongly agreed while only 70 strongly disagreed, and only 8% were neutral. Further, on whether the research and innovation have regulatory frameworks for developing health technologies: 25% agreed, 20% strongly agreed, 50% strongly disagreed and 5% disagreed. The study concludes that research and innovation are essential for the development of effective health technologies to prevent, detect, and treat pandemics. The study recommended collaboration between the research and innovation stakeholders and the health sector specialists in developing health technologies.

Keywords: *Research, Innovation, health technologies, COVID-19, Pandemics, regulatory frameworks*

125. Multispectral imaging of the Plasmodium falciparum using the OpenFlexure microscopy

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Subtheme: Health interventions for Global Pandemics through Innovation

Abstract

Malaria is one of the most serious public health challenges globally, especially in developing countries. Ironically, current malaria therapeutics have nearly 100% efficacy. The barrier to Malaria eradication is late diagnosis or no diagnosis, which could be aided by the availability of rapid, accurate, cheap, and easy-to-use screening methods. In this work, we report a multispectral imaging approach based on the OpenFlexure Microscope (OFM). The results show that the correct choice of wavelength results in enhanced contrast and better spatial resolution without staining the infected blood sample. And, the three best wavelengths for distinguishing between infected and non-infected erythrocytes were: 660nm, 633nm, and 450nm. The technique has high potential in Malaria diagnosis since it does not require reagents for processing, and could be used by low-trained personnel. Besides, the OFM platform is open source and cheap to fabricate.

Keywords: *Multispectral imaging, Plasmodium falciparum, OpenFlexure microscopy, Malaria, wavelengths, diagnosis*

126. Phytochemical constituents and antibacterial properties of Chia (Salvia hispanica L.) leaf and seed extracts of Meru County, Kenya [POSTER]

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Antimicrobial resistance remains a significant threat to human health. The search for novel antimicrobial agents is never-ending, and this has led to a shift in global interest toward antimicrobials of plant origin. According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicine for their primary healthcare needs, and over 50% of all modern clinical drugs are of natural product origin. Plants are a promising source of natural antimicrobials because they have a wider array of bioactive chemicals than any other source. These bioactive chemicals have the potential to be a vital source of new and potent pharmaceuticals. Chia (Salvia hispanica L.) is an exotic crop mainly grown for its seeds. Historically, chia seeds have been used as food and as a component in many herbal mixtures, albeit no specific therapeutic properties have been assigned to them. Despite its immense nutraceutical properties, chia remains an underutilized crop. This study aimed to analyze the phytochemical and antibacterial properties of methanolic chia seed and leaf extracts against Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus). Qualitative screening of phytochemicals was carried out using standard protocol, and quantitative phytochemical determination was conducted using spectrophotometric methods. Antibacterial activities were determined by disc diffusion and broth microdilution methods. Qualitative phytochemical screening revealed the presence of saponins, tannins, terpenoids, and glycosides in both extracts. The total phenolic content observed for chia seeds and leaves was 0.970 and 0.224 mg GAE g-1 respectively. The total flavonoid content for chia seeds and leaves was 0.435 and 0.272 mg GAE g−1. Methanolic chia seeds extract showed superior antibacterial activity against S. aureus with the lowest minimum inhibitory concentration of 1.5 mg ml-1 whilst that of methanolic chia leaves extract of 10 mg ml-1. Antibacterial activity against E. coli was not observed in the methanolic chia seeds extract. On the contrary, methanolic chia leaves extract exhibited antimicrobial activity against the tested bacteria. Overall, methanolic chia seed and leaf extracts have antibacterial potential.

Keywords: *Chia (Salvia hispanica L.), Meru, phytochemical, antibacterial, total phenolic, total flavonoids*

127. Role of stakeholders in the clinical training of Undergraduate Nursing Students.

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Objective: The study aimed to find out the role of stakeholders in the clinical training of nursing students. Problem: Nursing services begin with the training of nursing students. A poorly trained nurse may hamper team effectiveness leading to low quality health care. Clinical training is very important in professional nursing education because it enables nursing students to understand and experience theoretical knowledge in a clinical environment. A number of stakeholders are involved, those identified in this study are students, nurses, educators and administrators. **Methodology:** A mixed research design was used that involved collection of data from 173 nursing students, 140 nurses, 23 nurse educators and 7 administrators. An interview schedule and a semi-structured self-administered questionnaire was used to collect data. Data obtained was analyzed using descriptive statistics and inferential statistics. **Results:** 100% of the students knew that they should carryout patient care as per the clinical objectives and an average of 90% of the nurse indicated that it is their role to welcome, orient and supervise nursing students when they report to their wards. 89% of the educators are aware that they should mark students' case studies. 42% of the administrators indicated assignment of mentors and clinical instructors as their role. **Discussion**: The results showed that all stakeholders are aware of the obvious roles in clinical training of nursing students. Those subtle roles like guidance and counseling, availability in the clinical areas and giving demonstrations in the ward were not mentioned. **Application:** Data obtained can be used to enlighten the stakeholders on the gaps related to their roles in clinical training hence create a tailored mentoring education, which will ensure that stakeholders are highly proficient at supporting the clinical learning of nursing students. **Conclusion:** Many nursing students are not adequately prepared during clinical training due to omission of important roles by stakeholders.

Recommendation: According to the study results and previous research findings the researcher recommends that stakeholders be provided with primary information on roles and educate them on supporting students' learning process with setting of learning objectives, conducting reflection during mentorship, providing constructive feedback and conducting student-centred evaluate.

Keywords: *Nursing students, clinical training, effective nursing practice, roles of stakeholders, adequate preparation, clinical environment.*

128. Gratifications for social network site preferences for accessing reproductive health information among University Students in Nairobi.

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

In Kenya the youth represent 35% of the total population of about 50 million people. The youth are sexually active, experimental and thus exposed to adverse reproductive health outcomes including early marriage, unintended pregnancy, early childbirth, abortion, incomplete education and sexually transmitted infections including HIV and AIDS. For these youth to navigate this stage successfully there is a need to ensure they have adequate access to reproductive health information. The current mechanisms employed by the government and other stakeholders to communicate reproductive health to the youth are still inadequate. The increase to internet access and use of social networking sites (SNS) through mobile phones by the youth is speedily on the rise. There is growing interest in research on how SNS can be integrated with the traditional media to provide reproductive health information to the young people. The study sought to investigate the influence of gratifications on social network sites preferences for accessing reproductive health information among university students. The study was anchored on the Uses and gratifications Theory. Demographic factors of age and gender were considered as the moderating variables and SNS preferences as the dependent variable. The study focused on four popular social network sites namely; Facebook, Twitter, WhatsApp, and Instagram. The study adopted a mixed research design method combining both quantitative and qualitative data. Simple random sampling used to select students and purposive sampling used to selected key informants. The study found out that gratifications with gender as the moderating factor significantly affect the preference of choice of social networking site for access to reproductive health information among the university student in Nairobi county. Facebook was the most popular SNS with 55%, followed by WhatsApp with 34.2%. The study concludes that SNS need to be used together with other media to provide youth targeted reproductive health interventions.

Keywords: *Web 2.0, Social Media, Social Networking Sites, Reproductive Health, Preferences, Gratifications*

129. Work related musculoskeletal disorders and its associated factors among traditional cloth weavers in Chencha district, Gamo zone, Ethiopia, an ergonomic study.

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Objective: The aim of this study was to determine the prevalence of work-related musculoskeletal disorders and the factors that contribute to them among traditional cloth weavers in Chencha district, Gamo zone, Ethiopia. **Methods:** A community-based cross-sectional study was conducted in Chencha district from June to August 2021 using a simple random sampling technique. A total of 423 study participants were interviewed, all of whom are traditional cloth weavers working in individual households. For data analysis, STATA Version 15 was used. Bivariate and multivariable logistic regression analyses were used to calculate the odds ratio with 95% confidence intervals (CI). Multivariable logistic regressions were performed on variables with p-values less than 0.025 in the bivariate analysis, and p-values less than 0.05 were considered significant. **Results:** Work-related musculoskeletal disorders had been reported in the previous 12 months by approximately 97 (46.9%) of respondents. Work-related musculoskeletal disorders were reported by 76.1% of weavers in the shoulder region, 64.2% in the low back, 56.3% in the neck, and 0.2% in the upper back. Working for more than 10 years (AOR=5.05, 95%CI: 1.23, 20.77), working with prolonged sitting (AOR=4.77, 95%CI: 1.37, 16.62), and job dissatisfaction (AOR=2.41, 95%CI: 1.04, 5.55) were among the determinants of work related musculoskeletal disorders. **Conclusion:** As a result, ergonomically oriented weaving workstations are required because the majority of WRMSDs are caused by poorly designed workstations.

Keywords: *Muscoskeletal disorders, Women, Cloth weavers*

130. Determinants of uptake and utilization of contraceptive services among Undergraduate Students aged 18 - 27 years at Meru University of Science and Technology, Kenya

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Introduction: Contraceptive use is a human right and is identified as a priority in the National eproductive Health Policy (MOH, 2000). Data for most Kenyan university student shows uptake of contraceptive services at 34.2 **Aims:** To investigate factors influencing the uptake and utilization of Contraceptive services among undergraduate students aged 18-27 years in Meru University of Science and Technology, Kenya. **Methodology:** Descriptive Cross Sectional Survey of 333 undergraduate Students selected conveniently randomly from sampled schools of Meru University of Science and Technology. **Results:** Uptake and Utilization of Contraceptives by Undergraduate students was positively associated with age, return rate of over 100% was achieved with about 333 respondents being interviewed students across the schools sampled. Students' religious practice influenced uptake and utilization of contraceptives. The study revealed that 57.1 % of the student population were not using contraceptive services. Utilization of contraceptive services by students in Meru University was approximately 42.9. Low utilization level is relatively not matched to the school targets. Participants attitudes influenced contraceptives utilization and Uptake in relation to respondent's perception of contraceptive services with partners at (68.2%) indicating positive feedback, (25.2%) never discussed at (6.6%) found it embarrassing, while on the contraceptive responsibility responses indicated (53.2%) of both gender at (28.2%) for the young ladies and (18.6%) indicating that gentleman's were responsible. Utilization of contraceptive services was influenced by Meru university healthcare system factors with point of issue being shown by Majority (68%) of respondents as the reasons for not seeking contraceptives services, 22% had fear of discrimination and 10 % indicated that MUST had no privacy. **Discussion:** Majority of respondents were males (50.45%) and females (49.55%) which disagrees with a study this was influenced by sociodemographic factors of the respondents. Current study reveals that 57.1% of undergraduate student's population was not using contraceptive services. Utilization level of contraceptive services by students in Meru University revealed approximately 42.9% were utilizing the contraceptives. that majority of the partners do not encourage the use of contraceptive which was represented by 53.8% and those that encourage having a 46.2% of the responses **Conclusion:** The findings of this study gives evidence of strong association of the social demographic factors with uptake and utilization of contraceptive services among students aged 18-27 years at Meru University of science and technology. This study further reveals that there is a high level of sexual activity Condom was the most used contraceptive. Attribute such as religion, knowledge, availability, affordability greatly influences contraceptive utilization and uptake. To scale up utilization of all contraceptive

Keywords: *Contraceptives; Contraceptive Services, Undergraduate University, Students, Uptake/Utilization, Family, Planning Program; Health Care Workers*

131. Determining the effect of melanin on photoacoustic malaria signals

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Subtheme: Health Interventions for Global Pandemics through Innovation

Abstract

Melanin strongly absorbs optical radiation and therefore attenuates a significant portion of incident Photo-Acoustic (PA) light beam traversing the subcutaneous tissue. In this study we investigate how melanin concentration affects PA signal induced by malaria infected blood inside a vessel embedded in a tissue phantom. The setup is aimed at stimulating a non-invasive malaria test using PA signal imaging method. Agar-based and co-polymer-in-oil optical tissue phantoms with varying concentrations of melanin at their top layers were fabricated having tubular inclusions which were filled with malaria infected blood. The phantoms were imaged with both a laser-based and LED-based commercial PA imaging machines and the signals analyzed. It was observed that under some optical excitation wavelengths, PA images of tissue phantoms filled with malaria blood had distinguishable differences in pixel intensity values from those acquired from phantoms filled with non-infected blood. The findings suggest that PA sensing can be a feasible method for non-invasive screening of malaria applicable across human population of varying skin tone.

Keywords: *Photoacoustic imaging, Tissue Phantoms, Co-polymer-in-oil, agar, spectral inversion algorithm*

SUBTHEME 8: Business, Economy, and Society: challenges in the post-pandemic Era

PRE-CONFERENCE PAPERS

132. Strategic leadership and human resource performance in Nairobi City County Government

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Subtheme: Business, Economy, and Society: challenges in the post-pandemic Era

Abstract

Nairobi City County Government (NCCG) was founded in 2013 with a vision of making the city a choice to invest, work and live in. NCCG has been faced with a myriad of challenges in quality service delivery to its residents, that are partly attributed to poor human resource performance. While studies have identified strategic leadership as a key factor in improving human resource performance, there is limited research on relationship between strategic leadership and human resource performance in NCCG. Conversely, the current study seeks to establish the relationship between strategic leadership and human resource performance in NCCG in Kenya. The study will be anchored on four specific objectives: (i) To assess the relationship between alignment of workers to corporate statement and human resource performance in NCCG in Kenya, (ii) To investigate the relationship between developing human capital and human resource performance in NCCG in Kenya, (iii) To examine the relationship between ethical practices and human resource performance in NCCG in Kenya and (iv) To determine the relationship between effective resource allocation and human resource performance in NCCG in Kenya. The study will apply descriptive survey research design. The sample size will be 386 employees of NCCG staff drawn from across the county sectors whose offices are in City Hall. Primary data will be collected using a semi-structured questionnaire which will be administered by the researcher through a drop and pick later strategy. Pearson's Correlation and descriptive statistics will be used in data analysis.

Keywords: *Strategic leadership, Performance, Nairobi City County Government Human Resource*

133. The Influence of County Government financial management practices on service delivery in Meru County, Kenya

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Subtheme: Business, Economy, and Society: challenges in the post-pandemic Era

Abstract

Devolved governments were aimed at bringing services closer to the people at the grass root level Some functions were devolved to County government and others retained at national level. Due to inefficient delivery of services forty-seven Counties were created in the 2010 constitution. The study sought to identify the influence of county government financial management practices on service delivery in Meru County, Kenya. The study aimed at answering the question; what is the influence of county government financial management practices on service delivery in Meru County, Kenya. The Objectives were; to find out the relationship between finance mobilization and service delivery by Meru County Government, to determine the relationship between finance absorption and service delivery by Meru County Government and to establish the relationship between debt management and service delivery by Meru County Government. The study tested the null hypothesis that there is no significant relationship between finance mobilization, finance mobilization and debt and service delivery by Meru County Government. The target population of the study was County government finance officers who comprised of officers consisting of County Finance Board, Chief Executive Officer, Chief Officers, Director Revenue, Sub-county revenue coordinators and Members of County Assembly. The target population was 89 participants identified through census technique. The study adopted a descriptive survey research design. The questionnaire was the main tool used in data collection. Data analysis and interpretation was based on descriptive statistics and multiple linear regression. In addition, a null hypothesis was tested using t test at 5% level of significant. A pilot test was carried out and analyzed to ensure validity and reliability of the aforementioned data collection instruments prior to actual data collection. All the variables were tested for reliability using Cronbach alpha coefficient all the variables attained a value of above 0.7. The data was analyzed using SPSS software version 28. The summarized results of descriptive statistics show (N = 80, M = 2.83, SD = .999 for financial mobilization, M = 2.84, SD = .967 for financial absorption, M= 3.90, SD = .870 for debt management and M =3.5, SD = .929 for the intervening variable government policy. The regression analysis beta coefficients for the three independent variables were tested at 5% level of significant. The results indicate that all the variables are statistically significant. Null hypotheses were tested using t- test at 95% confidence level. Results of analyzed data are presented in tables in percentages, Mean, standard deviations, t- test and F- test values. The study concluded that financial management practices in Meru county government have been moderately executed that are leading to slightly above the average service delivery in Meru County government. Thus, there is need to increase resource mobilization and financial absorption so as to provide seamless service to Meru residents.

Keywords: *Financial Management, Devolved Government, Service Delivery*

134. Effect of strategic management practices on the performance of corporate social accountability of government institutions in Kenya

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Subtheme: Business, Economy, and Society: challenges in the post-pandemic Era

Abstract

Despite the fact that the strategic management practice literature strongly acknowledges the existence of a relationship between corporate social accountability and overall organizational performance, some studies have yielded conflicting results. "The inconsistency of findings suggests that more research into the ongoing debate about this corporate social accountability is needed. As a result, the purpose of this study is to investigate the effect of strategic management practices on the performance of Corporate Social Accountability of Governmental institutions in Kenya. Corporate social accountability is important in the economy, which is why it has piqued the interest of many stakeholders in recent years, as they become more aware of its impact on the socioeconomic well-being of institutions and society as a whole. Four specific objectives will form the basis of study and this include: to examine the effect of strategic competitive practice, strategic corporate governance practice, strategic planning practice and strategic total quality management practice on the performance of corporate social responsibility of governmental institutions in Kenya. The theories will include: Theory of competitive advantage, strategic fit theory, resource dependency theory and stakeholder theory. The study population will be 186 government institutions operating in Kenya, The study will select 2 senior managers as respondents from amongst the 186 government institutions in Kenya and the sample will be 127 government institutions hence making the total number of respondents to be 254.Quantitative research design will be adopted for the study. The primary data will be gathered from the directors of the Kenyan government institutions. The study will adopt the use of questionnaire as the data collection instrument. Data analysis and interpretation will be based on descriptive statistics and measures of dispersion as well as inferential statistics mainly regression analysis, Pearson correlation, factor analysis and analysis of variance.

Keywords: *Corporate Social Accountability, Strategic management, State corporations*

135. Brand equity and customer citizenship behaviour among students of selected universities within Mount Kenya region

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Subtheme: Business, Economy, and Society: challenges in the post-pandemic Era

Abstract

The purpose of the study was to assess the brand equity and citizenship behaviour among students of selected universities within Mount Kenya region. The specific objectives included to: find out the effect of brand image, brand loyalty, brand awareness, and perceived quality on customer citizenship behaviour among students of selected universities within Mount Kenya region. Keller brand theory and Aaker Brand Equity theory anchors the study. The study adopted a descriptive research survey. The accessible target population was 600 4th year students of selected universities within Mount Kenya region. The study used sampling formula proposed by Israel (2009) to obtain the required sample size of 240 respondents from the study. Primary data was collected using both closed and open-ended questionnaires. The questionnaires were carefully structured and pre-tested and adjusted to meet the demands of the study. The researcher administered the questionnaires personally to create a personal link with the respondents. The researcher acquired research permit from necessary institutions for use in the field. Data was analyzed using descriptive and inferential statistics. The findings showed that brand image, brand loyalty, brand awareness, perceived quality had a positive and significant effect on customer citizenship behavior. The study concluded that brand equity contributes significantly to enhanced customer citizenship behavior. The study recommends that Universities should ensure brand image that evokes cleanliness. Policy makers in the government and ministry of education should make policies that are favorable towards brand equity in Kenyan Universities. Marketers at the universities in Kenya should utilize strong advertising and marketing campaigns to create more brand awareness and hence build customer citizenship behavior.

Keywords: Brand equity, Citizenship behavior, Kenya, Brand loyalty

136. Uptake of digital innovations on performance of commercial banks in Kenya

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Subtheme: Business, Economy, and Society: challenges in the post-pandemic Era

Abstract

Commercial banks in Kenya have widely employed innovations as part of new developments in the markets, processes and organizational forms, interaction with customers and regulations of the banking system. Successful uptake of digital innovations among commercial banks in Kenya has remained a challenging task hence impacting negatively on their returns on equity, customer satisfaction and efficient business processes. There is lack of clear relationship between process, product, marketing and organizational digital innovations on performance of commercial banks. This study will seek to assess the effect of uptake of strategic digital innovations on performance of commercial banks in Kenya. The specific objectives will be to assess the effect of uptake of strategic digital process innovations, examine the effect of uptake of strategic digital product innovations, establish the effect of uptake of strategic digital marketing innovations and determine the effect of uptake of strategic digital organizational innovation on performance of commercial banks in Kenya. This research will be guided by diffusion of innovation, Evolutionary Theory of Economic Change, disruptive innovation and dynamic capabilities of firm theories. A descriptive study design will be used to establish the influence of the independent variables (uptake of digital strategic innovations) on the dependent variable (performance) of commercial banks in Kenya hence the use of return on equity will be important to measuring performance. A target population of 1,470 from the 39 licensed Commercial Banks in Kenya will be involved in the study. A structured questionnaire will be used to collect data from employees of the commercial banks including; Senior Management, Supervisory management, and Clerical Officers out of which a sample size of 306 will be sampled using stratified random sampling technique. Secondary data will be collected from individualized commercial banks, Central Bank reports and Banking sector innovation surveys. Reliability of the instruments for collecting data will be estimated using Cronbach's Coefficient Alpha while content and construct validity will ensure that the intended data is collected adequately and effectively. Statistical data analysis will be done using SPSS version 25.00 and STATA statistical software. Data will be presented using tabular of frequency tables and pie charts, scatter chart, and histograms. However, kurtosis, quartile and (ANOVA) will be used to measure the distributions of values and relations between independent variables and dependent variable. Inferential analysis using correlation and multiple linear regression models will be used. The study data will be tested for adherence to the assumptions of multiple linear regression. Test assumptions such as linearity, normality, autocorrelation, heteroscedasticity and multicollinearity tests will be utilized

Keywords: *Digital Innovations, Commercial banks, disruptive innovation*

137. Generic competitive strategies on firm performance of local road construction firms in Upper Eastern region, Kenya

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Subtheme: Business Management and Finance

Abstract

Competitive strategies are long term action plans directed to gain competitive advantage over the competitors established after evaluating strengths, weaknesses, opportunities and threats in the industry and compared to firm's own. This research is being carried out to investigate the relationship of the generic competitive strategies employed on performance of local road construction firms in upper eastern region, Kenya. The objective of the study is to investigate the relationship of the generic strategies and firm's performance. The specific objectives will singly study the relationship of cost leadership, differentiation strategy, focus strategy, combined strategy on firm performance. The game theory and porter's five competitive model theory, resource based theory anchors the theoretical study and empirical studies exploring the studies that have been done before on each variable of this study. The interest in exploring this topic is brought about by the stiff competition the local contractors are experiencing during biding from increased foreign firms and registration of many local road construction firms. There has been no study found to have conducted generic competitive strategies and firm performance of local road construction firm and in the Upper eastern region Kenya and hence this study aims to address this research gap. The target population is 71 companies currently working on the ongoing road projects by KeNHA, KURA, and KeRRA within the upper eastern region, Kenya from which data will be collected using a questionnaire. The choice of using the working contractors is so that data is collected from firms with evident success of winning road projects tenders. Data will be analyzed and visualized using MS Excel and SPSS data tools, from which recommendations will be drawn advising on the proven successful competitive strategies that other contractors can use to gain competitive edge against others in the industry.

Keywords: *Competitive strategy, Road construction firms, KeNHA, KURA, KeRRA*

138. Brand equity and customer citizenship behavior among students of selected universities within Mount Kenya region

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Subtheme: Business Management and Finance

Abstract

The growing number of higher learning institutions in Kenya and around the world has emphasized the importance of brand equity in customer decision-making. Despite the role of brand equity, enrollment in public universities has been declining in the past three years. The study was conducted to establish effect of brand equity on customer citizenship behavior among students of selected universities within Mount Kenya region. The study was anchored on Keller brand theory. A descriptive research survey was utilized and target population was 600 4 th year students of selected universities within Mount Kenya region. A sample size of 240 students was selected simple random sampling. Primary data was collected using both closed and open-ended questionnaires. Data analysis was done using descriptive and inferential statistics including correlation and regression analysis. Results indicated an R squared of 0.565. This denoted that brand equity explains 57% of the variations in the customer citizenship behavior. Findings also indicated that brand equity had a positive and significant effect on customer citizenship behavior (β=0.912, p<0.05). This suggested that a marginal increase in brand equity will lead to 0.912 increase in customer citizenship behavior. The study concluded that brand equity significantly contributes to improved customer citizenship behavior (57%). The study recommended that universities management should consider engaging in strong advertising and marketing campaigns so as to create more brand awareness and hence build customer citizenship behaviour. The university administrators should make sure the brand image conjures cleanliness. They should also create a positive and inviting environment. The government and ministry of education policymakers should also promote brand equity in Kenyan universities.

Key words: *Brand Equity, Customer Citizenship Behaviour, University students*

139. Impact of market liquidity on the Growth of equity security returns in Kenya

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Subtheme: Business Management and Finance

Abstract

Whereas classical portfolio theory argues that investor decisions are purely based on the status of market fundamentals and on how the fundamentals impinge on the securities, research is replete with contradictory studies that have produced results that show different decisions under similar circumstances. Stock market liquidity has been considered as one of the possible factors that explains the cross-sectional variation in equity stock returns. The influence of stock market liquidity on the performance of equity returns is utmost a contradiction or at least an augmentation to the classical portfolio theory argument that investor decisions are purely based on the status of market fundamentals. The implication of this phenomenon is that the investors are not only concerned about the quantity and price of a transaction but the market conditions as well. The most outstanding explanation of the investors' concern with the market is that investors incur numerous direct and indirect operational charges and risk future price fluctuations if they want to liquidate their position quickly. Liquidity of an asset therefore has a significant impact on the asset prices and returns. This study aims at determining the gross impact of market liquidity and perceptions on the growth of equity security returns in Kenya. The study reviews growth in returns, liquidity: width, depth, resiliency, immediacy and perception as important study variables as moderated by the levels of market efficiency. The study will employ proxies that gauge; investor compensation, trading cost, trading volume, price impact, trading speed and investor attitudes. simple and log returns, Roll's implied spread, Turnover rate, Amihud's ILLIQ and turnover adjusted zero daily volumes will be employed for the Operationalization of the research variables. The study will cover 3,192 investors sampled from across 8 counties; while the study's secondary data will focus time series and cross sectional data on the daily Nairobi All Securities index for the period 1st January 2018 to 31st December 2022. Based on panel data, either the: standard ordinary least squares, random effects model or the fixed effects model will be chosen based on rigorous diagnostic tests to establish a causal relationship between variables. The study hypothesizes market liquidity to exhibit a negative impact on the growth of equity security returns in Kenya.

Key words: *CAPM,Depth,Immediacy,Liquidity, Perception,Resiliency,Stock Returns,Width*

140. Sleeping on the job or poor gadgets? four years of dismal performance of companies in Kenya

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Subtheme: Business Management and Finance

Abstract

On the basis of KNBS (2018) statistical data, from 2014 to 2017, the Kenyan population growth rate averaged 2.8% when GDP grew at the average rate of 5.5 %. Both the population and the GDP were overtaken by inflation growth of 6.2 %. The nominal Treasury bill interest rate grew at the rate of 8.7%. Real interest rates rose at the rate of 2.5%, the US Dollar appreciated at an average rate of 4.8% while the NSE 20 share index declined by -5.5%. The dismal performance of the NSE returns relative to the Treasury bill interest rate and foreign exchange rate gain stimulated a quest for an urgent answer to the question as to whether somebody was sleeping on the job or the figures indicated failed to measure what they were intended to measure. The study aimed at investigating the effect of macroeconomic fundamentals on market performance listed companies in Kenya. The study adopted a mixed quantitative and qualitative research design to describe and establish a causal relationship between variables. The data was obtained from the Central Bank of Kenya, the Kenya National Bureau of Statistics, the Capital Markets Authority and the Nairobi Securities Exchange Database for the period 2012 to 2016. The study employed the pooled panel regression model with the capital asset pricing model utilized to determine the effect of macroeconomic fundamentals on market performance of all publicly listed companies in Kenya. Microsoft Office Excel 2007; Data Analysis ToolPak, Functions and Charts were used in the processing and presentation of data. The study upheld the null hypothesis while relatively, the equity returns outperformed both the interest rates and the foreign exchange contrary to KNBS end of year statistics, raising the question as to whether KNBS should continue reporting closing rates.

Key words: *Data Analysis ToolPak, TDIST Function, Trendline, SDGs, Marrakesh Action Proclamation, Green Capital Markets.*

141. Management by objectives and employees' performance in Isiolo County government

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Subtheme: Business Management and Finance

Abstract

Management by Objectives (MBO) is a type of performance appraisal management system that requires the manager and employee to identify employee goals as they relate to the overall business. It is unclear whether MBO as an appraisal method adopted by Isiolo County Government attains this, and whether it affects employees' performance. Moreover, various studies on performance appraisal in Kenya have hardly addressed MBO directly. Thus, this study sought to investigate management by objectives and employees' performance in Isiolo County government. The study specifically sought to ascertain the effects of planning, monitoring and evaluation on employees' performance in Isiolo County Government. This study was guided by socio-analytic theory, mirror theory and agency theory. This study adopted a descriptive design. The location of the study was in Isiolo County, Kenya. The target population for this study was the 806 employees working in Isiolo county government from the level of director to senior clerical officers. The sampling frame was the seven ministries of the Isiolo County Government. A total of 260 respondents was sampled using stratified random sampling procedure. The sample was proportionately distributed among the seven ministries in the county government. This study used one set of questionnaires as research instrument. Prior to the actual data collection process, the researcher conducted piloting of the instruments in two sub-counties that was not involved in the actual data collection. Split-half technique using Spearman Brown prophesy formula was employed to compute the reliability coefficient. The study obtained a correlation coefficient of 0.78 for the questionnaire. The instrument was thus deemed reliable since a minimum correlation coefficient of 0.7 was deemed to indicate that study instruments are reliable. Assistance was sought from supervisors and other experts from the Department of Business and Economics Meru University of Science and Technology, in order to help improve content validity of the instruments. Analysis of quantitative data was aided by Statistical Package for Social Sciences (SPSS) Version 23. Quantitative data was analyzed using both descriptive and inferential statistics. The results shown evidence of adaptability of planning, monitoring and evaluation by the management of Isiolo County. On evaluation, Process review and monitoring were found to be significant in influencing evaluation. It was further found that overall planning has a positive and significant influence on overall employee performance. The study also found overall monitoring has a positive and significant influence on overall employee performance. The study concluded that overall evaluation influence on employee performance is insignificant, and recommended planning process, and monitoring processto continue improving employee performance Longitudinal study should be carried out to ascertain the influence of evaluation on employee performance in Kenyan county governments.

Keywords: *Management By Objectives, Planning, Monitoring, Evaluation, Employees' Performance.*

142. Assessment of strategy implementation on the performance of Climate Change Adaptation Projects in Kenya

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Subtheme: Business Management and Finance

Abstract

Increased climatic variability and change over the years and the repercussions of the changes are being felt more and more each passing season. Globally, various mitigation measures have been attempted by both government and non-government actors in different societies. In Kenya, the government and non-Government have been supporting food security related climate adaptation projects across the country in ASAL (Arid and Semi -Arid Lands) areas with a view of building resilience and cushioning populations against the negative effects of these changes. However, these strategies have not achieved much success of the intended goals. Various food security and drought resilience projected initiated have not been successfully implemented to benefit the communities. These ASAL regions continue suffering from the adverse effects of climate variation and change, as witnessed by severely reduced livestock populations, frequent droughts, famine and food shortage crisis. Camels, known to be highly adaptive to excessively hot and dry climates are struggling to survive. This study seeks to assess climate change adaptation projects implementation issues in the ASAL regions of Kenya focusing on strategic implementation and the performance of the projects. The study will adopt descriptive survey design using both quantitative and qualitative approaches. Using Slovin (1960) formula, 399 sample respondents will be obtained from 133,164 beneficiary households in Marsabit and Isiolo Counties of Kenya where climate adaptation projects were implemented. Data will be collected using Focus Group discussion (FGD), Key Informant Interviews (KII), questionnaires, observation and secondary data. Data will be analyzed using both descriptive and inferential statistics. The findings of the study will be disseminated through thesis, learned conferences and project workshops.

Keywords: *Strategic implementation, Climate Change, ASAL*

143. Effect of on-the-job training techniques on employee performance: a case of G4S, Kenya

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Subtheme: Business Management and Finance

Abstract

There is a need to shed more light on the efficacy of OJT approaches as a way to boost employee performance in a developing nation since underperformance is being reported in the organization. The study's general objective was to establish the effect of on-the-job training techniques on employee performance at G4S, Kenya. The study was guided by the following specific objectives: To determine the effect of job rotation technique on employee performance at G4S, Kenya. To establish the effect of coaching technique on employee performance at G4S, Kenya. To determine the effect of mentorship technique on employee performance at G4S, Kenya. To determine the effect of internship technique on employee performance at G4S, Kenya. Expectancy theory, goal-setting theory, social learning theory, and cognitive load theory served as the study's guiding principles. This study used a descriptive survey research approach. There were 700 respondents among the intended audience. The Yamane formula was used to determine the sample size of 88. The stratified random sampling method was used in the investigation. Through the use of closed-ended questionnaires, data was gathered. Data was examined using quantitative methods. The SPSS software version 26 was used to evaluate quantitative data using descriptive statistics including mean, percentages, and standard deviation. Relationships between the dependent and independent research variables were established using multiple regression analysis and variance analysis. Tables were used to display the analysis' findings. Understanding the impact of on-the-job training practices made the study important to G4S. The study will add to the body of knowledge on the efficiency of on-the-job training methods. The study findings showed that job rotation improves task performance and overall job performance but has no appreciable impact on contextual performance. Coaching was found to lead to employee's retention thus higher productivity. Respondents indicated that mentorship helps in career progression. Internship was seen to help improve post-internship employment. Respondents indicated internship to help improve post-internship employment. The study concluded that job rotation can contribute to reduced employee turnover, skill development, reduced boredom, increased productivity, and learning opportunities. Employees recognize the potential of coaching in developing their skills and ultimately increasing productivity. It is important to further promote and implement coaching programs within the organization, emphasizing its potential benefits in retention, goal achievement, skill development, career prospects, goal clarity, and performance improvement. Employees generally perceive mentorship as beneficial in several aspects, although the level of agreement and belief in its effectiveness varies across statements. Promoting internships as valuable learning experiences and providing adequate support and guidance during internships can help enhance their perceived value among employees.

Keywords: *on the job training, internships, industrial attachment*

144. Leveraging digital marketing for organizational agility: a Study of SACCOs in Meru Town, Kenya

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Subtheme: Business Management and Finance

Abstract

Savings and Credit Cooperative Organizations (SACCOs) are vital drivers of economic growth in the country. SACCOs provide financial services, including deposits, loans, savings accounts, money transfer, insurance, and payment services. Even though digital media exists to improve the flexibility and the speed of the business processes to improve organizational agility, its aspects are a very recent phenomenon among Savings and Credit Cooperative Organizations. An ongoing empirical inquiry is relevant to understand the domain of communication, marketing strategies, and its influence on organizational agility since the discourse of digital marketing is continuously developing. SACCOs must understand the association of digital marketing to organizational agility to embrace digital technology in their operations and stay relevant to their members while increasing their level of business resilience. The study seeks to determine the effect of digital marketing (social media, mobile, and website marketing) on the organizational agility of SACCOs in Meru Town, Kenya. The study will adopt a descriptive research design to gather information on the relationship between the two research variables. With a target population of 5 SASRA-licensed SACCOs in Meru Town, data will be collected using questionnaires where a stratified sampling method will be utilized to attain the desired representation from the population. A pilot test will be conducted to check the reliability and validity of the questionnaires that have been adopted as the research instruments. The data will be tabulated and analyzed using descriptive and inferential statistics by utilizing the Statistical Package for the Social Sciences (SPSS) software. Data will be tabulated by frequencies, medians, percentages, standard deviation, variance, and means. Multiple linear regression will be conducted to establish the inferential statistics and define the relationship between digital marketing indicators and organizational agility. The study must further establish whether social media marketing, mobile marketing, and website marketing positively affect organizational agility. This study contributes to the discussion on sustainable business practices, economic resilience, and the integration of innovative solutions in the post-pandemic context. It aligns with the overall objectives of the subtheme/track by examining the role of business and the economy in the post-pandemic era and the need for research and innovation to address the emerging challenges and foster sustainable development.

Keywords: *digital marketing, organizational agility, SACCOs, social media marketing, mobile marketing, website marketing*

CONFERENCE PAPERS

145. M&E knowledge-sharing practices on livelihood programme performance: focusing on Caritas Meru, Kenya

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Subtheme: Business, Economy and Society: challenges in the post-pandemic Era

Abstract

Knowledge, whether implicit, explicit, or tacit, is created during the project management processes with diverse implications. This study aimed at determining the influence of monitoring and evaluation (M&E) knowledge-sharing on the livelihood programme performance at Caritas Meru, Kenya by examining the extent of knowledge-sharing among livelihood programme stakeholders and how it affects performance. The research design employed in this study was a mixed-methods approach, combining qualitative and quantitative data collection methods. The research population consisted of senior managers and employees at Caritas Meru, and small-holder farmer group leaders involved in the livelihood programme. Surveys, interviews, and focus group discussions were utilized to gather data on knowledge-sharing practices and livelihood programme performance indicators utilization within the organization. The data obtained was subjected to descriptive and inferential analysis using Statistical Package for Social Sciences (SPSS). The study established that M&E knowledge-sharing practices and performance of livelihood programme had a composite means of 3.935 and 3.88 respectively implying agreement among respondents. The study established that there was a statistically significant relationship ($r = .472$, $p < .001$) between M&E knowledge-sharing and performance of livelihood programme implemented by Caritas in Meru Catholic Diocese. The findings support previous studies that M&E practices in general influence the project and or programme performance. The study, empirically established that M&E knowledge-sharing practices influence the performance of livelihood programme at Caritas Meru. The study recommends the establishment of structures within development programmes by implementers to provide opportunities for knowledge-sharing hence effective performance. The study recommends legislation of policies by County and National governments on knowledge management in development programs.

Keywords: *M&E knowledge-sharing practices, Livelihood programme performance, Knowledge documentation, Knowledge dissemination, Knowledge presentation*

146. Financial constraints, firm size and investment cash flow sensitivity among non-financial firms listed at the Nairobi Securities Exchange, Kenya

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Subtheme: Business, Economy and Society: challenges in the post-pandemic Era

Abstract

The purpose of the study was to establish the effect of financial constraints and firm size on the investment cash flow sensitivity of non-financial firms listed at the Nairobi Securities Exchange. The study employed descriptive research design on secondary data to study a population of 33 non-financial firms operating in Kenya and listed at the Nairobi Securities Exchange over the period between 2012 and 2021. The data collected was analyzed through descriptive and inferential statistics. The study findings pointed to an effect of size on the positive relationships between financial constraints and firm investment cash flow sensitivity. The overall conclusion was that firm size influences the positive relationships between financial constraints and the investment cash flow sensitivity of the non-financial firms. Specifically, firm managers rely on profitability to finance investments possibly because of financial market financing obstacles that include cost, access and information asymmetry. The positive effect of leverage and liquidity is a pointer to existence of pecking order preference in working capital and capital structure decisions. The study thus contributes to managerial policy in suggesting that corporate managers should increase the use of internally generated funds especially from retained profits and debt capital when financing their firm investment and operations in order to maximize the tax shield benefits available to their firms. Further research can be taken on financial firms for comparison purposes.

Keywords: *Financial Constraints, Firm Size, Investment Cash flow Sensitivity, Non-Financial Firms*

147. Factors affecting consumer acceptance and attitudes towards genetically modified food products in the world

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Subtheme: Business, Economy and Society: challenges in the post-pandemic Era

Abstract

Food security has been a major issue of concern during the past two decades with more than 800 million people globally lacking adequate food especially in developing countries. The rapidly growing global population has put pressure on food sources thereby inviting the need to device a sustenance plan. In Africa, and particularly in Kenya, the agricultural production of food crops has not grown in tandem with the growing human population which has increased at least 6 times since the 1960s. This points to the vulnerability of Kenya in ensuring food security for its people. Biotechnology has developed mechanisms for improving plants and livestock as a remedy for food security. Proponents have asserted that the use of biotechnology in agriculture and food production offers the promise of delivering larger quantities of foods with enhanced nutritional value and thus improving food security. However, the realization of these benefits largely depends on consumer acceptance of these new genetically modified foods (GMFs) or biotech foods. In this paper, we reviewed published articles dealing with consumer response towards food products made from genetically modified ingredients. The articles for this review were identified by conducting a search on Google scholar using the key words identified below. Overall, the response of consumers to GMFs has been largely negative all over the world. Furthermore, the findings indicate that consumer attitudes and acceptance of GMFs is determined by gender, age, education level, trust on the relevant government and non-governmental organizations which promote biotechnology in food production. In Kenya, despite the introduction of research in genetically modified organisms more than 20 years ago, opposition to the commercial release still remains largely due to concerns related to food safety uncertainties.

Keywords: *biotechnology, adoption, consumer attitudes, consumer acceptance, food security.*

148. Factors that influence small and medium enterprises access to credit in Meru county

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Subtheme: Business, Economy and Society: challenges in the post-pandemic Era

Abstract

Small and Medium Enterprises (SMEs) significantly contribute to both the social and economic development of people largely through their roles in job and innovation creation, and revenue generation. Majority of SMEs are undercapitalized due to inaccessibility of credit facilities. This adversely influence their capacity to invest in productive ventures and realize their corporate goals. determinants that influence small and medium enterprises access to credit is not well known. Thus, the current study sought to establish the determinants that influence small and medium enterprises access to credit in Meru County. The study specifically sought to find out how capacity to pay, collateral availability, availability of information and business risks influence access to credit by SMEs in Meru County. The study was guided by the theory of information asymmetry and the pecking order theory. The study was based on the descriptive survey design. The study targeted 204,810 SMEs in Meru County of which 384 SME owners were sampled using stratified sampling. Quantitative data was analyzed using both inferential and descriptive statistics. Qualitative data was analyzed thematically. The study established that SMEs which are capable of paying are likely to access credit from financial institutions in Meru County as opposed to those that are incapable or repaying credit. It was also found out that majority of SMEs in Meru county are able to access credit from SACCOs but not from MFIs and Banks without necessarily having to provide collateral since guarantors' savings act as security for the loans. The study further indicated that SMEs which have positive information listed about them by CRB are likely access credit from financial service providers as opposed to those which are negatively listed especially for banking institutions and MFIs as opposed to SACCOs. Finally the study found out that SMEs which have minimal business risks are more likely access to credit from financial service providers than those which venture in risky enterprises. It was envisaged that the findings of this scholarly investigation would have been of great value to entrepreneurs running Small and Medium Enterprises (SMEs) on identifying those firm determinants adversely influencing their access to credit. It is also hoped that the current research study's findings would have helped them in formulating appropriate policies of addressing the adverse effects emanating from these SMEs' determinants and address policy gaps.

Keywords: *SMEs, SACCOs, CRB, Access to Credit*

149. Cutting construction costs with scissors: exploring possibilities of recycling plastic waste in Kenya.

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Subtheme: Business, Economy and Society: challenges in the post-pandemic Era

Abstract

Sustainability is the sum total of enhanced quality of life, derived from living in a healthy environment, with improved social, economic and environmental conditions. The major output of cutting construction costs is anchored on the idea of Sustainability. The project is also a double hedged sword that does not only seek to rationally improve quality of life but seeks to do it with pleasure leaving people with that nostalgic feeling of "beautiful," "attractive," "pleasing to see," "nice to see," and "like to look at," by incorporating the component of aesthetics. The project seeks to address the plastic waste which negatively impacts on the natural world and affects everyone. Stakeholders interested in the realization of the project objectives range from nations to individuals. The project seeks to turn tables by converting a threat into an opportunity by capitalizing on the weaknesses. The current plastic waste management challenge emanates from its bulkiness and intermingling with other wastes. Plastic is easily reusable, is in high supply, Low demand, can make items with high aesthetic value. The major challenge is collecting domestic and single use plastics. This aspect is addressed by creating awareness, shredding and using plastic waste in manufacturing of bulky reusable cost effective items. The project had identified 300mm x 200 mm x 50 mm trappers. The project identified the synergy of rotating semi-circular thermal scissors trending against a continuous grip and mounted on fluid filled fly wheel for shredding. The use of furnace to melt ground plastic in used oil in a high-pressure container. The Project focused on evaluation of aesthetic value of ceilings built using recycled plastic trappers, the project evaluated the cost of plastic against wood trappers, the project involved communities in clean up exercises, creating awareness on plastic waste pollution to discourage landfill, littering, and incineration and developed a culture of shredding plastic especially by collectors to reduce bulkiness in storage and transportation, the project also explored partnerships with stakeholders, reviewed the extent of ocean pollution and evaluated possibilities of commercialization of (a) Shredding (b) Manufacture of shredders(c) Hire of trappers (d) Manufacture of trappers (e) Training and consultancy on plastic waste management and research on plastic waste.

Keywords: *Aesthetics, Construction Costs, Environment, plastic waste, Scissors, Sustainability.*

150. Effect of performance contracting strategic elements on implementation of performance appraisal systems in public universities within Mount Kenya region.

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Subtheme: Business, Economy and Society: challenges in the post-pandemic Era

Abstract

The implementation of performance appraisal systems (PAS) has not been very successiful in most public universities. Despite the implementation of PAS since 2005 in the public universities, their performance is still not comparable with the private sector to enable it meet the ever changing, competitive global world as well as meeting the demands of a well-informed citizen. For example, employees of Jomo Kenyatta University of Agriculture and Technology (JKUAT) and Kenyatta University (KU) have complained of poor PAS. Most employees have no full understanding of the PAS. The general goal of this study was to determine the effect of performance contracting's strategic elements on the implementation of performance appraisal systems in public Universities within Mount Kenya Region. The study was guided by the following objectives: to determine how organization structure influences implementation of performance appraisal systems in the public Universities in Mount Kenya Region, to determine how monitoring and evaluation influences implementation of performance appraisals in public Universities in Mount Kenya Region, to determine how employee attitudes influences implementation of performance appraisals in public Universities in Mount Kenya Region and to examine the extent to which training influences implementation of performance appraisal in public Universities in Mount Kenya Region. The study was informed by agency theory, the expectancy theory, the goal-setting theory and theory of planned behavior. This study adopted descriptive survey research design. The target population of this study was the staff, human resource officers, administrators and finance officers in the seven (7) chartered public universities as they are considered as the ones directly involved in the implementation of performance appraisal systems. The target population for this study consisted of 2423 respondents from which a sample size was drawn. The sample size was 136 respondents from the 7 chartered public universities in Mount Kenya Region. Stratified random sampling was used in this study. A questionnaire was used as the research instrument for this study. Quantitative data was analyzed by the use of descriptive statistics using SPSS (Version 20) and figures and tables were used to present the results. The study found that organizational structure, monitoring and evaluation, employee attitude and training had a positive and significant effect on the implementation of performance appraisals in public Universities in Mount Kenya Region. The study also concluded that monitoring and evaluation of projects helped various project stakeholders including the clients and project financiers which helped to improve the implementation of performance appraisal systems. In addition, use of monitoring and evaluation framework put in place contributes directly to the quality of PAS. Universities must increase the awareness of the employees about its goals, targets and strategies. This will make it easier and smoother the introduction of PAS and afterwards the system itself will help to increase this awareness.

Keyword: *Performance contracting, Strategic elements, Performance Appraisal Systems*

SUBTHEME 8: Water, Sanitation and Hygiene (WASH) and SDGs

PRECONFERENCE PAPERS

151. Influence of environmental sanitation on the implementation of sanitation policy guidelines on the sanitation facilities in public primary schools in Meru county

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

There is a need for a healthy and conducive learning environment, safe drinking water, and child-friendly sanitation facilities in the school where children spend a lot of time. The objective of the study was to establishing the influence of environmental sanitation on the implementation of sanitation policy guidelines as stated in Kenya School Health Policy and the Safety Standards Manual for schools. To achieve its objective, the study adopted a descriptive survey design. A sample of 159 schools was selected from the total of 773 primary schools in Meru County using simple random sampling. Data will be collected using a Structured Direct Observation Schedule. Data was analysed using SPSS software. Descriptive statistics including mean and cross-tabulations was used. Pearson's Chi-Square test was used to determine relationships between the variables. The study revealed that 75% of the schools visited had pit latrines and 90% of the schools had hand washing stations with water for the process, 12% of the latrines which were visited seemed to have fecal matter on the surface. Through observation it was evident that 93% of the schools visited had clean environments which were free from litter. The study concluded that sanitation structures in the schools needs to be cleaned regularly. The schools should come up with a clear budget on sanitation that includes employing a staff specifically for cleaning toilets. The study also concluded that the environment in most of the schools was conducive and safe for the pupils. The study recommended for similar studies to be done in other counties.

Keywords: *child-friendly environment, policy, sanitation, school structure*

152. Assessment of faecal exposure pathways in low-income urban area in Meru municipality, Kenya.

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Objective: To identify major faecal exposure pathways and quantify magnitude of contamination in Majengo slum, Meru. Problem Statement: Rapid urbanization and population growth have greatly stressed the existing urban infrastructure for water and sanitation. This has led to increased risks of environmental faecal contamination through illegal dumping, inadequate or unsafe storage of human waste. This study assessed different pathways through which faecal contamination occurs and the magnitude of E. coli in each pathway in of Majengo Slums, Meru. Methodology: The study was conducted in Majengo Slum of Meru County. The identification of the main pathways was conducted through the key informant interviews with public health officers and the community gatekeepers. Additionally, the transect walk was conducted to assess the sanitation situation in the area. The environmental samples were selected through grid method proposed by the Sani Path study. Later, a microbial analysis was done on the environmental samples collected from the pathways. Finally, the data was analysed using SPSS and presented inform of tables, charts and graphs. Results: Four potential contamination pathways were found in Majengo slum. The surface water, open drain, municipal water, and soil were the main pathways found. The E. coli count was highest in open drain samples with highest presenting 238 CFU DL factor 5 and the least 112 CFU DL factor 4. The average CFU in the pathways were 190, 191.8, 37, and 171.6 for surface water, open drains, municipal water, and soil respectively. Discussion: Inadequate sanitation infrastructures such as overflowing latrines and illegal dumping of waste has greatly contaminated the environment. The area is overpopulated making residents to dump their wastes into open drains, rivers and fields because the shared facilities are not adequate. Conclusion: In conclusion, there are several faecal exposure pathways in Majengo slum including surface water, open drain, soil, and municipal water. While all pathways tested positive for E. coli, open drains recorded the highest average number of colony-forming units thus becoming the dominant pathway. Recommendation: study recommends covering of all the open conduits in Majengo slum to reduce the risk of contamination.

Keywords: *Faecal contamination, exposure pathways, E coli, sanitation infrastructure, E coli quantification, Slum sanitation*

153. Assessing the role of municipal solid waste management in sustainable urban sanitation in Kitengela town, Kajiado county, Kenya.

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Over the years, municipal solid waste (MSW) generation has increased. Literature suggests that increased volumes of MSW are a great burden in developing countries, especially due to the lack of adequate resources and infrastructures for managing these wastes. Consequently, developing countries grapple with poor management of MSW which is not only a threat to public health, but also hinders the achievement of sustainable urban sanitation. Indeed, MSW is a crucial factor in urban sanitation since the quality of its management greatly influences the state of urban sanitation. The purpose of this study is to evaluate the impact of the quality of MSW management on urban sanitation as well as the role of MSW management in environmental and public health, especially open defecation, in Kitengela town. To achieve the objectives of this study, a cross-sectional research design will be used. Data will be collected using questionnaires, interviews and field observations. A sample of 399 participants comprising of market traders, residents, municipal solid waste service providers and community leaders will be used. Data collected through interviews and observations will be analyzed and presented thematically whereas data collected through questionnaires will be coded and analyzed using the IBM SPSS software. Descriptive statistics will be used in analyzing data collected through questionnaires. Inferential statistics will also be used whereby correlation analysis will be used to give inferences about the quality of municipal solid waste management in Kitengela and correlation to sustainable urban sanitation. Data presentation will be done using tables, charts, graphs, scatter diagrams and figures. The expected results from this study are that poor management of MSW in Kitengela encourages open defecation which is a serious sanitation issue. It also leads to the blockage of drains and flooding during the rainy season and creates a conducive environment for vermin that cause sanitation-related diseases such as cholera, typhoid fever and dysentery

Keywords: *municipal solid waste, sustainable urban sanitation, environmental and public health, open defecation, urban sanitation, solid waste management..*

154. Motivational determinants of sanitation practices in rural settlements of Tigania East Sub-county, Meru county, Kenya.

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

In Kenya, the average rate of open defecation is 23.5%. Meru County has insufficient sanitation facilities, resulting in financial loss and a high incidence of diarrheal diseases, especially among children. The Meru County government incurs an annual cost of 816 million KES due to poor sanitation, despite having only 60% pit latrine coverage. Diarrhea and related illnesses are the second leading cause of death in Meru County for children under 5 years old, accounting for 16% of deaths. Even though Tigania East Sub-County has been declared open defecation free, some residents still practice it, increasing the risk of diarrheal diseases. This study aims to determine the motivational determinants influencing sanitation practices in rural settlements of Tigania East Sub-County, using the SaniFOAM behavior change model. A descriptive survey design was used, and 169 household heads were selected randomly from a population of 32,810 using Arsham's formula. Data collected through questionnaires were analyzed using SPSS version 25, including descriptive and inferential statistics for quantitative data and thematic presentation for qualitative data. The study found that beliefs play a significant role in determining sanitation practices. Despite latrines' availability, a significant percentage of the population continued to defecate in the open due to their beliefs that it was healthier. The study revealed that there was a strong positive association between the determinants for sanitation practices and improved sanitation practices, highlighting the importance of addressing cultural beliefs and improving the structure of sanitation facilities to increase the adoption of latrines and improve sanitation practices in rural settlements. The study recommends policymakers and practitioners increase awareness on open defecation penalties and provide training on constructing ventilated pit latrines. They should also address cultural beliefs, improve sanitation facilities, ensure gender equality in decision-making, and educate on safe disposal of children's faecal matter to reduce diarrheal disease risks.

Keywords: *Motivational Determinants, Sanitation Practices, Rural Settlements.*

155. Determination of the mass balance process of faecal and kitchen waste across the Black Soldier Fly treatment process.

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Novel technologies to convert faecal waste into valuable nutrient provide a win-win situation in enhancing the closed sanitation loop, and providing safe sanitation. In this study, laboratory scale experiments were set to examine the treatment of organic matter (faecal matter (FM) and kitchen waste (KW) using Black Soldier Fly (BSF) larvae. The study focused on determination of mass balance. Using each of the feed substrates (500g), three trials of experiments, each in triplicate were set up in rectangular plastic containers (18 by 9 by 6cm) and 3 grams of 6-day old larvae introduced. Ten larvae were randomly picked after two days from each feeding containers in (triplicate) to monitor the larval weight gain. The larval developmental time to 50% pupation, survival rate (SR), waste reduction rates (WR), prepupal yield, bioconversion rate (BCR), feed conversion rate (FCR), and efficiency of digested feed (ECD) were monitored in triplicate at the end of the experiments for mass balance process. The larval development time was 22 days on both feed substrate with final protein content of 34.90% and 34.55%, fat content of 41.61% and 36.64% from BSF pupa reared on faecal and kitchen waste respectively. Mass balance determination (triplicate) yielded average prepupal yield of 70.43±0.02g and 56.77±0.01g, ECD of 17.63±0.01% and 12.05±0.00% waste reduction of 79.91% and 92.24%, FCR of 4.67% and 7.30%, bioconversion rate of 14.09% and 11.35% from faecal waste and kitchen waste respectively. The study findings show the potential of using BSF larvae technology to valorize faecal and kitchen waste and produce larval biomass rich in proteins and fats. By implementing the technology, occurrence of open dumping and faecal contamination could be reduced.

Keywords: *BSFL (Hermetia illucens), Closed loop sanitation, Larval biomass, Mass balance, organic matter, Sanitation value chain, faecal waste, kitchen waste.*

156. Role of Formal and Informal Actors in feacal sludge management in Mukuru Kwa Reuben slums, Nairobi

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

The Sustainable Development Goals agenda 6.2 aims to improve access to safely managed sanitation by 2030. Although efforts have been put in to meet the target, only 17 % of the Sub-Saharan African population in informal settlements are served by sewer systems. Possible interventions and options to address sanitation issues in informal settlements have been advanced through research. However, upscaling and improving feacal sludge management in Kwa Reuben has been a challenge as a result of overpopulation, land tenancy issues, complex roles of stakeholders, technical and political constraints. This study sought to investigate the role of formal and informal actors in faecal sludge management in Mukuru Kwa Reuben. The study used a case study design with a qualitative approach. Snowballing and purposive sampling techniques were used to enroll 52 participants, including Public Health Officers, Mechanical and Manual Operators, Landlords, Ministry actors, sanitation enterprises, and non-governmental organizations. Data was collected using focus group discussion and key informant interviews and analyzed thematically in Nvivo version 12. Findings from the study showed that although landlords were willing to provide safe sanitation options, a cost of 5,000 Ksh for sewer connections was expensive. Manual operators, although reliable for the transportation of fecal sludge, reported poor payment which demoralized them from offering services. Further, despite the devolution of sanitation functions, the Nairobi County Government was unwilling to service loans for sanitation infrastructure. The operation of sanitation systems was constrained by the presence of cartels who controlled water provision. Findings also showed the existence of overlapping functions on WASH coordination between the Ministry of Health, Ministry of Environment, and Ministry of Water, Sanitation, and Irrigation which affected sanitation services. The study concluded that the governance of sanitation delivery in the slum was inadequate and fragmented due to the conflicting roles between actors, controlling cartels, unresponsive financial arrangement and partially implemented WASH Acts. The study recommends the need for more investment in sanitation services and coordination strategies to ensure improved sanitation in slums

Keywords: *formal actors, faecal sludge management, manual operators, informal actors.*

157. Influence of community participation on the implementation of Urban Sewerage Systems: a case of Meru Town Sewerage System, Meru County, Kenya.

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

The Sustainable Development Goals emphasize on provision of improved sanitation facilities for all by 2030. However, despite government investment in the provision of sanitation options in low-income areas, the proposed systems face rejection and fail to meet their intended aims or take too long before completion making the population continue bearing the brunt of poor sanitation. Unless the benefiting community is involved in the analysis, decision-making, planning, and implementation of sanitation projects, their acceptability could remain questionable. The study examined the influence of community participation on the implementation of sewerage systems using the case of the Rwanyange sewerage system in Meru County, Kenya, which has remained in a state of limbo for years. The study used a descriptive cross-sectional design with a mixed methods approach. Quantitative data was collected using structured questionnaires from a sample of 138 household heads selected using cluster and proportionate simple random sampling techniques. The data was analyzed in descriptive and inferential statistics using Statistical Package for Social Sciences (SPSS) Version 25. Qualitative data was collected from a focus group and analyzed thematically. Findings showed that the community was dissatisfied with the sewerage treatment plant because it contaminated their backyards and agricultural land. Due to failure to understand the project's benefits, residents perceived that it was meant to destroy their lives. It was established that 61.3% of the community members had faced forced displacement which resulted in poor contentment with the project due to lack of compensation. As well, the engagement of non-community members in the provision of labour as reported by 71% of the respondents facilitated rejection of the project by the community. Lack of engagement of community members in the initial stages of project implementation increased the likelihood of failure of the project ($r=0.421$, p-value=0.000). Besides, poor participation of the community in decision-making ($r=0.498$, p-value=0.000) and in resource mobilization ($r=0.613$, p-value=0.000) had a significant influence on implementation of the sewerage system. The study concluded that community participation at all stages of project implementation was critical for its success. The study recommended the need for sanitation development interventions to ensure community participation in the initial processes and during the establishment of projects for improved ownership and acceptability if sanitation projects have to succeed. The study also showed the criticality of considering local resources for local community projects.

Keywords: *Community participation, sewerage systems, project implementation, decision making, urban areas.*

158. *E.coli* inactivation efficiency by Black Soldier Fly faecal sludge seeded in UDDT-CBS as an option for peri-urban settlements: case study-Nchiru, Kenya.

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Sustainable development goal 6.2 advocates for increasing access to equitable and adequate hygiene and sanitation for all by 2030, and its indicator target is to raise the proportion of the population using safely managed sanitation. On the contrary, it is approximated that only 54% of people globally have access to safely managed sanitation, while 2.4 billion lack access. Recent innovations have however seen the development of low-cost technologies that can be customized depending on the region. The container based sanitation CBS is one of the options for safely managing the waste compared to conventional sewerage systems that are expensive. However, the need for emptying and transportation of filled fecal sludge (FS) containers on daily basis, leads to high operational costs and increases the operational exposures risks to fecal pathogens amongst the CBS operators. The study determined the performance efficiency of BSFL in inactivation of *E.coli* via SCBS-UDDT model. Sample was transported to the lab for analysis of *E.coli* after every 3 days from each three household in replication. One gram of sample was used in serial dilution up to factor 5.The inoculum was plated in Tryptone Bile Glucuronic (TBX) agar for enumeration according to manufacturer's instructions. Plates with 30-300 colonies were considered viable for counting. The study used statistical analysis IBM SPSS software from the sets of experiments. Findings from this study showed that there was reduction of *E.coli* coliforms with HH1 recording 4.056 from 6.21, HH2 day 0 to 6 5.182 from 9.083 and HH3 day 0 to 6 was 4.199 from 7.615. The ANOVA results for the E. coli log showed that the F statistic was 0.435536, which is less than the critical value of 4.256495 F (2, 9) = 0.65986, > p 0.05.This indicates that there was no significant difference between the means of three households across days 0, 3, 6, and 9. Bioconversion of organic waste using the BSF technology has been noted to reduce the *E.coli* load and reducing the volume of the bio-waste. Sanitation policy makers can apply the findings of this study in formulation of policies on safe handling and disposal of fecal matter from onsite sanitation facilities.

Keywords: *Onsite, Bioconversion, Faecal, Coliforms, Container based Sanitation.*

159. Influence of social factors on human faecal management in Changamwe Sub-County, Mombasa County, Kenya

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

The Sustainable Development Goals (SDGs) agenda 6.2 focuses on ensuring that human faecal matter is safely managed for improved human health. Whilst efforts to improve sanitation standards such as provision of excreta management facilities, community education programs, and construction of sewerage systems have been made, excreta management still remains poor especially in areas with high population, observations done during the transect walk indicated evidence of open defecation, dilapidated toilets, and broken-down sewerage systems. The study examined the influence of social factors on human faecal management in Changamwe Sub-County, Kenya. Convergent design with a mixed methods approach was used where quantitative and qualitative data was gathered simultaneously. Structured questionnaires were used to gather quantitative data from 397 household heads selected using cluster and proportionate simple random sampling technique. The data was analysed for descriptive and inferential statistics. Qualitative data was obtained from a focus group, analyzed thematically and presented as narratives. Results showed that toilet sharing between gender and in-laws affected latrine use and that social pressure to conform with societal norms informed residents' decisions of faecal management. Existence of beliefs that considered human faeces unclean restricted proper handling of faeces on filled up toilets. Children were more likely to defecate in the open compared to adults due to age factor. Findings showed that beliefs and age were significant predictors of human faecal management practices with beta values (β=0.721,p=0.000) and (β=0.081,p=0.003) respectively. On the other hand, residents' knowledge was not a significant predictor of faecal management practices (β=-0.29,p=0.598). Findings from the focus group discussion and interview supported the quantitative findings by indicating that beliefs influenced greatly human faecal management. It is concluded that based on the study findings, the beliefs of people influenced human faecal management greatly followed by age, while knowledge did not have any influence. The study recommends that sustained social interventions should be initiated by both the government and non-governmental organisations so as to facilitate behavioral change which is believed will have substantial influence on human faecal management.

Keywords: *Human Capital, Service Quality, Human Capital Development, Higher Education, Strategic Leadership.*

160. Perception and attitudes of potential producers and consumers towards eating broiler chicken fed with Black Soldier Fly Larvae in Kenya

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

The Sustainable Development Goals agenda 2 and 6.2 focus on achievement of zero hunger and attainment of safely managed sanitation for all by 2030 respectively. However, developing countries, Kenya included, seem to be off track in addressing hunger and sanitation issues which continue keeping the population at risk of nutrition and sanitation-related diseases. Although the use of black soldier fly larvae (BSFL) is not only a sustainable and cost-effective fecal waste treatment solution but also a source of proteins and fat for conventional animal feeds, acceptability of the solution remains questionable. The study explored the perceptions and attitudes of potential producers and consumers in Kenya towards this technology for wider adoption. The study used mixed methods research design that enabled collection of quantitative and qualitative data. Producers were involved in focus group discussions (FGDs) and consumers filled structured questionnaires. Qualitative narratives were thematically analyzed to identify patterns while quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) Version 26.0. Findings showed that 85% of producers did not perceive substituted protein to poultry feed to be a problem. Significant comparisons to other animal protein by the producers suggest that the BSFL broiler chicken is fit for consumption. Results also revealed that 73% of the producers preferred food produced using BSF compared to the conventional ways of rearing citing reasons like natural and chemical-free production. Additionally, 93% of the consumers stated that it was okay to consume meat produced using the technology while 73% of them reported that the taste of meat was key in informing decisions made relating to eating meat. The study findings suggested that there is a positive attitude towards consuming chicken whose protein feed is substituted with BSFL among potential producers and consumers in Kenya. The results also showed that the use of BSFL as an animal protein source in broiler chicken production has the potential to contribute to safely managed sanitation, sustainable agriculture thus reducing the environmental impact and promoting food security. The study recommends that use of available resources can promote fecal waste management and promote a circular economy in sanitation value chain.

Keywords: *BSFL, Broiler chicken, SDPs, consumers, producers, perceptions and attitudes*

161. Influence of economic factors on faecal emptying, conveyance and disposal: a case of Meru Slums, Kenya

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Safe management of faecal waste is one of the Sustainable Development Goals (SDGs) which envisions safe sanitation for all. However, although efforts to improve sanitation conditions in slums have been made, faecal emptying, conveyance and disposal still remain a challenge endangering the health of the public. The increasing number of slum dwellers accessing on-site sanitation systems has overwhelmed on-site sanitation infrastructure compromising faecal handling mechanisms in cities and towns. The study examined the influence of economic factors on faecal emptying, conveyance and disposal in on-site sanitation facilities in Meru slums. A convergent design with a mixed methods approach was adopted. Quantitative data was collected using structured questionnaires from a sample of 228 household heads selected using cluster and proportionate simple random sampling techniques. The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20 in descriptive and inferential statistics. Qualitative data was gathered using focus group discussions and analyzed thematically. Findings showed that only 31% of slum dwellers emptied latrine pits and that manual emptying was more common (84%) than mechanical emptying because of its cost efficiency, reliability and the effectiveness in handling all nature of materials contained in pits. Increased cost constrained faecal emptying, conveyance, and disposal (r=0.499, p-value=0.000). Residents who were able to pay for faecal handling services were more likely to practice hygienic faecal emptying, conveyance, and disposal (r=0.524, p-value=0.000). Low level of income for majority of slum dwellers influenced the design of the latrines adopted. Emptying faeces from poorly designed pit latrines was more expensive due to operators' safety concerns. The study concluded that the inability to meet the costs associated with faecal emptying, conveyance and disposal services facilitated poor sanitation status in slums. There is need to sensitize the slum community on the benefits of practicing safe management of faecal waste. Besides, development of government policies to regulate pricing and increase the capacity of mechanical handling of faeces could be essential.

Keywords: *Economic factors, faecal emptying, conveyance, disposal, slums, ability to pay for emptying services, level of income, toilet designs, on-site sanitation systems*

162. Influence of resource planning in the implementation of a faecal sludge management system in Embu county

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Author to provide summarized abstract this study was guided by the positivist domain which is a major doctrine or theory in social sciences largely used in survey types of research. The study employed both cross-sectional research design and explanatory research design. The target population comprised the 74 public and private universities in Kenya. The sample size was 222 respondents. The main data collection tool was a questionnaire. Both descriptive and inferential statistics were used to analyze the data **Findings-** the study established that human capital had a significantly positive relationship with service quality. Human capital explained about 38% of the variation in service quality of accredited universities in Kenya. **Practical Implications-** The human capital such as strategic leaders in universities should be aligned and increase their adoption of strategic leadership practices in order to inspire good managerial practices in universities. Additionally, the finding that human capital affects service quality is consistent with the Upper Echelons theory. This theory offers a framework for viewing leaders as wise, experienced and educated change agents who serve as a critical asset capable of enhancing service quality in their institutions.

Keywords: *Human Capital, Service Quality, Human Capital Development, Higher Education, Strategic Leadership.*

163. WASH and SDG 3: satisfaction of SDG target 6.2 by non-resident student accommodations of Higher Learning institutions in Tigania West

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Separation of human excrement from further human contact in the environment has drawn universal attention through the SDGs which approach the provision of safely managed sanitation on SDG 6. Open defecation is the least sanitary option for waste elimination while safely managed sanitation where the waste is contained and treated/disposed is the most sanitary approach. As of 2020 the African population reached 1.3billion with 1.039b lacking basic sanitation and 208million engaged in open defecation, 27% of the people had safely managed sanitation outside institutions. In Kenya urban coverage of basic sanitation for 2015 – 2022 was 30% while safely managed sanitation was absent in the same area. Meanwhile, rural coverage of safely managed sanitation held at 25% with 2% coverage for basic sanitation. There is then a demand to visualize the status of sanitation in these vulnerable communities as the SDG window nears its end. A close ended structured questionnaire to be self-filled and proportionately distributed to all institutions of higher learning in Tigania West targeting only non-resident students was developed looking to assess the fulfillment of SDG target 6.2 by non-resident student housing. Data analysis was performed by the principal investigator through categorization and comparison against real world statistics and targets as outlined by the Joint Monitoring Program. Findings indicate provisions were mainly shared with hand wash sinks largely missing. Dissatisfaction was higher with adequacy and availability of the provisions more than access to the provisions. This preempts the unsettling reality that the goals will not be actualized and that most people will be left behind on the continent. Such as it is, the study recommends, for the actualization of targets that sanitation provision be pursued over sustained blame shifting at the vulnerable population for not engaging in practices beyond their reach

Keywords: *SDGs, WASH, Nonresident student accommodation, Open defecation, sanitary options*

164. Quantification of microbial risk associated with faecal exposure in a nomadic lifestyle; case study of Turbi ward, Marsabit county

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Background: Water, sanitation and hygiene (WASH) is the cornerstone for health and growth at all stages of life in helping to maintain health and increase in life span. Poor sanitation has led to disease causing microorganisms such as Escherichia coli to be on the rise. This study aimed to determine water and milk contamination of Escherichia coli from nomadic community. **Methods**: A cross-sectional study was conducted on water and milk samples using the most probable number method to determine contamination as a result of poor sanitation in this community. **Results:** The dominant exposure pathway in this study was via water with high Escherichia coli positivity, 20% (n=50) for dam water sampled, 20% (n=50) for pan and borehole feed water tanks. Dam water sources analyzed had presence of 1.05 x107CFU/mL and pan water sources 1.93x104 CFU/mL, which is above acceptable Escherichia coli level in water for consumption is (10-40 CFU/mL). **Conclusions**: Microbial contamination noted from this study indicates that there is poor sanitation in the nomadic lifestyle. This study reaffirms the need for an elaborate sanitation model tailored to the need of pastoralist community to reduce perennial faecal contamination of water sources for the community of Turbi ward.

Keywords: *Sanitation, Escherichia coli, Colony forming unit.*

165. Parametric analysis of sanitation technologies for fecal sludge management: a case of Eldoret Municipality, Uasin Gishu County, Kenya.

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Sustainable sanitation is majorly focused on provision of safe, equitable and accessible sanitation for all irrespective of their gender, age and socio-economic status. In African countries, Kenya included, sanitation provision is faced with inadequacy, high costs, unequal distribution and poor fecal sludge management strategies leading to environmental pollution. This study aimed at the key parametric analysis of main sanitation technologies used and outlining urban fecal sludge management using a shit flow diagram. The Excreta flow diagram generated will be used as an advocacy tool for informing key sanitation stakeholders in the town on the key parameters for sustainable fecal sludge management along the sanitation service chain. The key parameters focused on entailed the user interface, containment, conveyance, treatment and final disposal/reuse. Furthermore, the regulatory compliance monitoring, health and safety of the sanitation provision were considered in the study. The study applied a mixed approach research design whereby qualitative and quantitative techniques were incorporated. Data collection process involved key informant interviews amongst sanitation workers and questionnaire guided interviews with the residents. Results unveiled that 64% of fecal sludge generated from Eldoret municipality was safely managed with 36% properly managed. Within the town, current coverage of existing sewer network (offsite sanitation) stands at 40% while 60 % actually rely on onsite sanitation. Study results further indicated a population of about 3% still practice open defecation. Comparing with high income areas, this study noted minimal coverage within areas where low income communities occupied. Additionally, sanitation facilities were less accessible in these low income areas including Langas, Munyaka, Huruma and Mwanzo. There is dire concern on gender exclusivity of available sanitation facilities because of poor hygiene making it unsafe for use by women and children within this town. This study recommends increasing of coverage of sewer network in the town owing to higher water table in most areas around the town and its subsequent contribution to ground water contamination, and thus public health complication. In addition, this study recommends that regulatory authorities to oversee policies regarding safe fecal sludge disposal by improving access to reduce open defecation.

Keywords: *Sanitation technologies, Shit flow diagram, sanitation, fecal sludge management, sewerage, onsite sanitation, offsite sanitation*

166. Are there factors responsible for poor Occupational Safety, health, and dignity of sanitation workers? an assessment in Mukuru kwa Reuben slums, Kenya

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Of the 17 Sustainable Development Goals, SDG 6 target 2 aims at ensuring universal access to safely managed sanitation for all by 2030. To spur realization of the target, accelerated action is needed. However, this may be negatively impacted if the invaluable role of sanitation workers continues to be neglected in the sanitation service chain. Despite the importance of safety in workplaces, the occupational safety, health (OSH) and dignity of sanitation workers has remained a distant priority for most actors in the sector. Their critical role and the scarcity of empirical research regarding the state of their OSH and dignity informed the decision to conduct this study. The study sought to investigate factors responsible for poor OSH and dignity of sanitation workers in Mukuru kwa Reuben. A case study design with a qualitative approach was adopted. Purposive sampling and snowballing techniques were used to record responses from 35 participants. Participants were sanitation workers in manual emptying; officials from Directorate of Occupational Safety and Health (DOSH), workers and officials from sanitation enterprise, sanitation workers' association, and officials from Ministry of Water and Sanitation. Data were thematically analyzed in QSR NVivo 20. The study found that multiple factors, including, poor working conditions such as frequent handling of hazardous waste; weak regulatory framework and enforcement mechanisms; lack of infrastructure to support OSH; and discriminatory attitudes, and cultural beliefs and practices perpetuating stigma contributed to the deplorable state of OSH and dignity of sanitation workers in the study area. The study concludes environmental factors due to exposure to hazardous waste as the main factor responsible for poor OSH, with the least being socio-cultural factors. The study recommends the need for implementation of interventions, including policies, guidelines, and regulations to protect OSH and dignity of sanitation workers, in both study area and beyond.

Keywords: *Human Capital, Service Quality, Human Capital Development, Higher Education, Strategic Leadership.*

167. Social and Cultural Factors Influencing Menstrual Hygiene Management among Adolescent School Girls: A Case of Chuka Sub-County, Tharaka Nithi County, Kenya

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Subtheme: Water, Sanitation and Hygiene (WASH) and SDGs

Abstract

Menstrual hygiene management remains a major challenge in developing Countries and is sometimes unaddressed in public places such as schools. Although menstruation is an important part of adolescent girls' lives, if not managed in a dignified and healthy manner, it could result in adverse health effects. Understanding the link between social cultural factors and menstrual hygiene management in schools could be essential in ensuring that hygiene and sanitation conditions in schools do not pose difficult choices for menstruating girls. The study examined the influence of social cultural factors on menstrual hygiene management in schools. Data was collected using structured questionnaires from 383 adolescent school girls in Chuka Sub-County and analysed in SPSS version 26 using descriptive and inferential statistics. Findings showed that 21.6% of girls did not change menstrual materials while in school and that 19.4% of the girls used cloths as menstrual management materials. Besides, 39.7% reported failure to wash hands after changing menstrual materials and 40% cited failure to bath while in school during menstruation due to inadequate menstrual hygiene management facilities. Findings showed that girls were likely to change menstrual hygiene materials when they were provided with the materials in schools (r=0.752; p-value=0.000). Inadequate resources for purchasing menstrual hygiene management materials, the shame of being associated with menstruation, the perception of uncleanliness during menstruation and fear of being mocked by boys on staining of cloths and shared toilets constrained menstrual hygiene management in schools. Existence of interaction restrictions with boys during menstruation was a factor which qualified as a menstruation taboo and created a sense of stigma for the menstruating adolescent girls. Failure to make girls aware of menstrual hygiene prior to onset of menstruation reduced their probability of maintaining hygiene on their menarche (r=0.371, p-value=0.000). The study concluded that a holistic definition of menstrual hygiene response in schools, one that entails provision of menstrual supplies, appropriate information on menstruation, and advocacy against gender-discriminatory norms experienced in schools is needed. The study recommended popularization of education programs on pre-adolescent girls in secondary schools by the Ministry of Education to help them psychologically prepare for the natural process of menstruation. The study also recommended the need for health practitioners and policy makers to create an extensive multi-sectoral approach oriented on human rights to address stigma and the deeply embedded social and cultural menstruation-related encounters in schools.

Keywords: *Menstruation, adolescent girls, social cultural factors, menstrual hygiene management.s*

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