The Inaugural Meru University of Science and Technology

International Conference

On

INNOVATION FOR DEVELOPMENT

Meru, 28th to 30th June 2022

Conference Theme:

"Research and Innovation for Sustainable Development"

ORGANIZED BY:	Meru University of Science and Technology
IN CONJUCTION WITH:	NRF, KenGen, ICTA
KEYNOTE SPEAKER:	Ambassador Simon Nabukwesi
	Principal Secretary, State Department for University Education and Research
VENUE:	Meru University of Science and Technology, Main Campus

CONFERENCE PROCEEDINGS

Inaugural Meru University of Science and Technology International Conference (MUSTIC 2022)

Conference Proceedings.

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Machakos University (MksU)

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2.	**Dr. Stephen Mutua**	ICTs including Big Data, Artificial Intelligence & Mathematical applications
3.	**Prof. Jacob Makanga**	Mining, Sanitation, Engineering, Biological and Physical Sciences
4.	**Prof. John Mworia**	Climate Change, sustainable Blue & Green economy
5.	**Prof. Eric Muchiri**	Health interventions for sustainable development amidst global crises
6.	**Dr. Hilda Omae**	Social science Research in the Innovation Ecosystem
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8.	**Dr. Mohammed Shano**	Business, management and finance.
9.	**Dr. Guyo Huka**	Public policy and governance.

RAPPORTEURS

1.	**Dr. Eric Mworia**	Food Safety, Security & Agribusiness.
2.	**Prof. Eustace Mwenda**	ICTs including Big Data, Artificial Intelligence & Mathematical applications.
3.	**Dr. Joy Riungu**	Mining, Sanitation, Engineering, Biological and Physical Sciences
4.	**Dr. Kennedy Gachoka**	Climate Change, sustainable Blue & Green economy
5.	**Dr. MaryJoy Kaimuri**	Health interventions for sustainable development amidst global crises
6.	**Dr. Mercy Thuranira**	Social science Research in the Innovation Ecosystem
7.	**Dr. Beatrice Owiti**	Innovative pedagogies in STEM/STEAM Education amidst global crises
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EDITORIAL

Dear Reader,

Welcome to the inaugural issue of the African Journal of Science Technology and Social Sciences: a peer-reviewed, multidisciplinary journal in the field of Science, Technology and Social sciences. Launched by Meru University of science and Technology, AJSTSS provides a cross-disciplinary and international forum for researchers to disseminate innovative research and practices that preserve the integrity, life-cycle performance, and resilience of new or existing knowledge. The many challenges towards achieving improved publications must be addressed with proactive, holistic, and multidisciplinary approaches. This journal is facilitating an in-depth dialogue and synergistic collaboration between both the academia and industry.

We aspire to establish AJSTSS as the flagship journal in the various emerging fields with a focus on creating consistent contributions. All abstracts and manuscripts have gone through a rigorous yet relatively rapid peer-review process, which translates to benefits such as timeliness of publication, widespread dissemination, high visibility, and likelihood of high citations and broader impacts. We are presenting cutting-edge innovations and the latest insights and strive to maintain quality.

AJSTSS provides the most complete and reliable source of information on current developments in the field and facilitate peer-to-peer exchange and dialogue beyond the conventional discipline boundaries, leading towards proactive and systematic solutions to enhance reliability. The emphasis is on publishing high-quality articles, including original research papers, research notes, and reviews—all of which contribute to advancing the knowledge base of infrastructure preservation and resilience and bridging the gaps between different disciplines and stakeholders relevant to the development and implementation of best solutions.

In this first issue we have published abstracts from the Inaugural Meru University of Science and Technology International conference proceedings.

Welcome.

From the Editor in Chief

Prof. Eric Muchiri, Ph. D.

MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

VICE CHANCELLOR'S WELCOME NOTE

Dear Colleagues,

The Inaugural Meru University of Science and Technology Conference (MUSTIC 2022) running from the 28th to 30th June 2022 at Meru University of Science and Technology, Meru, Kenya, is focused on discussions of advances in innovation and Development. This annual event is a crucial opportunity for National, Regional and Global academics, policy makers and practitioners to gather and examine the latest developments in Science, Technology, Innovation and related research and subsequently explore how scientific advances can be quickly translated into effective development activities.

Geographically, Meru County is located along the equator and on the slopes of the famous Mount Kenya. Besides the wonderful weather and centrality, it compliments Kenya's unique position as an emerging regional hub and a living bridge for knowledge and innovation exchange. Meru University of Science and Technology is proud to be on the forefront in research, innovation, incubation and IP commercialization in this region. Considering that we are in the knowledge economy, it is refreshing to be able to host such a Conference in one of the most strategic cities of the region. We are definitely positioning ourselves as a lead in conference tourism based on the features around our university including famous national parks, conservancies, mountains, an international airport and the LAPPSET corridor.

In the coming days, we urge you to have lively and fruitful discussions and hope that you will establish lasting future collaborations amongst yourselves as stakeholders in the broad area of science, technology and innovation. We anticipate that the discussions and interactions at this forum will enable us to collectively step up our efforts to further all facets of research and innovation for sustainable development as emphasized by the theme of the conference.

Prof. Romanus Odhiambo
Vice Chancellor
Meru University of Science and Technology

KEYNOTE PRESENTATIONS

1. **Prof. Anthony J. Rodriguez**
   Jaramogi Oginga Odinga University of Science and Technology
   National spatial data infrastructure and sustainable development: A Kenyan Perspective.

2. **Dr. Irene Koomen**
   Wageningen Centre for Development Innovation Netherlands
   Enhancing partnerships for industry-led vocational training and education (e-pivot) for water smart & climate proof horticulture

3. **Prof. Geoffrey Muchiri**
   Murang'a University of Technology, Kenya
   Harnessing our ICT skill set and research efforts for sustainable development

4. **Prof. Jerono Phylis Rotich**
   North Carolina Central University, Durnham, USA
   Innovation for Development

5. **Prof. Robert Bortolussi**
   Professor Emeritus Dalhousie University, Canada
   Towards Sustainable Health Research During Uncertain Times

6. **Prof Muthoni Masinde**
   Central University of Technology, Free State (South Africa)
   Application of Design Thinking in Steering Innovation for Relevance and Societal Impact

7. **Prof. Mugendi K. M'Rithaa**
   Machakos University (MksU)
   Innovation for Sustainable Development: a designerly perspective

8. **Dr. Alison Parker**
   Cranfield Water Science Institute (UK)
   Title of Abstracts: Adrian Mallory, et al (2020) Evaluating the circular economy for sanitation: Findings from a multi-case approach, Science of The Total Environment 744
   Title of Abstracts: Mallory A, Holm R, Parker A. A Review of the Financial Value of Faecal Sludge Reuse in Low-Income Countries. Sustainability. 2020; 12(20):8334.

KEYNOTE ABSTRACT: HARNESSING OUR ICT SKILL SET AND RESEARCH EFFORTS FOR SUSTAINABLE DEVELOPMENT

PROF. GEOFFREY MUCHIRI MUKETHA, Ph.D

Murang'a University of Technology

For some time now, ICTs have become ubiquitous, making them a common place phenomenon in modern society. Almost all electronics are ICT enabled to date, with most people who can read and write having interacted with ICTs one way or the other. For example, mobile phones which have changed the way we think, socialize and do business, are ICT-enabled. According to Statista, a German Company specializing in market and consumer data, The number of mobile subscriptions in Kenya rose from 0.13 million in the year 2000 to 61.41 million in 2020. This makes sense when you consider that many Kenyans walk with two or more mobile devices wherever they go.

Countries that have had the highest infusion of ICT in their sectors have reaped the most benefits. These benefits can generally be seen alongside the developed vs developing countries divide. ICTs are seen as a powerful solution to the problems affecting developing countries. Indeed, ICTs have the potential of making developing countries to catch up and even overtake developed countries much faster than originally thought.

This paper challenges us to harness ICT skill set through: 1. enhancement of our computing curricula by thinking through how they are designed and implemented. 2. Enhancement of research efforts by addressing four key problems that characterize research in this sector so as to come up with novel and sustainable solutions to challenges that affect our developing economies.

KEYNOTE ABSTRACT: THE IMPORTANCE OF VOCATIONAL TRAINING IN HORTICULTURE

IRENE KOOMEN (Ph. D.)

Wageningen Centre for Development Innovation, Wageningen University & Research, the Netherlands.
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Horticulture is one the fastest growing sub-sectors in Kenya and contributes significantly to the agriculture sector, mainly through export but increasingly supplying the domestic market. The Enhancing Partnerships for Industry-led Vocational Training and education for water smart & climate proof horticulture (ePivot) project aims to improve professional education and vocational training at of Polytechnics and Technical and Vocational Colleges (TVCs) in the horticulture value chains through strong collaboration with the private sector.

The horticulture sector is expected to contribute towards the envisioned poverty reduction, and overall food security, as such contributing to SDG 2 while the need for water and climate smart technologies is high. The sector is generally a labour-intensive industry with high demand of skilled workers, trained supervisors and professional managers. Over six million Kenyans are directly and indirectly employed in horticulture, women constitute 75% of the labour force in the horticulture industry. The increase in horticulture is fuelled by rapid population growth and urbanization, an increasing middle class that is health conscious and consumes more fruits and vegetables but demands the produce to be of good quality and safe to consume. Horticulture offers opportunities for economic growth and employment both in production but increasingly so in value addition. This calls for a specified and educated pool of labour is high.

The current TVCs and associated education institutions have a very general focus and there is lack of specialized workforce in horticulture. The ePivot project aims to close those gaps, strengthening the capacity of the TVCs through a strong collaboration between the education institutes and the private sector, strengthening linkages among the various actors to enable practical learning and innovation in the horticulture sector and making it water and climate smart. The consortium consisting out of 6 TVCs working together with Meru University of Science and Technology and supported by industry partners as well as 4 universities in the Netherlands, focuses on making the horticulture curriculum more competence based. Initial results are encouraging, both tutors and students are appreciating the practical approach to skills development.

KEYNOTE ABSTRACT: MICRORESEARCH - TOWARDS SUSTAINABLE HEALTH RESEARCH DURING UNCERTAIN TIMES

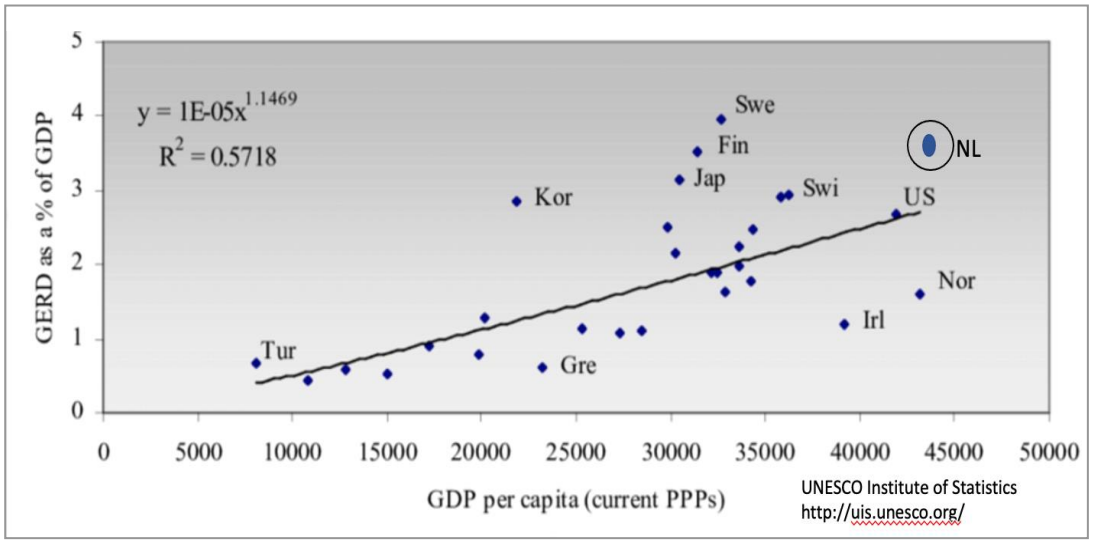
ROBERT BORTOLUSSI*

**Robert Bortolussi[1], Jerome Kabakyenga[2], Noni E. MacDonald[1]*

*[1]Dalhousie University, Canada, [2]Mbarara University of Science and Technology, Uganda *Keynote Speaker*

Objectives: (a) to show that investment in research is an extremely wise move for any country, (b) to illustrate how research influences health decisions, and (c) to illustrate pathways in the "decolonization" of research in low- and middle-income countries (LMIC).

As shown by data compiled by UNESCO (Figure), the Gross Expenditure on Research and Development (GERD) as percent of national GDP greatly enriches its citizens (it's an investment). For example, the Netherlands (NL), a country with few natural resources, invests heavily in research and has achieved a high level of prosperity for its citizens. Economists concluded that research is an essential investment for a country's prosperity!



The decision-making process by any government is a complex process influenced by budgetary, political, legislated, and other considerations. The importance of "embeddedness" in this process was identified by Koon et-al. who showed that ministerial decisions on health are primarily influenced by people who have a reputation for research and work within the local system. This phenomenon is seen in both rich and poor countries; people who know and understand the culture and context of a country are key influencers on the decision process.

The challenges of LMIC to develop capacity in research was the topic of a UNESCO conference in Bamako Mali in 2008. Ministers-of-health from LMICs realized that research is critical in any decision process to ensure "evidence-informed" policy decisions. Their "Call to Action" recognized an essential need to build community-based research capacity to ensure health agendas would be decided by national needs informed by their own researchers.

The pathway to decolonization began anew in 1976 with the introduction of Microfinance offering startup funding, capacity-development, and coaching for local people with entrepreneurial ambition. Like Microfinance, MicroResearch (MR) is an innovative, capacity building, community-focused program, empowering local health researchers to improve health in their communities. Conceived in 2008 MR puts local research teams firmly in the driver's seat from question selection, proposal development to knowledge translation. As of 2022:

- 19 partner institutions in 8 countries
- Over 40 two-week training workshops
- 1,250 health workers and professionals trained
- Including >300 doctors, >200 nurses and 600 other professions
- 126 MR teams have launched research projects (over 50 completed)
- Over 50 PubMed publications and/or policy changes
- Thousands of lives saved as a result of MR research-initiated changes
- MR training programs have been incorporated into local institutes

MR has shown that high-quality research can be achieved locally when supported by training, coaching and access to small grants. MR decolonizes and democratizes research in LMIC.

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KEYNOTE ABSTRACT: INNOVATION FOR SUSTAINABLE DEVELOPMENT – A DESIGNERLY PERSPECTIVE

MUGENDI K. M'RITHAA
Machakos University (MksU)

There is growing consensus that the 21st Century is the African Century, However, this noble vision cannot happen by default - it must catalysed by Design Thinking - by a deliberate and strategic drive to achieve sustainable development for the continent's denizens. This presentation showcases a number of innovative solutions emerging from the creative minds of Africans with solutions for Afrika*. The exemplars discussed herein advocate an ethical and socially conscious ethos that embraces transdisciplinary as a means of co-creation and co-production. Further, the presentation makes a strong case for disciplinary imagineering beyond the traditional STEM approach, to one of STEAM - a more inclusive and empathic design approach that takes cognisance of the design, the arts and humanities. For Afrika to achieve its lofty ambitions and play an active role in the 4th and 5th Industrial Revolutions, we must adopt a more holistic Quadruple Helix model of partnership (that includes Academia; Business/Industry; Community/Civil Society; and Government). In conclusion, this presentation exhorts innovators and inventors in academic institutions to contribute to Afrika's sustainable development through projects that make a marked social impact in the real world...

Keywords: *Design Thinking; Empathy; Innovation; Socially Conscious Design; STEAM; Sustainable Development; Transdisciplinarity; Universal/Inclusive Design*

KEYNOTE ABSTRACT: APPLICATION OF DESIGN THINKING IN STEERING INNOVATION FOR RELEVANCE AND SOCIETAL IMPACT

MUTHONI MASINDE
Central University of Technology, Free State (South Africa)

Given the definition of an innovation as an implementation of a new or significantly improved product (good or service) (Gault, 2018), it is thesis of this paper that many innovations fail to create social impacts due to lack of involvement of targeted beneficiaries. Using an innovation called ITIKI (Masinde, 2014), we demonstrate that since design thinking (DT) emphasizes on empathy, invention, and iteration, its adoption in creating social innovations helps in reversing this trend (Masinde, 2020). One way of applying DT in designing winning products/services is by pursuing four questions focusing on the *what-is*, *what-if*, *what-wows* and *what-works* (Liedtka and Ogilvie, 2011).

At the core of ITIKI is indigenous knowledge, which is defined as accumulation of knowledge passing from generation to generation, and guides communities in almost every aspect of their interactions with their environment (Mafongoya, 2017). IK has been at the heart of the coping mechanisms employed by Africa's small-scale farmers to adapt to climatic variabilities.Though known to be very accurate in predicting, especially the short-term weather patterns, IK is highly endangered and many of its aspects are currently at the verge of extinction. Therefore, innovative ways of conserving and enhancing IK for the benefit of the small-scale farmers are required. ITIKI is one such solution - ITIKI stands for Information Technology and Indigenous Knowledge with Intelligence (https://itiki.co.za/).

ITIKI is an integrated decision support system that combines scientific weather data with IK to predict droughts. It takes the form of an early warning system with three components for: (1) drought knowledge capturing, (2) prediction and monitoring, (3) communication and dissemination of the forecasts. ITIKI is implemented using artificial intelligent algorithms, weather sensors and a mobile application. The disseminated forecasts enable the small-scale farmers make better and informed decisions, such as on when, what, how, and where to plant. The forecasts are sent via the ITIKI mobile application or SMS message. The forecasts are also accessible through a web portal, emails and audio files.

The main characteristic of ITIKI that informed the adoption of DT is the use of IK whose ownership, appreciation, understanding and application is solely in the hands of the local indigenous people. This makes it a purely human-cantered problem and for which three DT tools were applied in understanding and modelling IK: (1) brainstorming, (2) storytelling and (3) Prototyping. Besides, the problem that ITIKI addresses fits in the domain of problems favoured by DT because it deals with the hardly understood drought prediction domain and the level of uncertainty in drought prediction is very high. The end result of the above is high rate of adoption of ITIKI in Kenya, Mozambique and South Africa by more than 12,000 individual farmers and up to 11% increase in crop yields. This

success is associated with the ability of to derive the unique needs of the target users (Africa's small-scale farmers) through the systematic steps supported by design thinking.

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THE INAUGURAL MERU UNVERSITY OF SCIENCE AND TECHNOLOGY

CONFERENCE ON INNOVATION FOR DEVELOPMENT

Meru, Kenya
28th to 30th June 2022

Conference Theme: "Research and Innovation for Sustainable Development"

VENUE: MAIN CAMPUS, NCHIRU

Conference Sub-themes

1. ICTs including Big Data, Artificial Intelligence & Mathematical applications (IBDAM)
2. Food Safety, Security & Agribusiness (FSSA)
3. Business, management and finance. (BMF)
4. Social Science Research in the Innovation Ecosystem (SRIE)
5. Public policy and governance. (PPG)
6. Climate Change, sustainable Blue & Green economy (CCBG)
7. Mining, Sanitation, Engineering, Biological and Physical Sciences (MSEBP)
8. Health interventions for sustainable development amidst global crises (HSDG)
9. Innovative pedagogies in STEM/STEAM Education amidst global crises (ISSG)

SUBTHEME 1: Food Safety, Security and Agribusiness

1. Impact of fermented milk on the glycemic response of maize, millet and sorghum stiff porridges

Amwoma, Lorraine Moindi[1]; Ebere, Rebecca[1] and Arimi, Joshua[1]

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Objective: 1.To determine the proximate composition of millet, maize and sorghum stiff porridges 2. To examine the impact of fermented milk (*mala*) on the glycemic response of maize, millet and sorghum *ugali.* Problem Statement: The prevalence of diabetes mellitus has been increasing over the years. Glycemic control is important in the management and control T2DM. Whole flour stiff porridge is advised for diabetic patients despite their medium to high glycemic response. Dairy products have an inverse relationship with the development of T2DM, but whether it lowers the glycemic response of stiff porridge is yet to be established. Methodology: Proximate analyses were determined using AOAC methods. Moisture, fat, protein, ash, dietary fiber content by oven drying method, soxhlet method, Kjedhal method, dry ashing method, Hennenberg and Stohmann method respectively and carbohydrate by difference 100- (fat+protein+ash+dietary fiber+moisture content). Energy content was calculated using the Atwater formula. Glycemic index was determined using standard procedures. Results and Discussion: Whole maize, millet, sorghum had the highest fat, fiber and protein respectively. Maize, millet and sorghum had a medium, low and high glycemic index respectively. Maize, millet and sorghum stiff porridge alongside mala had high, high and medium glycemic index respectively.Application & Recommendation: In the diet planning of T2DM individuals, stiff porridge alongside *mala* should not be advised. Conclusion: Stiff porridge from maize, millet, sorghum is a source of fat, fiber and protein respectively. Mala increases the glycemic response of maize and millet stiff porridge.

Keywords: *Diabetes mellitus, glycemic index, glycemic response, stiff porridge, mala, whole flours.*

2. Green gold: refining crude Miraa (Catha edulis) into a real green gold

Arimi, Joshua M. [1]

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Miraa (Catha edulis) is a very lucrative psychoactive crop for the farmers in lower parts of Meru county and Embu county. However, its handling is unhygienic and it's a perishable crop. Withering and drying leads to conversion of the stimulating compound; cathinone to a less stimulating compound; cathine. Therefore, it has to be transported to the market within the shortest time possible. This has led to culture of high speed driving of miraa delivery pick-ups and lorries. This is both unsafe to the miraa transporters as well as other road users leading to high records of fatal road accidents. Once in the market, the twigs are chewed raw without any value addition. This form of presentation and chewing makes it look unaesthetic, archaic and primitive. The objective of this study was to determine microbial load and evaluate the possibility of extending the shelf-life and development of various processed products from miraa while retaining the active ingredients. The miraa twigs for all the studies were purchased from the local vendors in Meru. Microbial load of miraa from different miraa vending points around Meru town, these are; Nchiru, Kianjai, Ruiri, Makutano and Meru town was studied. Shelf-life of miraa was studied by storing miraa at ambient temperature, refrigerated conditions (4-8 °C) and humidity chamber. Weight loss and total phenolic compounds were monitored. Miraa was processed into unflavoured and flavoured infusion bags. Miraa sourced from Meru town exhibited the highest microbial load compared to the other vending points. This is associated to environmental contaminants and high number of handlers. Miraa stored at ambient temperature exhibited the highest weight loss and reduction in total phenolic compounds while that stored in humidity chamber showed the lowest weight loss and highest retention of phenolic compounds after 72 hours. Consumer tests preferred miraa infusion bags as hygienic with moderate stimulation effects. The results showed that it's possible to store miraa for up to 72 hours and to prepare miraa infusion bag with stimulatory effects.

Keywords: *Miraa, Catha edulis, infusion bags, Cathinone, cathine*

3. Development of a complete meal from underutilized indigenous and exotic foods

Arimi, Joshua M[1]; Musembi, Amos[1]; Muia, A[1]; Kibowott, C[1]; Kiptoo, K.[1] and Awino, Annette[1]

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Subtheme: Food Safety, Security & Agribusiness

Abstract

A complete meal is a food served and eaten in one sitting whose nutrient variety has been optimized. Green bananas are a good source of resistant starch and dietary fibre while Irish potatoes are rich in starch and dietary fibre. Moringa leaves are rich in protein, minerals and vitamins while being low calorific value. Fig gourd leaves are mainly rich in vitamins. However, many people prefer ripe bananas as snacks/fruit to cooked green ones. Moringa leaves are mainly used for medicinal purposes hence rarely used as a food item. Exotic vegetables are mostly preferred in food processing to indigenous ones hence making the indigenous vegetables underutilized. Development of a complete meal using these neglected food items would improve their utilization. The bananas, fig gourd leaves and Moringa leaves were oven dried at 60 □C and ground into powder using a blender. A composite powder was prepared that could be reconstituted at the time of need. The flours were blended into a paste and a pellet as the final product in a ratio of Moringa: potato flour: fig gourd leaves (1:10:1). The paste and pellets were subjected to proximate analysis and sensory evaluation. The proximate composition of the paste was 3.22±0.5, 12.83±0.8 2.86±0.2, 11.32±0.6% for protein, fat, fibre and ash. The product was formulated to provide the RDA for an average adult of 62kg. The overall acceptability of the product by sensory panelist was liked moderately by 70% of the panelists making it viable food product.

Keywords: *Complete meal, Fig gourd leaves, Underutilized foods, Indigenous foods*

4. Effects of camel feed supplementation on milk yields and composition during early pregnancy period

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Subtheme: Food Safety, Security & Agribusiness

Abstract

A study was conducted between January and March 2022 which was the camel mating season at Ngaremara ward of Isiolo County. The objective was to determine the effect of feed supplementation on milk yield and composition in early pregnancy. It is documented that camels in pastoral environment drop milk production immediately after conception. There is limited information in literature on effects of supplementation on milk production at this stage. A complete randomized design was used to select ten camels which were supplemented with a formulated concentrate supplement made of locally available materials and ten un-supplemented which was the control. All camels were dewormed at the beginning of the study. Formulated feeds were gradually introduced to ten camels by adding 1 kg daily and enticing them with green acacia pods for 2 weeks until all supplemented were able to feed 3.5 kgs in the evening after grazing. Mating took place naturally using a bull between 6th January and 15th February 2022 and one supplemented and two un-supplemented camels were not mated. Milking was done in the mornings after allowing the calves to stimulate the teats for the milk letdown reflex. Production of milk in litres was recorded daily and total production per camel tabulated on weekly basis. Milk samples were taken every week and analyzed for protein and fat levels. Statistical data analysis for milk yields was done by comparing weekly means using ANOVA with the help of SPSS. Mean weekly milk yields per camel in litres for the supplemented and un-supplemented was 8.6067 ± 0.23691 and 8.0797±0.26185 respectively. There was a consistent increase in milk production for the supplemented camels with a significant increase of 1.63 litres at week 3 ($P<0.05$). The un-supplemented camels had a consistent drop of milk production which was more significant ($P<0.05$) at week 5 and 7. Supplemented camels milk had percentage increase in fat content of 3.470 ±0.0300 compared to 3.157±0.0228 for the un-supplemented. The supplemented camels were mated earlier than the un-supplemented. Six supplemented and five un-supplemented were confirmed pregnant through the indigenous knowledge method of cocking the tail (kutoa mkia) when the male or a person approaches. The study concludes that feed supplementation can positively affect the lactation curve and fertility in camels. It is recommended that camels be supplemented with feed formulations made from locally available materials at around the time of mating to improve production and reproduction. Further studies are recommended to determine the effect of pregnancy on milk yields and composition.

Key words: *Supplementation; Lactation Curve; Yields; Milk Composition; Early Pregnancy; Tail Cocking*

5. Evaluation of the effect of different types of stabilizers and salt on improving the physico-chemical properties of camel milk yoghurt

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Camel milk is recognised for its nutritional and medicinal properties. Camels are very resilient can also withstand harsh and hot climatic conditions and produce milk over a long period of time when other livestock succumb. Converting camel milk into yoghurt can increase milk shelf-life ensuring its available during drought enhancing food security. However, processing of camel milk yoghurt is challenging due to weak coagulum which has unacceptably low viscosity. The objective of this study was to evaluate the effect of different stabilisers and salt on viscosity, titratable acidity, pH, water holding capacity and syneresis of camel milk yoghurt. Camel milk was obtained from Anolei women group, Isiolo County and transported to Food Science Laboratories in Meru University of Science and Technology. The milk was assessed for quality through platform tests. Effect of two stabilisers (starch and modified starch) and a salt on yoghurt properties were evaluated. The stabilisers were added in the range of 2- 3% while salt concentration was 0.075%. The fermentation was carried out under controlled conditions in a cheese vat. After fermentation, yoghurt was analysed for the viscosity, water holding capacity, susceptibility to syneresis, tritratable acidity and change in pH over six hours during fermentation and after 7, 14 and 21 days during storage under refrigeration. The pH of yoghurt with modified starch decreased with fermentation period (1-6 hrs) from 5.8 ± 0.2 to 4.3 ± 0.2, while for yoghurt containing starch decreased from 5.8 – 4.0. The water holding capacity increased with increasing stabiliser concentration from 2-3%. The susceptibility to syneresis decreased with increasing stabiliser concentration but increased over the storage period. The viscosity increased with increasing the stabilisers concentration from 2 - 3% during fermentation. At a concentration of 3% modified starch and 0.075% salt resulted in highest viscosity (0.173±0.01 Pa.s) which is similar to that of commercial yoghurt. This study shows that it is possible to manufacture camel milk yoghurt by adding modified starch and salt to achieve similar physico-chemical properties to available commercial yoghurts.

Keywords: *Camel milk, Climate change, Camel milk yoghurt, Stabilisers, Viscosity.*

6. Determination of physicochemical properties of model beverages and baked products incorporated with avocado seed powder

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Consumption of Avocado (*Persea americana* mill) has increased worldwide in the recent years. The pulp is used but the peel and seed are discarded as waste. Studies have shown that the seeds are rich in phytochemicals that can be utilized in food systems. The objective of this study was to evaluate the potential of Hass avocado seed as a source of polyphenols in the processing of model beverages and baked products with functional properties. The proximate analysis of the avocado seed powder was carried out. The shelf life of phenols in avocado seed powder (ASP) stored in darkness, amber and transparent bottles was studied for six months. The seed extract was incorporated into model beverages of different pHs and the shelflife was monitored for 140 days. The seed powder was incorporated into baked products followed by total phenols and sensory properties analysis. Proximate composition of the seed powder for moisture, ash, protein, fiber, fat and total carbohydrates were 14.19, 1.82, 7.05, 4.00, 13.64, and 59.30 percent, respectively. During storage of the seed powder, there was no significant difference ($P>0.05$) in the phenol content under the different storage light conditions for six months. In the model beverages, the rate of phenol degradation was higher in lower pH levels (2.8, 3.8, and 4.8), and those stored at ambient temperatures lost more phenols than those refrigerated in 140 days. The concentration of phenols in the baked products reduced due to the loss of thermolabile phenolics during the baking process. The sensory evaluation of the cakes in terms of color for all the formulations was liked very much. The aroma of 0% and 15% ASP was liked very much, while the other formulations were liked moderately. The overall acceptability decreased with the increase in avocado seed powder in the queen cakes. Avocado seed can be utilized to produce acceptable queen cakes and extracts incorporated into beverages to make them functional with health-promoting properties.

Keywords: *Avocado seed powder; phenols; beverages; queen cakes; stability*

7. Growth, yield and quality of selected sweet potato (*Ipomoea batatas [L.] lam.*), lines under varying soil moisture conditions

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Sweet Potato (Ipomoea batatas [L.] has increasing potential as a food security crop in Kenya. However, its production is relatively low compared to its potential production attributed to drought conditions alongside use of local landrace cultivars that are quite low yielding. A study was conducted at Meru University in 2020-2021 to assess the performance of selected improved sweet potato lines under varied watering regimes. Two selected sweet potato varieties were used; Naspot 13 and Margarette and a farmer-preferred variety, kemb-10. The varieties were subjected to three different watering regimes (i) Continuous water deficit 30 DAE (ii) Continuous water deficit 60 DAE and (iii) well-watered to maturity. A randomized complete block design in a split plot, with water treatment as the main plot and varieties as subplot with 3 replicates was used. There was no significant interaction between varieties and water regimes. Watering regimes significantly ($p \leq 0.05$) affected vegetative growth and yield. Plants under continuous water deficit from 30 DAE had significantly lower vine length, number of branches and leaves. Under continuous water deficit from 60DAE, plants experienced significant reduction in vine length, number of leaves and branches compared to control plants. However, this reduction was less compared to 30DAE. Margerete had significantly lower vine length, number of branches and leaves (41.01% 11.2% and 44.3%) respectively. Kemb 10 had a significantly higher tuber diameter and tuber length, 101% and 91.05% respectively. The vegetative growth and yield of Naspot 3 was comparable to Kemb 10. Naspot had 89.4% increases in number of tubers. It's concluded that varieties tested responded similarly to water deficit, with larger vegetative and yield reductions at 30DAE. Based on findings, planting earlier is recommendable for crop establishment to escape water stress whereas Naspot 13 is more suitable for the area considering its higher growth and yield.

Keywords: *Vine length, Number of leaves; Number of branches; Tuber length; Tuber diameter; Number of tubers.*

8. Influence of *Rhizobium* inoculation and phosphate rock fertilizer application on growth and yield components of green gram in Tharaka-Nithi county, Kenya

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Green gram is an important drought tolerant grain legume crop in Kenya. In Tharaka Nithi County green gram is as a major source of food security. Hence, there is need for a cheap and sustainable system of agricultural production is needed to increase its production. The legume/*Rhizobium* symbiosis in combination with phosphate rock offers a natural system for improving green gram nitrogen fixation. Therefore, this study was aimed at determining the effect of *Rhizobium* and phosphate rock fertilizer application on growth and yield attributes of N26 and KS20 varieties. The study was carried out at Chuka University Horticultural Research Farm for two seasons, November 2019 to January 2020 and February to April 2020. Factorial experiment of 2x2x2 was laid out in a Randomized Complete Block Design (RCBD). There were three factors, variety (N26 and KS20), phosphate rock (0 and 30 kg P ha^{-1}) and *Rhizobium MEA* 716 (0 and 100 g ha^{-1}). The experiment contained eight treatments which were replicated three times. The data was collected fortnightly on four randomly selected plants on parameters such as plant height, number of leaves, branches, pods, total dry biomass, shoot and root dry weight and grain yield. These data were analyzed using Statistical Analysis Software (SAS). Significant means are separated using Least Significant Difference (LSD) at probability level of 5%. Results for both seasons indicated that combined application of *Rhizobium MEA* 716 *Rhizobium* 100 g ha^{-1} and phosphate rock 30 Kg ha^{-1} phosphate under variety in treatment (R1P1KS20) showed significantly ($P<0.05$) higher plant height (76.07 cm), number of branches (14.08 $plant^{-1}$), shoot dry biomass (52.01 g $plant^{-1}$), root dry biomass (7.60 g $plant^{-1}$), total dry biomass (146.4 g $plant^{-1}$), number of pods (84 $plant^{-1}$) and yield (2158 kg ha^{-1}) compared to variety N26 in treatment (R1P1N26). Therefore, combination of *Rhizobium* MEA 716 100 g ha^{-1} and phosphate rock 30 Kg ha^{-1} under variety KS20 led to improved growth attributes equally yield components of KS20 variety over N26. From these findings, application of *Rhizobium* MEA716 at 100 g $ha^{-1,}$ and 30 Kg ha^{-1} phosphate rock under variety KS20 was recommended for improved and a sustainable green gram production in the study area.

Keywords: *Low green-gram production; Rhizobium inoculation; phosphate rock application; green gram yield improvement.*

9. Microbiological quality of *kachumbari,* a raw vegetable salad popularly served alongside roast meat in Kenya

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Raw salads are regularly implicated in foodborne disease outbreaks globally. Consumption of *kachumbari*, a raw vegetable salad alongside roast meat is widespread in Kenya. This study aimed to evaluate the bacteriological quality of *kachumbari* samples (n=39) collected from a cross-section of roasted meat eateries in Kenya. United Kingdom's Health Protection Agency guidelines were used to infer the safety of the salads due to the lack of local criteria for microbiological safety of ready-to-eat fresh produce placed in the market. Based on *Escherichia coli* counts, 14 (35.9%) of the samples were of satisfactory microbial quality (<20 CFU/g), 7 (17.9%) in the borderline (20 - $\leq 10^2$ CFU/g) and 18 (46.2%) unsatisfactory (>10^2 CFU/g). All samples examined for *Staphylococci* had counts falling within the borderline range (20-$\leq 10^4$ CFU/g). Collectively, 3 (7.7%) of the sampled salads were classified as potentially harmful to health and/or unfit for human consumption due to the presumptive presence of *Campylobacter* spp. 2 (5.1%) and *E.coli* O157 1 (2.6%). *Salmonella* was not detected in any of the samples. The presence of hygiene indicator microorganisms and pathogens demonstrates that *kachumbari* salads present a public health risk.

Keywords: *Kachumbari, hygiene indicators, foodborne pathogens, raw vegetable salad*

10. Effect of storage temperature on quality parameters of liquid organic fertilizer prepared from Mexican sunflower (*Tithonia diversifolia*)

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Objectives: To determine the effect of storage temperature on physical-chemical properties of tithonia liquid organic fertilizer. To determine the effect of storage temperature on microbial population in tithonia liquid organic fertilizer. To evaluate the effect of tithonia liquid organic fertilizer on kales crop. **Problem Statement:** *Tithonia diversifolia* has been used as green manure in soil fertilization and improvement of crop performance. Attempts have been made to extracts tithonia liquid organic fertilizer (LOF) to ease storage and transport. However, not much was known about quality parameters of liquid organic fertilizer (LOF) during storage. This study established the effect of storage temperature on the quality parameters of LOF from *Tithonia diversifolia.* **Methodology:** Tithonia LOF was prepared by fermenting 2 kg of tithonia leaves in 20litres of water for 2 weeks to maintain leaf water ratio of 1:10. The fermented extract was filtered using a clean cloth and transferred into 36 one litre specimen jars. Eighteen of the specimen jars were placed in the refrigerator at temperature of 0^0 C to 5^0 C while another batch of 18 in the specimen cabinet at room temperature at 23^0C. Specific laboratory analysis procedures were used to determine the nutritional chemical content of the sampled LOF. Total nitrogen(N) was analyzed by ISO 5315-trimetric method, phosphorus (P) by ultraviolet visible spectrophotometer at λ-420nm, and potassium (K) by AAS ISO17319:2015. Other chemical analysis done were Magnesium (Mg) using method EN 16197:2012 AAS, Calcium by ISO method 17025 AAS and total reducing sugars by normal- phase chromatography HPLC method. The pH of the LOF was analyzed by handheld pH meter. Microbial analysis used plate count agar for bacterial and potato dextrose agar (PDA) for fungus count. Kale plants were arranged in a randomized block design of 9 plots each with 9 potted plants. The treatment was replicated three times for samples stored in the refrigerator and three times for the room temperature storage repeatedly for six months. Plant parameters measured were; plant height, number of leaves and the plant girth. **Key findings:** The study established that there was a significant change in LOF pH during storage, however correlation was higher for room storage than fridge storage. The study also established that there was no significant change in chemical properties of LOF in both storage conditions however, the room stored LOF had negative correlation with storage time an indicating that plant nutrients in LOF reduced with increase in storage time. In regards to microbial properties, it was found that there was no significant change in microbial count in LOF in both storage temperature

experiments. The study also established that treatment of kales with LOF stored at room temperature had higher growth variance than for the fridge stored and control treatment. **Discussion** There was a significant change in LOF pH during storage where p=0.012. Correlation was higher for room storage than fridge storage. Freshly prepared LOF was slightly acidic at pH 6.5 attaining pH 7.88 and 7.1 at room and fridge temperatures respectively. Change in chemical properties of LOF in both storage conditions was not significant whereas, the room stored LOF had negative correlation with storage time indicating how plant nutrients in LOF reduced with increase in storage time. The microbial count in LOF in both storage temperature experiments had no significant change. The relationship between microbial count and storage period was weak. **Application:** This study is useful to organic agriculture farmers, researchers and policy makers. **Conclusion:** The study established that the quality of LOF during storage deteriorated. LOF stored in room temperature reduced in quality faster than the refrigerated one. Therefore, the quality of the LOF is best when freshly prepared. Despite kales performing marginally better when treated with room stored LOF, there was no significant difference with fridge stored LOF. Investment in cold storage of LOF therefore does not make economic sense. **Recommendation:** The study recommends further research on effect of LOF concentration on crop growth to ensure optimum nutrients for production.

Keywords: *Liquid Organic Fertilizer (LOF), Tithonia diversifolia, Quality parameters, Storage temperature, physical-chemical properties, microbial population*

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

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Subtheme: Food Safety, Security & Agribusiness

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*

12. Effects of supplementation with climate-smart feeds on camel weight gain during drought

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Camels are very resilient and can survive up to 14 days without water. They can also keep producing milk when other livestock succumb during drought. This makes camel the suitable animal to harness for climate change. Currently, there are no formulated camel feeds for feeding camels during the drought when the shrubs and vegetation dries up. This has led to conflicts between camel herders and crop farmers. In the recent past as recent as this year, 2022, it has resulted to loss of human lives and camels in an alarming rate. It is estimated that during drought there is loss of at least 100 lives pa as a result of this conflict. The loss of camels due to drought is hundreds of thousands. This study aimed at formulating and processing camel feeds with locally available ingredients which can be stored to be used during drought. The study was carried out at Garemara, Isiolo. The feeds were formulated with locally available materials including acacia pods and local grass. The feeds were analysed for the crude protein content and nutrient content. The camels were supplemented at a rate of 1.5 % of the body weight. Ten camels were purchased for the study. Five camels were supplemented while the other five camel were un supplemented. The camels were weighed fortnightly to monitor weight changes. The formulated camel feed has a crude protein of 17%. The camels supplemented with climate-smart feed increased the weight at a rate of 15% while those unsupplemented increased the weight at 10%. Climate smart feeds can be formulated and used to supplement camel feeds during drought and avert loss of camels and human conflicts.

Keywords: *Camels, Camel feeds, climate smart camel feeds, Acacia pods*

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

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Subtheme: Food Safety, Security & Agribusiness

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.*

14. Use of sensor based drip irrigation in improving irrigation water efficiency for vegetable crops Tharaka Nithi county

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Drip irrigation is a water saving technology recommendable for ASAL regions of Kenya that are water deficit. However, it is largely manually operated in Kenya, leading to variable irrigation water use efficiency (IWUE). This necessitates automating the irrigation. Sensor based irrigation has been developed at Meru University of Science and Technology. In this study, the system was configured for use in ASALs areas of Kenya. The system has an electronic gadget designed to automate irrigation. It is fitted with soil moisture sensors and motorized water valves. The sensors are installed near the crop root zone. When soil moisture drops below a predetermined threshold, the pump and the valves are triggered to switch ON automatically and start supplying water to the crops. When adequate water has been supplied, the sensors detect trigger the pumps and motorized valves to switch OFF hence cutting the water supply to the crops. The system was validated at Mukothima in Tharaka Nithi, an ASAL region in Kenya between April and August 2021 using water melon (Sukari F1) and onion (Red creole) as test crops. A randomized complete block design with three replications was used with three irrigation systems; sensor based drip, manually drip and furrow irrigation. Data was collected on vegetative growth and yield, soil moisture and irrigation water used. Farmers were invited to evaluate the crops during the vegetative stage. There were no significant differences in vegetative growth and fruit yield of water melon and bulb yield of onions between the irrigation systems. Soil moisture tended to be high in furrow irrigation. Irrigation water used was significantly higher in furrow irrigation and lowest in the sensor based drip irrigation. This led to a significantly higher IWUE in sensor based drip irrigation. Farmers evaluation did not detect significant differences in the crops between the irrigation systems. It is concluded that use of sensor based drip irrigation is able to enhance efficiency of irrigation water use while at the same time giving productivity of crops similar to the common methods of irrigation used in ASALs.

Keywords:

15. IoT based smart irrigation system for communal use

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Kenya is experiencing a rapid human population growth and consequently rising demand for food. This is happening at the backdrop of adverse climatic changes currently being experienced. The problem is further aggravated by the fact that more than 80% of the country's landmass is classified as Arid and Semi-Arid Lands (ASALs). In order to meet the food demand, there is need to divorce from rain-fed agriculture and put most of the arable land under irrigation. Since Kenya is a water scarce country, efficient irrigation systems are required. An efficient irrigation system that promotes use of rain water harvesting technologies and maximizes crop water productivity through use of appropriate sensors and wireless communication technology has been developed. The innovation involves use of farmers' earth pans for harvesting and storing rain water and irrigating fields through drip lines. In addition, smart soil moisture sensors are fitted to each field under irrigation for real-time monitoring of soil moisture content and automatically notifying an irrigation administrator through mobile phone when crops require watering. The administrator is equipped with a tricycle fitted with solar powered water pumping system for pumping water from the earth pan to the crops. When the operator receives a signal request from water sensors in field he/she moves with the tri-cycle and services it. The smart sensors (IoT based) installed in the field will then notify him/her when sufficient amount of water has been received so that irrigation can be stopped. The operator waits for the next request from another farmer's field to service. The technology has been tested in different portions of the university land under irrigation. The results indicate that crops receive timely watering and show no water stress. The innovation has the potential of making high tech irrigation system accessible to small scale farmers at an affordable cost and enhance food production and in turn food security in the country.

Keywords: *IoT, smart Irrigation system, Soil Moisture Sensors, Lora, Mobile Phone Application*

16. Effect of plastic mulch colour and transplanting stage on baby corn plant performance

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Subtheme: Food Safety, Security & Agribusiness

Abstract

In Kenya most of the baby corn crops are produced on un-mulched soil. The country experiences rainfall scarcity and extreme weather conditions which affect the productivity as well as the farmers' income. Mulching and transplanting can be employed as a way mitigating against the two. Plastic mulch colour determines the characteristic optical properties that influence the levels of light radiation reaching the soil, causing increase or decreases in soil temperature thus affecting the performance of plants differently. Similarly, the colour has a direct effect on the amount and type of rays reflected back onto the plant leaves which influences photosynthesis. The experiment was conducted using two varieties Pan-14 and Thai-gold, four different plastic mulch colours and four different transplanting stages in Meru County in Kenya. This was conducted in two seasons of January to April and June to October 2018. After the scientific data analysis, it has proved that varietal differences influence various plant performances in baby corn. Also the plastic mulch film colour had an effect on plant growth and yield. Similarly, the interaction between the plastic mulch colour and baby corn variety influenced the plants performance. However, transplanting stage had no effect on plant performance.

Keywords: *baby corn; mulching; plastic mulch*

17. Farmers' Knowledge, Attitude and Perception towards Uptake and Utilization of Treated Human Excreta as Organic Fertilizer in Imenti South, Meru County

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Subtheme: Food Safety, Security & Agribusiness

Abstract

Universal access to safe and adequate sanitation for everyone remains a global challenge as over 35% of the total global populations have no access to adequate sanitation. This call for action and a paradigm shift from the sanitation conventional approach systems to onsite sanitation approach to ensure complete sanitation value chain and safeguard circular nutrient economy. This study explores small scale farmers' knowledge, attitude, perception and practices on the uptake and utilization of treated human excreta as organic fertilizer. Data was collected from 96 respondents comprising of the farming household heads using both stratified and purposive sampling techniques across the six wards of Imenti South Sub-County using questionnaires. The study showed that education level and religion significantly influence on the level of utilization ($p<0.05$), while gender, occupation and farming duration had no significance level ($p>0.05$) on the utilization of treated human excreta. Half (50%) of the respondents agreed that increase in knowledge, positive attitudes and perceptions on treated human excreta improved on their application of treated human excreta as organic fertilizer. However, negative attitudes and health risk perceptions were the main limiting factors to utilization of treated human excreta. The type of sanitation technology used also influenced on the uptake and utilization of treated human excreta where by improved sanitation practices increased usage and application of human excreta as organic fertilizer by 52%. Therefore, there is a need for frequent open dialogues around the benefits and risks of treated human excreta utilization as organic fertilizer to increase farmers' knowledge on it proper application. Further, it is important to understand the nature and direction of attitudinal influence dimensions and characteristics of farmers for mainstreaming circular economy interventions.

Keywords: *Human excreta, organic fertilizer, KAP, Circular economy*.

SUBTHEME 2: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

18. A review of techniques for morphological analysis in natural language processing

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Natural language is a crucial tool to facilitate communication in our day-to-day activities. This can be achieved either in text or speech forms. Natural language processing (NLP) involves making computers understand and process natural language. NLP has enhanced the way humans interact with computers, from having computers use speech to talk to humans as well as having computers translate human speech. Apart from speech, computers also create and understand sentences in natural language in a process called morphological analysis. Morphological analysis is an important part in natural language processing, being applied as a preprocessing step in most NLP tasks. Morphological analysis consists of four subtasks, that is, lemmatization, part-of-speech (POS) tagging, word segmentation and stemming. In this paper, we explore in detail each of these tasks of morphological analysis. We then evaluate the techniques used in this NLP field. Finally, we give a summary of the results of each of these techniques.

Keywords: *Natural Language Processing (NLP); Morphological segmentation, Low resource language; Lemmatization, Speech tagging*

19. Implementation of the ISO 27001:2013 standard in an academic library: case of Meru University of Science and Technology

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Academic libraries are often considered the 'heart' of academic institutions. They are charged with provision of a range of resources, services, tools and software that are increasingly made available online. With information as the key resource under its responsibility, information security is a pertinent component to assure its confidentiality, integrity and availability. This paper describes the process of implementing the ISO 27001:2013 Information Security Standard for the library system of Meru University of Science and Technology. Theoretical models in information security in the library are examined. Next, details of the approach undertaken in meeting the requirements of the standard are discussed. The benefits gained and challenges that were faced are presented The lessons gained herein will assist similar institutions seeking to get certified using this standard.

Keywords: *ISO Standards; Information Security; Academic Libraries*

20. Digitalization of academic libraries, a response to the blended mode of teaching in private higher learning institutions in Africa

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Academic libraries are being encouraged to digitalize their services. This idea has been supported with the advent of COVID-19 where health measures are encouraging social distancing and avoiding hand to hand distribution of documents and the limit of face to face contacts. Encouragement is being made to have a full online lectures or blended mode of teaching where there is a mixture of face to face with online courses. The main challenge in this process is that most of core books related to academic courses in libraries are in printed format and accessible only by visiting the library.It is to note that private higher learning institutions in Africa are still facing challenges related to inadequate resources as they do not get governmental finance support. This study aims to review literature on the role of digitalization of academic libraries as a response to the blended mode of teaching. The objective of the study is to investigate challenges faced by academic libraries in private higher learning institutions in Africa that limit them to satisfy their users' needs through digitization of the library and to propose strategies that can be adopted in order to overcome those challenges. Literature reviewed found out that: The digitalization of library has a great role to play on library users' needs satisfaction; That academic libraries are facing challenges during the digitalization process, challenges that limit fully adoption the use of internet and the digitalization of libraries in order to satisfy library users' needs.The study recommends: the managementto avail adequate resources to libraries; hiring new personnel and deploying/retraining existing staff in ICT related to library digitalization; Training of library users on the access and use of digitalized library resources; To embrace new technology and move from printed documents accessed physically to digitalized documents accessed through internet in order to meet the users' needs satisfaction in the age of digitalization of education.

Keywords: *Digitalization; Academic libraries, Blended mode of teaching*

21. Deep packet analysis firewall model

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Firewall (software or hardware device that monitors traffic into and out of the network). It can be classified as stateless or stateful. The existing firewalls are only concerned with filtering packets based on the information contained in the header part of every packet. The most improved stateful inspection firewalls have a state table enabling the storage of header information such as source address, destination address, port, connection status and protocol. Consequently, existing firewalls can be compared to only reading the book tittle and foregoing other essential activities such as evaluating the content of the book. The proposed Deep packet analysis firewall model, not only evaluated the header content of a packet but also open and examines the content in a packet in order to detect and block any threats. In addition, the proposed model will be analyzing the actual content of the traffic that is flowing through packet as opposed to existing firewall which only focuses on analyzing the header content. The model will also locate, detect, categorize, block, or reroute packets having certain data payload and specific codes that are not located, detected, categorized, blocked or redirected by existing firewall. Therefore, deep packet analysis firewall model is a feasible approach to overcome challenges faced in cyberspace today. The proposed Deep packet analysis firewall model will use mixed research method. Quantitative method will include obtaining data from the peer reviewed academic articles in the area of study. Quantitative method will also entail using a simulation by feeding quantitative data into the model to produce quantitative results. Finally, qualitative method will include conducting interviews and use of questionnaires

Keywords: *Deep Packet analysis; Firewall Models*

22. Machine learning in software security testing: a literature survey

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

As the use of software systems permeate diverse areas of the society, there is a need to ensure that not only does the software provide the needed functionality but it is also of high security, providing confidentiality, integrity and availability of the underlying data. Software security testing is one among the approaches towards detecting vulnerabilities and flaws in software which contribute to software insecurity. As machine learning finds success in other areas of computing, it has also gained interest in the field of software security testing. A review of the application of various machine learning techniques, including current trends in software security testing is of high value both to research and practice. This research provides an overview of how machine learning has been applied in software security testing and especially in the different phases of the testing cycle. Basic and recent developments of machine learning application in static analysis testing, dynamic analysis testing, symbolic execution and fuzz testing are discussed. The research followed a literature survey approach where existing literature on the subject were reviewed. A comparative performance of various machine learning techniques in the different phases of security testing is provided.

Keywords: *Software Security Testing, Software Security, Machine Learning, Static Analysis, Dynamic Analysis, Symbolic Execution, Fuzz Testing*

23. Web based systems security review and trends

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Security of any web application is paramount because any breach to this can result to major consequences. Many developers have given web security an afterthought which has made it possible for the attackers to target these systems. Technology has also contributed to security vulnerability since most applications were built on old platforms which make it harder to be compatible. Cyber wars among the countries and many other more reasons have worsened the situation. Emergent of artificial intelligent has given hope to the fight gain some of the security threat. The main objective of this paper is to review on the current trend of web based systems security. The paper has applied exploratory research design to review on security of web applications, protection mechanism and the role of convolution neural networks. The outcome of this review aims on improving the body of knowledge.

Keywords: *web security, convolution neural networks, hacking, cyber wars*

24. Analysis of digital contact tracing technologies employed in Covid-19 pandemic

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

The corona virus disease 2019 (COVID-19) is a worldwide pandemic that has claimed lives and negatively changed the mobility patterns of humans. Various Infection control measures have been employed for COVID-19, among them digital contact tracing technologies (DCTT). DCTTs are used to track and notify users digitally about their interactions with infected individuals and help strengthen health service systems. COVID-19 infections have reduced worldwide as Nations have adopted use of DCTT like Global Positioning Systems (GPS), Bluetooth, Quick Response (QR) Codes, Wireless Fidelity (Wi-Fi) which use health data, symptoms monitoring, mobility, location and proximity data for contact tracing. This paper reviews literature by analyzing GPS, Bluetooth, QR Codes and Wi-Fi as DCTTs employed for COVID-19 through desk study, highlighting their success and failure with an aim of stipulating ways the technologies have been used and how they could be improved for better results. Beyond its use for mitigating and containing COVID-19, digital technology can complement or in some cases amplify the traditional approach to global health program implementation. Digital contact tracing technologies (DCTT)have challenges, of key to note is low smartphone adoption, poor user acceptance, privacy concerns and digital training skills, to mention a few, that have all hampered digital contact tracing but are all overshadowed by the health benefits of DCTT and is required in addition to manual contact tracing. However, additional policy efforts are needed, to gain wide spread adoption of Digital Contact Tracing technologies (DCTT) among the public as a valuable means for containing the effects of the Covid-19 pandemic.

Keywords: COVID-19, Contact tracing, Digital contact tracing, DCTT, GPS, QR

25. Integrated QoS management technique for internet protocol storage area networks

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

The increasing number of Information Technology Users around the world has led to tremendous increase in the amount of data that requires storage. Traditional implementations of storage area networks are not able to meet the increasing demand for storage capacity as well as a reduction in the operational and capital expenditures. In response to this challenge, new storage area network architectures based on Ethernet (IP) have evolved. IP storage network is a network of storage devices where the underlying technology is based on IP protocol. The creation Internet protocol storage SANS is enabled by the use of iSCSI protocol which makes it possible for SCSI commands to be transmitted over IP network. Meanwhile, storage QoS has become of great importance with the need of assuring a suitable storage service to the clients who share the same pool of IP storage. With the coexistence of storage traffic with other types of traffic in the same IP network, it is important to offer storage traffic QoS guarantees to prevent performance degradation for storage users. Regrettably, the storage device itself does not provide any capability of guaranteeing storage QoS. The research process involved four stages: This first stage involved systematics review of literature to determine techniques for providing QoS in IP networks and then categorized based on performance isolation, bandwidth management and burst handling. However most of the techniques reviewed were found to implement QoS techniques in the storage devices themselves which means the same algorithm run on different devices. In addition, the reviewed techniques did not put into consideration the network statistics when assigning resources. The second stage involved the optimization of QoS techniques for performance isolation, bandwidth management and burst handling for users in IP SANs. Third phase involved the integration of performance isolation, bandwidth management and burst handling techniques for QoS in IP SANs. The fourth stage involved the validation of the integration of the QoS techniques of performance isolation, bandwidth management and validation of the integrated technique based on the response time, throughput and jitter QoS metrics. To optimize the performance isolation, the study formulates an optimization problem to find optimal performance isolation schedule and use it to bind resources to class of users. The study optimized the process of matching packets to rules by sorting rules based on priority, splitting rules and use of a linear tree rue structure. Experimental results generated proves that the proposed performance isolation technique show significant reduction in response time and increase in throughput.To optimize bandwidth management also formulate an optimization problem to find out the optimal bandwidth allocation for optimal burst handling using network statistics. The research put forward HPDDRR a hierarchical

priority based scheduling technique that used a quantum generated based network statistics and priority of users. Experiments results proves that HPDDRR is able to allocated bandwidth proportionate to the user's priority and when there is idle bandwidth is shared based on priority. The results further show that users that generate burst within their allowed limits do not miss deadlines.

Keywords: *Quality of Service (QoS); Internet Protocols; Storage Area Networks (SAN)*

26. Effectiveness of Covid-19 contact tracing solutions

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

COVID 19 has become a global pandemic requiring public health officials to take many measures to contain its spread. Amongst the measures is tracing those who have been in contact with infected people i.e. contact tracing. This paper examines some digital contact tracing applications that were developed soon after the outbreak (in the year 2020) and how effective they have been. The paper highlights a study done on these applications which shows that there are some issues around the use of the applications which hinders their wider adoption by the public (adoption of these applications by the public is one of the surest ways of containing the spread of the pandemic). The paper goes on to examine an instance where one of the issues raised (security of Personally Identifiable Information, PII) is addressed in a proposed design solution. The paper concludes by suggesting what should be done by contact tracing application developers to ensure their products are more acceptable to consumers thereby leading to their wider adoption.

Keywords: *COVID-19, Contact tracing, Proximity estimation, Contact-tracing apps, App adoption, Contact tracing incentives*

27. Energy efficacy in confined turbulent flow field

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Problem: Due to ever-increasing technological advancement, household energy consumption has been on the rise globally. This has led to massive depletion of the non-renewable energy sources due to the increased demand for more energy. In confined thermal systems, the high energy consumption is attributed to ineffectual energy distribution mechanisms. **Objective:** Energy being an essential factor in development, there is need to establish parameters that influence mechanisms of its distribution to obviate this problem. **Methodology:** The distribution of energy in confined environments is largely associated with the interactions between the fluid particles and the walls of the flow domain. The intricacies of these interactions is responsible for the diversity in energy profiles in thermal systems. The Rayleigh number incorporates these interactions into a single parameter. In fluid dynamics, energy transfer is expressed in terms of the Nusselt number. In confined flow, $Nu = CRa^n$. The values of the constants C and n respectively depend on the geometry of the flow domain whereas Ra depend on the flow conditions. Since most fluids are of low viscosity, flows encountered in practical applications are mostly turbulent. This paper analyses energy profiles in a turbulent flow in a domain with adiabatic walls for $0.5 \le Aspect\ Ratio \le 1$ and $10^9 \le Rayleigh\ number \le 10^{11}$. The physical laws governing the flow are modeled into a generic equation that incorporates all mechanisms of energy transport. The finite volume method is used to discretize the generic equation due to its ability to adapt a grid structure that captures the local features of the flow domain and the consistence of the final mathematical formulations with the underlying physical laws. The discrete equation is solved iteratively using a segregated pressure-based algorithm. **Results:** The results revealed that the distribution of energy in the flow field is dependent on the geometrical configurations of the flow domain and the flow conditions. **Conclusion:** Mechanisms of energy transfer is a function of the Rayleigh number and the Aspect ratio of the flow domain. **Application & Recommendation**: Aspect ratio and Rayleigh number are the parameters that form a scientific basis for energy management as well as tools for designing thermal systems that enhance energy-efficacy while providing the desired thermal conditions.

Keywords: *Rayleigh Number, Aspect Ratio, Turbulent flow, confined thermal systems, thermal management, energy-efficacy.*

28. Blessing in disguise: Kenya's prospects towards harnessing data-driven ICT techniques in quest of post-Covid-19 economic recovery

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

COVID-19 crisis caused tremendous disruptions and abrupt shut down or slow down on core business processes globally and ultimately causing a worldwide recession. The unpredicted nature of the economic informed decision data due to rapid unstructured data that was generated at a high pace, business entities were at a great risk to collapse. Kenya is no exception to these unprecedented phenomena - COVID-19 pandemic. Retrospectively, we can learn lessons from the earlier shattering worldwide pandemics such as the Spanish Flu or the great influenza which paved way to paradigm shifts in the introduction and implementation of disruptive technologies. In the recent past, there is an increasing effort on innovative technologies to make every sector sustainable to meet the opportunities arising from the COVID-19 pandemic. This paper explored and presented the latent opportunities in which Kenya's business community in virtually all sectors/industries can harness and leverage not only for economic recovery's sake but also creating a platform for businesses to catapult towards business reengineering maturity frameworks that is hardened with almost infinite potency of innovations. More specifically, integration of BI and AI to business processes is proposed in this paper. Leveraging BI and AI will aid business organizations transform data into useful insights that inform a businesses' strategic and tactical decisions. Pragmatically, detailed intelligence about the status of the business using BI and machine learning techniques together with predictive analytics will be demonstrated in this paper as a panacea of economic recovery from post COVID-19 ravages when adopted and integrated well in Kenya's business landscape. It will no doubt provide business entities with groundbreaking data-driven insights that can be leverage and be utilized to synthesize big data into a coherent action plan (using BI/AI powered economic data). This way, business entities will be able to employ this data to create post COVID-19 recovery indexes which is further used to give business entities important statistics such as predictive recovery Index that ultimately aid quick economic recovery for Kenya's business sector by embracing the utilization of the unstructured vast data generated for the advantage of economic revolution.

Key words: *Business Intelligence, Artificial Intelligence, Machine learning, data, data-driven*

29. Adoption of Augmented Reality (AR) and Virtual Reality (VR) in healthcare systems

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Virtual reality (VR) and Augmented reality (AR) are the cutting-edge technological innovations that is going to shape how members of the society live and interact in future. In recent years, such technologies have been successfully implemented in various sectors including, military, education, healthcare, gaming among others. In the same way, its explosion more so in healthcare sector has resulted to various research being done that have revealed potential benefits and challenges in its adoption. This paper aimed at researching and providing an understanding of the role of VR and AR in healthcare systems as well as investigating its applications, potential benefits and challenges. The article applied exploratory research design to review the future applications, benefits and provide solutions to the challenges of VR and AR in healthcare. The review revealed that despite the tremendous growth and potential of such technologies, challenges resulting from cost implication of the technologies, technical capabilities of devices, infrastructural issues have all impacted on adoption of VR and AR in healthcare sector. As a result of advancement in technology over years, most of the challenges have been addressed due to invention of computers with more processing power and screens with better resolution. However, the issues of data privacy and security of both healthcare professionals and patients need to be addressed. This can be achieved by stakeholders developing and implementing universally acceptable standards and procedures that will guide research, development, and implementation of such technologies. This calls for parties involved in the development and usage of this devices to be assured of data privacy and security in healthcare sector.

Keywords: *Virtual reality, Augmented reality, Mixed reality, Healthcare systems, Standards, Systems*

30. Implementation of AI-based assistive technologies for learners with physical disabilities in Kenya: a practical design thinking approach

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Subtheme: ICTs, Big Data, Artificial Intelligence, Mathematical Applications

Abstract

Inclusion of Learners with disabilities continues to extensively rely on digital and Artificial Intelligence (AI) enabled Assistive Technologies (AT) as enablers for teaching and learning. However, the provision of ATs to meet the unique needs of PWDs continues to be a challenge. Moreover, such AI enabled ATs exist within areas of innovations, learning and working environments, hence the need for ease of learning, usage and cost effective acquisition and implementation. This paper introduces a systematic approach that matches the unique needs of PwD learners and abilities of innovators using AI-ATs. The research approach applies Design Thinking (DM), participatory elements enhanced with online collaborative tools. The study was conducted in 3 physically challenged pilot schools and an AT Centre at Meru University of science and technology. The objective of the study was to create better understanding of learners with physical disabilities and innovators with a view of enabling accurate identification, evaluation and choice of appropriate AI-ATs so as to develop learning and innovation spaces that enable the creation, introduction and testing of AI-ATs for e-inclusion. The expected outcome of this research is socio-economic inclusivity for livelihood empowerment as well as de-stigmatization of PwDs.

Keywords: *AI-based Assistive Technologies, Areas of Innovation, Design Thinking, Disabilities, eInclusion*

SUBTHEME 3: Mining, Sanitation, Engineering, Biological and Physical Sciences

31. Co-treatment of fecal matter with kitchen waste using black soldier fly: process performance evaluation

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Subtheme: Mining, Sanitation, Engineering, Biological and Physical Sciences

Abstract

Organic matter processing through *Hermetia illucens* (black soldier fly) technology offers promising fecal sludge management (FSM) and sustainable sanitation option. Fecal matter has been valorized using black soldier fly (BSF) technology; however, there is insufficient knowledge in substrate co-treatment rationing rates to scale up the extant BSFL systems for optimum waste conversion. In this study, an evaluation of BSF process performance during co-treatment of fecal matter and kitchen waste was carried out under laboratory-scale conditions. BSF larvae feeding substrates were formulated using fresh fecal matter and kitchen waste (FM: KW) in the ratios; 1:0, 4:1, 2:1, 1:1, and 0:1. The experiments were set out in rectangular plastic containers (26*13*11cm). Under each mixing ratio, 1000g of the feed substrate was treated utilizing 5g of 5-day old BSF larvae. One hundred larvae were randomly picked at three-day intervals from each treatment (in triplicate) to monitor the larval weight gain across the treatment process. Larval days to 50% pupation, mean pupal yield, waste reduction rate (WR), bioconversion rates (BR), and feed conversion rates (FCR) were monitored for the process performance. The results showed that substrate mixed 1:1 attained the best measures; WR (90.56%), a high weight reduction index (WRI) (5.66), high BR (14.56), and a high overall pre-pupal yield (72.78g) within a shorter development time (16 days). This study affirms the performance efficacy of BSFL to sufficiently convert fecal substrates when co-treated with kitchen waste, promoting a circular economy. It, therefore, illustrates that a co-treatment strategy has the potential to boost and enhance sustainable fecal waste management for future applications.

Key Words: *Circular economy, co-treatment, fecal matter, **Hermetia illucens**, sanitation*

32. Assessment of sanitation practices among households of Tigania West sub-county, Meru county, Kenya

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Subtheme: Mining, Sanitation, Engineering, Biological and Physical Sciences

Abstract

A poorly constructed toilet may deter its use and provoke open defecation. Globally, 2.5 billion people do not have access to improved sanitation facilities. In Kenya, over 5 million people are forced to defecate in the open due to inadequate or lack of sanitation facilities resulting in high prevalence of water, sanitation and hygiene-related diseases such diarrhea. This study therefore sought to profile the sanitation practices on containment and disposal systems among households in Tigania West with a view of yielding insights on promotion of safe disposal of human waste. Questionnaires, interview guide and observations were used to collect data in a mixed study design. Cluster sampling technique was employed to select respondents and the data analyzed using SPSS version 21.0. The results showed that 95.2% of the respondents had access to a toilet, whereas 4.8% did not (n=236). Out of those with toilets (n=225), 54.3% had pit latrines without a slab. With regard to construction materials, 72% of the households had their latrines constructed using timber and iron sheet; 9.3% with concrete; 8.4% with mud and grass; whereas 10.3% had theirs constructed with polythene materials (n=225). The majority of the households had toilets in poor hygienic conditions with 149 (66%) with faeces on the floor, exposing users to the risk of getting into contact with the faeces. 120 (53.2%) of the households did not empty latrines when full, instead they opted for a new one. Latrines did not offer any privacy in 45 (20%) of the households, therefore discouraging their use. 71.8% of households disposed of children's faeces in the latrine, whereas 6.4% did so in the environment (n=225). 53.2% (n=225) of the residents had no detergents and disinfectant to clean the toilet. 37.7% (236) of the respondents never washed their hands with soap and water after using the latrine/defecating in the open. Sanitation practices had a significant positive correlation with cultural practices (0.119 ($p=0.003<0.05$), sharing of toilets (0.142; $p=0.48<0.05$), space availability in the household (0.098; $p=0.011<0.005$) and financial challenges (0.074; $p=0.004<0.005$). Innovative approaches to toilet construction using locally available materials, training and subsidies together with behavioral change sensitization could improve sanitation among households of Tigania West Sub-County.

Keywords: *Sanitation access, open defecation, improved sanitation, public health, sanitation, excreta.*

33. Tracking the flow of excreta across the sanitation service chain in Nkubu town

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Subtheme: Mining, Sanitation, Engineering, Biological and Physical Sciences

Abstract

Inadequate access to improved sanitation and water remains a huge factor contributing to increased mortality and morbidity rates, especially among children. Despite the growth in economy and recognition of sanitation as a basic right, investment in sanitation infrastructure has not yet been achieved, particularly in low- and middle-income area. As such, nearly 827 000 people die yearly due to inadequate sanitation, water and hygiene. To track the flow of excreta in Urban areas, the existing sanitation systems were assessed, the proportion of community with access to safely managed feacal sludge was examined, the challenges facing service delivery was assessed and finally, a Shit Flow Diagram for Nkubu town was developed. A descriptive cross-sectional survey was employed. The research instruments involved were use of key informants' interviews, observation for primary data. The secondary data was gotten from existing data. The Susana platform and the shit flow diagram tools were used for data analysis and generating SFD for Nkubu town. The data collected has been presented using a shit flow diagram, tables, graphs and charts. The results indicate that only 28% of the excreta is safely managed. The pit latrines were the most used containment method with 45% and 3% of the population practicing open defecation. Only 40% of the feacal sludge taken to the treatment was properly treated and disposed. The challenges experienced in the management of fecal sludge were high water table in the area and high license and service fee charged. The findings imply that the unsafely excreta management practices in Nkubu town pose a risk to the health of residents in and around the town and the quality of water sources. This study points to the possible areas of interventions such as proper planning of the town and also creating an enabling environment for feacal sludge management.

Key words: *Safely managed, sanitation systems, service delivery, feacal sludge, shit flow diagram, treatment.*

34. In the Cultural Mirror: Influence of cultural factors on adoption of sanitation practices in rural areas: A case of Nzaui Sub-County, Makueni County, Kenya.

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Subtheme: Mining, Sanitation, Engineering, Biological and Physical Sciences

Abstract

Provision of adequate sanitation is among the common approaches of preventing sanitation-related diseases. However, provision of sanitation facilities may not be a sustainable sanitation solution unless the population's behavior changes and a positive perception is embraced. This paper underlines the influence of cultural factors on adoption of sanitation practices in rural areas. The article is based on field research employing convergent mixed methods research designs where both qualitative and quantitative data was gathered simultaneously. Quantitative data was gathered using structured questionnaires from 100 household heads selected using stratified and proportionate simple random sampling techniques. Qualitative data was collected using interview guides from a purposively selected focus group consisting of 9 participants. Quantitative data was analyzed using the Statistical Package for Social Sciences (SPSS) version 25 which generated descriptive and inferential statistics to unveil the relationship between variables. Qualitative data was organized into themes and presented in narratives. From the findings, a unit increase in gender roles would lead to a 0.147 increase in adoption of sanitation practices (p-value=0.000) and a unit increase in traditions would lead to a 0.032 decrease in adoption of sanitation practices (p-value=0.014). From the qualitative findings, some religions associated diarrhea with demons other than poor sanitation which was seen to facilitate adoption of poor sanitation practices. Further, the qualitative findings revealed that faeces left in the open could be used for witchcraft purposes, a tradition which had a positive impact on eradicating open defecation. The study recommends women inclusion in household sanitation matters. The study revealed the need for incorporation of leaders as advocates of sanitation behaviour change. The study also recommends future studies to examine adoption of sanitation practices alongside environmental, demographic and economic factors.

Key words: cultural factors, sanitation practices, rural areas, improved sanitation

Key words: *Social factors, sanitation practices, rural, improved sanitation*

35. The effect of purple tea extract activity on selected metabolic syndrome parameters in mice

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Subtheme: Mining, Sanitation, Engineering, Biological and Physical Sciences

Abstract

Metabolic syndrome (MetS) is a cluster of metabolic abnormalities. Prevalence of MetS is documented at 50% and 87.5% in Africa and Kenya respectively. It is managed by combining lifestyle modification and pharmacotherapy. Although *Camellia sinensis* TRFK306 has been proven to induce weight loss in mice and humans, its effect on metabolic syndrome is yet to be investigated. This study aimed to investigate the effect of *Camellia sinensis* TRFK306 extract on MetS induced Sprague Dawley male rats. A total of thirty-five, six-weeks-old rats were acclimatized for one (1) week and randomized into 5 groups (n=7). Metabolic syndrome was induced using high- fat fructose diet for eight (8) weeks. Post-hoc statistical analysis using Tukey's multiple comparison test was used to analyze the effect of freeze-dried extracts of *Camellia Sinensis TRFK306* on various markers of metabolic syndrome. Random blood sugar levels revealed significant differences ($p = <0.0001$), for experimental animals. Oral glucose tolerance results were significant ($p = <0.0001$). Total serum triglyceride levels was significant ($p = <0.0001$). Mean serum HDL-C levels revealed significant differences between the normal control and negative control ($p = 0.0009$), the negative control and low dose test ($p = 0.0023$), the negative control and high dose test ($p = 0.0025$) and the negative control and positive control ($p = 0.0014$). The mean serum LDL-C levels revealed significant difference ($p= <0.0001$). *Camellia Sinensis TRFK306* possessed significant beneficial effects on various markers of metabolic syndrome.

Keywords: *Camellia Sinensis, TRFK306, Metabolic syndrome, blood sugar levels, Total serum triglyceride*

36. Pit emptying stakeholder preferences in informal settlements: case study of Mukuru kwa Reuben and Mukuru kwa Njenga, Kenya.

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Subtheme: Mining, Sanitation, Engineering, Biological and Physical Sciences

Abstract

This study established the sanitation stakeholder's preference for the most suitable type of sanitation technology for the informal settlement. Manual pit emptiers had formed a community-based organization that was supported by a container-based sanitation company. The container-based sanitation company supported the CBO pit emptiers through provision of a transfer station that had a septic tank for containment of liquid waste. The household users were grouped into three: households' tenants' toilets, landlords of households' toilets and caretakers or landlord representative of households' toilets. The study adopted descriptive case study research design that enabled collection and analysis of both quantitative and qualitative data in Mukuru Kwa Rueben and Mukuru kwa Njenga. Semi-structured questionnaires were used as primary collection tools, collection technique included observation, pictures, and in-depth interviews with stakeholders. Quantitative data was analyzed using SPSS Version 20.0, qualitative data was presented in a reported way. There is insufficient research on stakeholder preference in informal settlements. Although some studies have been conducted on slum sanitation, no published study has explored stakeholder preferences in sanitation technologies specifically in these study areas. The study will give baseline information on the sanitation preference of the stakeholders in Mukuru kwa Njenga and Mukuru kwa Rueben in Nairobi, Kenya.The study established that CBS service provision was the most preferred sanitation technology among 39.2% of the household tenants, 55% among the landlords, 40% caretakers. The results from this study can be applied by the container-based company providers operating and sanitation service providers in low-income high-density settlement for scaling up emptying practices and sanitation technologies.

Keywords: Pit emptying, container-based sanitation, informal Settlements, sanitation preference, Mukuru kwa Rueben, Mukuru kwa Njenga

37. Integration of container-based sanitation service provision in cities: influence of gender, religion and culture.

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Subtheme: Mining, Sanitation, Engineering, Biological and Physical Sciences

Abstract

The purpose of this study was to investigate the challenges and opportunities in container based sanitation service provision in cities. Container based sanitation is an innovative technology where waste is collected and captured in sealable containers transported and treated use and/or safe disposal. CBS and non-CBS users' perspectives were sought, to gain understanding on their experiences and perception about CBS services integration. Users were unpacked into three groups: households using CBS as pay per use, those running CBS as business and household with CBS installed in their residential. The study also sought to establish whether CBS suited sanitation needs of the users' in line with social factors surrounding latrine adoption and User toilet Preference .Further, the study sought to establish the CBS stakeholders perspectives; support and perception of CBS as a sanitation option for the high density low income settlements The study adopted descriptive survey research design that enabled collection and analysis of both quantitative and qualitative data. The study was conducted among household members of Mukuru Kwa Njenga. Semi-structured questionnaires were used as primary collection tools, collection technique included observation, questionnaires and interviews. Additionally, ten in-depth interviews were conducted, with community chairmen, public utility representative, service providers and a government official. Quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) Version 20.0, qualitative data was thematically presented and reported in a verbatim prose. The study established that CBS service provision was rated as most preferred sanitation technology by 92% and 60% among CBS and non CBS household sampled. In addition CBS though most dominant option among the residents of Mukuru kwa Njenga, there some aspects of this innovative technology that needed to be upgraded including: Reevaluation on the CBS cost, structural improvement customized on the users sanitation preferences in line with socio-factors underpinning latrine usage, increased stakeholders involvement. The results from this study can be applied by container based service providers operating in low-income high density settlement for upscaling of CBS service provision ,this could be achieved through integration of CBS users preferences in the CBS technology upgrade. Additionally the results are also relevant to sanitation stakeholders including public and private institutions for strengthening of partnerships with an aim of creating an enabling platform for CBS operation for the betterment of CBS services especially in the informal area, where CBS has been demonstrated as viable.

Keywords: *Portable Sanitation; Gender and sanitation*

SUBTHEME 4: Climate Change, Sustainable Blue & Green Economy

38. Use of zeolites in wastewater remediation

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Subtheme: Climate Change, Sustainable Blue & Green Economy

Abstract

Huge amounts of wastewater in low and lower-middle-income countries is released into the environment in untreated forms due to an increase in anthropogenic activities and disposal in water bodies. Pollution in water ecosystems results in water scarcity and crisis if effective and sustainable water treatment technologies are not adopted. Due to their abundance, cost-effective synthesis, and high contaminant removal capacities, zeolites have been considered as green and effective wastewater remediation materials. This paper presents an overview of the methods of synthesis, types, and efficiencies of zeolitic materials reported in wastewater remediation. In a state-of-the-art review, the latest data, discussion, conclusions, recommendations, and future perspectives are presented. In summary, synthetic zeolites are preferable in wastewater remediation because their structural characteristics can be fine-tuned at synthesis. In addition, synthetic zeolites can be tailored to remove specific contaminants based on ionic size, charge or type. The most common method of zeolite synthesis that has been reported is hydrothermal synthesis, which simulates the natural conditions of formation of zeolites. It is however not environmentally friendly due to large quantities of solvent-based byproducts. Recent methods utilize microwave radiation and solid-state synthesis methods to achieve green high-yield zeolites to be utilized in wastewater remediation. These materials are applicable in the removal of heavy metals, organic pollutants, and dyes, among others. The removal of these and other pollutants cost-effectively, sustainably, and efficiently is a great step toward a sustainable blue and green economy.

Keywords: *blue and green economy; heavy metals; organic pollutants; wastewater remediation; water pollution; zeolites*

39. Adoption of mine water treatment to improve the social-economic status of artisanal miners – Case of Mkuki, Kenya

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Subtheme: Climate Change, Sustainable Blue & Green Economy

Abstract

Artisanal mining in Kenya where women and youth play a vital role accounts for over 60% of the gemstone mining revenue in the country. Inspite of this most miners work and live in an environment characterized by water and food scarcity. This study seeks to improve the quality of life for the artisanal miners and by extension the remote areas in Africa by providing food and water security as well as better housing solutions. Poor living conditions and nutrition contribute to poor mental and physical health.

Keywords: *mine water treatment, sustainable mining, mine waste, artisanal miners, artisanal communities*

40. Significance of collaborative synergies in executing EIA and audits for environmental sustainability

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Subtheme: Climate Change, Sustainable Blue & Green Economy

Abstract

The journey of environmental auditing began in the USA in the early 1970s. An environmental impact assessment is defined as an assessment of the impacts of planned activities on the environment, biodiversity, vegetation and ecology, water, and air. Research objective was to elucidate the significance of collaborative synergies in executing EIA and Audits for environmental sustainability. The researcher applied the descriptive design in carrying out the survey in Laikipia County where a comprehensive review of literature review was done from relevant journals, conference and workshop papers, review papers, theses, books, reports, informative flyers/booklets and information available on the internet published by individual researchers, NEMA, NETFUND, UNEP and questionnaires were administered to 400 sampled respondents were the main sources of data for this paper. Findings revealed that 30% NEMA officials carried out environmental impact assessments during the planning phase; 20% UNEP Officials provided information via conferences, workshop papers, review papers, theses, books, reports, informative flyers/booklets & responded to questionnaires on significance of collaborative synergies in executing EIA & Audits for environmental sustainability and 20% Laikipia county residents took part in Public participation on the significance of collaborative synergies in executing EIA and Audits for environmental sustainability & responded to questionnaires. 20% of NETFUND officials disseminated information on EIA & Audit Case Studies. The researcher recommended environmental safeguarding measures such as, introduction of corporate environmental policies and strategies, adequate human and institutional capacity; environmental impact assessments during the planning phase.

Keywords: *environmental auditing, environmental impact assessment, environmental sustainability.*

41. Comparative study on the effects of quarry dust and natural fines on performance of concrete blocks

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Abstract

Natural fine aggregates have been used in the construction industry to bind with cementing materials in the presence of water for building structures. Its use has led to increased daily demand with a subsequent rise in prices as the reserves get exhausted. Its overdependence has resulted in increasing scarcity because of over-harvesting from river beds causing an increase in demand. Moreover, uncontrolled sand harvesting has imposed dire impacts on the various environmental subcomponents of the river ecosystem such as water quality and quantity, bedforms, sediment milieu, flora and fauna, and socio-economic conditions of the people in the long run. This has led to the agitated search for an ecofriendly and less expensive substitute that can produce comparable compressive strength when used in concrete making. Quarry dust, a waste product of the quarry's grinding operation, is gaining momentum as a viable alternative to the conventional aggregates in concrete manufacturing due to its accessibility and lower cost. Quarry dust poses environmental pollution when dumped hence its use in the production of concrete will mitigate the pollution. This research was to determine the impacts of the addition of quarry dust in the performance of Concrete blocks (CB). This was achieved through the evaluation of the compressive strength of the CBs when quarry dust is used instead of natural fine aggregates. The concrete blocks were cast using molds of size 150 mm x 150 mm x 150 mm and then cured for seven days, fourteen days, and twenty- eight days. The size of particle distribution, the slump and workability test, and compressive strength was done respectively for the fresh and cured concrete blocks. The 28-day prepared CBs were subjected to alternate dry and wet cycles to assess their durability performance. A cost-benefit analysis of the use of quarry dust in place of fine aggregates in CB was also be conducted. The results obtained was be subjected to a T-test to study the significant difference in the performance between CB and the control.

Keywords: *Concrete Blocks, Quarry dust*

SUBTHEME 5: Health Interventions for Sustainable Development amidst Global Crises

42. Yellow fever virus disease: a systematic review of reemergence, incidence and mortality in Isiolo county, Kenya

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Yellow fever is an endemic arboviral disease caused by yellow fever virus (YFV), with high fatality. WHO (Eliminate Yellow Fever Epidemics) is a plan to control YFV, with strategies to be carried out from 2017 to 2026. YFV outbreaks occurred in nine African countries in 2021. The burden was estimated in 2013 to be between 84,000 and 170,000 severe cases and 29,000 to 60,000 deaths. Most of the world's cases were reported in West and East Africa. Understanding the occurrence of yellow fever epidemics is critical for targeted interventions and control efforts to reduce the burden of disease. A systematic review study design was used to review existing literature and data on the yellow fever incidence and mortality rates in the region. Predictors of occurrence of yellow fever outbreaks were identified to include; local mosquito populations and specific yellow fever virus strain, eco climatic conditions, sociopolitical and demographic factors including population size, density, mobility, and vaccine coverage. Kenya declared an outbreak of yellow fever in Isiolo County after the death of three people. About 20 cases were reported in Isiolo in February. Counties bordering Isiolo were placed in the high-risk bracket. A national incident management structure to manage the outbreak was established. The team visited the epicenter of the outbreak in Merti and Garbatulla. Active case search and surveillance was done. It was noted that there was delay in case investigation. This was attributed to low index of suspicion among clinicians. It was concluded that there could be a possibility of both malaria and yellow fever outbreak in the county. The county health team was advised to heighten continued active case search and surveillance, case management and improve on risk communication to the community.

Key Words: *Yellow fever, Re-emergence, Incidence, outbreak, Systematic review, Isiolo*

43. Corona virus pandemic response among health workers in selected health facilities in Meru County

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Corona virus pandemic has exerted an unprecedented burden on health care systems, governments and health workers across the world. It has hampered health care delivery globally with far reaching effects in African countries that are already struggling with weak health systems (WHO, 2020) and limited resources (The World Economic Forum, 2020). The first case of the novel coronavirus was reported in Wuhan city Hubei Province of China (WHO, 2020). Since then, the virus has spread across the globe with Kenya confirming 186,000 cases by July 2021 (Worldometer, 2021). Transmission pathways of Corona virus include person-to-person such as coughing, sneezing, aerosol inhalation as well as contact transmission with nasal or mucus membrane from humans or contaminated surfaces (Peng et al, 2020). Health care workers are at the frontline of COVID-19 response and yet are at a high risk infection. This has been linked to inadequate personal protective equipment (PPEs), exposure to infected patients, poor infection control and work overload (Viswanath & Monga, 2020); Mhango et al, 2020; Bai Y et al, 2020). It has been reported that healthcare workers and patients admitted to health facilities for other medical reasons are particularly vulnerable to infection from super spreading cases. This was witnessed in Wuhan, China where Corona virus infection occurred among a group of healthcare workers and hospitalized patients originating from a patient who was admitted in a surgical ward (Wang et al, 2020). Control and management of highly infectious patients within health facilities requires adequate resources which limited in resource scarce settings. Initial report from China revealed that inadequate PPEs as the major risk factor for COVID among healthcare workers (Ran L et al, 2020). In addition, long working hours with minimal rest and overstretched health system due to rising number has been shown to contribute to risk of COVID19 transmission among healthcare workers (Wang J, Zhou M, Liu F, 2020). Emerging research recognize that risk of COVID-19 infection among healthcare workers is compounded by contaminated working environment owing to insufficient infection control and lack of protocols (Viswanath & Monga, 2020; Bai Y et al, 2020). Work environment is key as a transmission route of various infections. It was reported that more than half of all infections among healthcare workers in United States of American occurred in a healthcare facility (Ref). A study conducted among healthcare workers in a health facility in Wuhan, China demonstrated that use of appropriate PPEs coupled with observance to standard recommendations were effective against COVID-19 infection (Min Liu et al., 2020). Africa region continue to be at high risk for COVID19 pandemic, with relatively low capacity to manage the health emergency. While many countries in Africa are stepping up their preparedness for COVID-19 (Gilbert et al, 2020), assessments by WHO

point to substantial limitations in response capacity (WHO, 2020). Risks of infection to healthcare workers requires adequate resources within the facilities, which are limited in many Africa settings. Nevertheless, WHO report indicate that global stock of PPEs is insufficient to meet the rising demand (WHO, 2020). A similar situation is experienced in Kenya and more so exacerbated by reduced supply hence, increase prices for essential PPEs. In addition, healthcare workers require training and supervision in donning and doffing of PPEs to ensure effective protection. Adequate knowledge and skills in use of PPEs may increase risk of infection where healthcare workers may not yet be familiar with their use. In the wake of Corona virus pandemic, WHO developed an algorithm for triage of patients and referral for resource scarce settings. Effective patient triage is necessary to respond to majority of the corona cases who can be treated as outpatients. This ensures prudent allocation of scarce resources and protect healthcare workers (WHO, 2020). In Kenya, lack of national triage guidelines is a limiting factor for effective response to corona virus infection. This was a cross sectional study design conducted among health care workers in selected health facilities in Meru County to evaluate their response to Corona virus pandemic. The study involved primary healthcare workers and specialists practicing in health facilities in Igembe South, Meru County. Slovin's formula was used to determine the required sample size as indicated: n=N1+N(e) Where: n is the desired minimum sample size N is the population size of health workers in the Igembe South sub-County (320 health workers) E is the precision error allowed (10%) Hence: n=3201+320(0.1) ≈ 77 health. Cluster sampling approach applied and simple random sampling was used to select six out of 10 Health Facilities in Igembe South Sub-County. The first step was to develop a sampling frame of all health facilities owned by the Meru County Government in Igembe Sub-County. This was obtained from the website of e-Health -Kenya updated as at June2013. Health facilities were then grouped into public, private and faith based institutions. From each category, a list of facilities with average monthly Staff reporting of between 2 of 50 and above were obtained from the six selected health facilities. Number of participants per facility was distributed proportionately based on the average monthly staff reporting. A list of eligible participants was drawn from the monthly staff returns register and shared with research assistant. Eventually, 87 healthcare workers were recruited into the study after the principal investigator highlighted the nature of the study and its benefits in responding to corona virus pandemic. Data entry and analysis was done using SPSS;25. Descriptive statistics was used to explain study variables. The Results from 87 health care workers mean age 34± 9 (SD) were enrolled in the study. Most (32; 36.8%) of the participants were nurses. Other professional disciplines included nutritionists, records officers, supporting staff, social workers among others. Slightly half (49; 56.3%) of the participants were females. Most (48;55.2%) of the participants revealed that they had worked in that particular health facility for a period of 1 – 3 years with a small proportion (6; 6.9%) indicating that they had worked in that health facility for 7 – 9 years. Almost half (43; 49.4%) of the participants had practiced their professional discipline for more than 5 years. **CONCLUSION:** The Health care workers (HCWs) within Meru County face an unprecedented occupational risk of morbidity and mortality owing to SARS-COV-2 pandemic. Generally, there is increased uptake of IPC measures due to improved awareness levels about the risks of SARS-COV-2 infections among HCWs. Occupational exposure to asymptomatic SARS-COV-2 infected patients, partial adherence to infection prevention and control (IPC) protocols as required by the ministry of health, and preexisting medical

conditions put HCWs at risk for nosocomial Covid-19 infection. Hence, there is need for development of sustainable approaches to familiarize health care personnel with technical updates on COVID-19 and provide appropriate tools to assess, triage, test, and treat patients, and to share IPC information with patients and the public.

Keywords: *Pandemic Response, Knowledge, Preparedness, COVID -19, Corona Virus, Health Care workers.*

44. Methods of pharmaceutical waste management disposal practiced in sanitation value chain by community pharmacies and households in Nkubu Town

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Introduction: Pharmaceutical Waste Management (PWM) has emerged as a challenging issue, with both health and environmental negative impacts. The study assessed the common methods of pharmaceutical waste management disposal in Nkubu town among community pharmacies and households in the sanitation service chain. **Problem statement:** Increasing disease incidence and prevalence necessitate healthcare practitioners to prescribe and dispense different medications. According to World Health Organization (WHO2010), more than half of all medications are inappropriately prescribed and sold, which causes unnecessary storage in community pharmacies (CPs) and households creating environmental threats that jeopardize efficiency of sanitation service chain.
Methods: The study area was Nkubu town, where data was collected by use of structured questionnaires. size was 19 community pharmacies and 380 households. Descriptive statistics were used for data analysis. Results are presented in tables. **Results:** The study showed that 23.9% (n=91) of the households use pit latrines while 73.5% (n=14) of the community pharmacies use burning as the common methods of pharmaceutical waste disposal. **Conclusion**: The common method of pharmaceutical waste disposal being practiced in community pharmacies was burning while for households was emptying in the pit latrine. Disposal of unwanted pharmaceutical products through unsafe methods along the sanitation chain was prevalent among the respondents. **Recommendation**: There is need to create public awareness and establish educational programs regarding management and handling of unwanted pharmaceutical wastes among community pharmacies and households in Nkubu town.

Key words: *community pharmacies, household, pharmaceutical waste, pharmaceutical waste management, Sanitation, sanitation value chain.*

45. WASH facilities affecting menstrual hygiene management among adolescent school girls in Chuka Sub-county in Tharaka Nithi County

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Introduction: Menstrual hygiene management has not been satisfactorily addressed in developing countries due to insufficient WASH facilities. This results to poor health outcomes for adolescent school girls. The purpose of this study was to identify available WASH facilities affecting menstrual hygiene management among adolescent school girls in Chuka Sub County in Tharaka Nithi County. **Methods:** A cross-sectional study was conducted in Chuka Sub County, in Tharaka Nithi County among 383 adolescent school girls aged 10-19 years basically in secondary schools from December 2021 to March 2022. Data was collected using questionnaires then entered into Statistical Package for Social Science (SPSS) version 26 software and descriptive statistics was utilized for analysis. The results were presented in tables. **Results:** Majority of the girls reported availability of clean water at 94% (n=329), adequacy of clean water at 64% (n=224) separate toilets/ latrines at 94.6% (n=331),adequacy of toilets / latrine at 75.7% (n=265) privacy of toilet facilities at 78.3% (n=274) and cleanliness of the toilets/ latrines at 85% (n=297). Despite this, most of girls highlighted the toilets/ latrine lacked hand washing facilities at 52.9% (n=185). **Conclusion**: Most of the schools in Chuka Sub County had WASH facilities which included; sufficient clean water, separate latrines/toilets, privacy in toilets and clean toilets. Notably, some schools had unreliable hand washing facilities, which in turn negatively affected the menstrual hygiene of the students/ adolescent girls. **Recommendation**: The school administration should ensure that the hand washing facilities are installed at various designated areas for girls to use.

Key words: *Adolescent girls, Menstruation, Menstrual hygiene, Menstrual Hygiene Management, Schools, WASH facilities*

46. Distribution and genetic diversity of *cystic echinococcosis* in a non-endemic region: a one health approach

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Background: Cystic echinococcosis (CE), caused by *Echinococcus granulosus* sensu lato (s. l.) is an endemic zoonosis in pastoral communities in Kenya. However, the spread of CE to non-endemic areas is possible due to livestock trade, dogs' roaming behaviour and limited knowledge on CE transmission. This study determined the presence of CE in humans, the genetic variability of the parasite in livestock and the role of dogs in the establishment of lifecycle in a non-endemic region.
Methodology: Screening of human CE in Bungoma County was performed using a portable ultrasound scanner, while livestock cysts were collected during meat inspection in Busia and Bungoma slaughterhouses. Around each slaughterhouse, ten dog-keeping homesteads were selected and from each homestead a dog faecal sample was collected for microscopic examination of taeniid eggs and other helminths. Copro-ELISA was performed on the dog faecal samples for detection of *E. granulosus* s. l. Polymerase chain reaction-restriction fragment length polymorphism and sequencing were performed to genotype taeniid eggs, characterize CE livestock cysts and determine the genetic diversity of *E. granulosus* sensu stricto (s. s.). **Results:** Out of 1002 people screened for CE; 67 (6.7%) participants had abnormal findings and, of these, 7 (1.1%) had simple liver cysts classified as CL by WHO. In livestock, *E. granulosus* s. s. was identified in 135/153 cysts. Eleven haplotypes for *Nad1* and 19 for *Cox1* gene were identified in *E. granulosus* s. s. Helminths detected in dogs included hookworms (n=92; 59.4%), ascarids (n=15; 9.7%), and taeniid (n=1; 0.6%). The sequences of nine (9) taeniid eggs recovered from the single taeniid positive sample identified as *E. canadensis* (1), *T. multiceps* (1) and *T. serialis* (6). Copro-ELISA was positive in 12/77 (15.6%) faecal samples. **Conclusion:** This study report for the first time *E. granulosus* s. s. haplotypes in livestock in East Africa and the establishment of *E. granulosus* s. l. and taeniids life cycle in a non-endemic region.

Keywords: Cystic echinococcosis; zoonotic diseases; *Echinococcus granulosus*

47. Mushroom: a potential anti-aging agent

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Aging is a progressive physiological change in an organism that lead to senescence or a decline of biological functions of the organism's ability to adapt to metabolic stress. Aging takes place in a cell, an organ, or the total organism with the passage of time. As much as this is change is natural, it can be hastened by both the biotic and abiotic factors and the organism's inherent factors. Of these factors, reactive oxygen species (ROS), induced by various endogenous and exogenous sources has been shown to be the most potent aging agent in organisms. Almost all organisms have antioxidant defence mechanisms. However, these are often inadequate to completely prevent oxidation stress-induced damage. Consequently, antioxidant supplements or natural foods containing antioxidants may be used to reduce oxidative damage to the human body. For example, some naturally occurring foods contain fiber, pigments (e.g. betalains, carotene, Xanthophyll, lycopene and chlorophyll) and other bioactive components all of which have been shown to be strong antioxidants. Since antiquity, mushroom, a fungus, has been part of the normal human diet and currently, the amount consumed has increased greatly, involving a large number of species, both the cultivated and the wild. The increase is due to reported health benefits which have been associated with regular mushroom consumption. The main bioactive molecules in mushroom are phenolic compounds (phenolic acid and flavonoids), tocopherols, ascorbic acid, carotenoids polysaccharides, lipopolysaccharides and peptidoglycans. These bioactive molecules have been shown to have a significant antioxidant activity which is manifested by a lower EC_{50} value. *Pleurotus eryngii*, *Agaricus bisporus*, *Flammulina velutipes* and *Lentinula edodes* have been shown to have a high antioxidant potential. This review will discuss ROS, their effect on biological systems and the antioxidant properties of mushrooms with special attention on some popular edible and medicinal mushrooms.

Keywords: *Aging; Antioxidant; Reactive oxygen species; Mushrooms; Bioactive molecules; Oxidative damage.*

48. Assessment of knowledge, attitude, and practices of health care waste management among nurses in Nyambene Level 4 hospital

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Healthcare waste management requires an organized, systematic channeling of waste, consistent with acceptable public health and environmental safeguards (Vanesh et al., 2019). The Ministry of Health estimates that 47% of hospital waste generated cannot be accounted for (Hugo & Lima, 2021). This indicates improper segregation, thus putting health care workers, the population, and the general environment at risk. The broad objective was to assess nurses' knowledge, attitude, and practices in healthcare waste management at Nyambene Level 4 Hospital. The study adopted a cross-sectional design. The target population of this study was nurses working in Nyambene level 4 Hospital with a sample size of 61 nurses. The data collection tool was the questionnaire. The study findings showed that 93.4% (57) of the nurses had good knowledge of waste management, 52.46% (32) of the nurses had a positive attitude and majority (55.7% (34) of the nurses had average waste management practices. Generally, the nurses had good knowledge of waste management. Most nurses had a positive attitude towards prioritizing waste disposal, among other activities in the hospital, and the nurse's practice was generally average. The researchers recommended regular training and education for the nurses, awarding certificates and tokens to nurses who show proper waste management and the administration to carry out regular health care waste management inspections. For example, ensuring each department has three waste management bins. In addition, the researchers recommended introduction of an infection control program to prevent and stop transmission of infections due to improper waste management.

Keywords: *health care waste, waste management, nurses' knowledge, attitude, skills.*

49. Quality assurance programs to support tuberculosis diagnostic capacity amongst laboratories within Meru county, Kenya

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Background: According to the Kenya Ministry of Health, Meru County had reported a tuberculosis (TB) notification rate of 158/100,000 population in 2015. Aforementioned reports indicates that the prevalence of TB that warrants early detection and diagnosis, hence the need to determine quality assurance programs to Support tuberculosis diagnostic capacity of Tuberculosis amongst laboratories within Meru County. Objective: To determine quality assurance programs to support tuberculosis diagnostic capacity amongst laboratories within Meru County, Kenya. Materials and Methods: This was a descriptive study survey which utilized quantitative techniques to establish the potential and capacity of laboratory personnel in TB diagnostic laboratories in selected medical centres. Data entry was done through use of Statistical Package for Social Sciences (SPSS). Frequency and percentages were calculated. Findings were presented in form of frequency distribution tables and bar graphs and analyzed using Chi square. Results: Majority of laboratory personnel had indicated that their laboratories were public laboratories (69.2%) followed by private owned laboratories (30.8%). There were significant differences in the diagnostic capacity of TB between public and private owned laboratories in relation to availability of the following resources: Safety cabinet [χ2 (1 df, N= 26) = 18.49, p=0.000<0.05], Centrifuge [χ2 (1 df, N= 26) = 10.64, p=0.000<0.05], Gene Xpert resources [χ2 (1 df, N= 26) = 18.49, p=0.000<0.05], Freezer/refrigerator [χ2 (1 df, N= 26) = 14.28, p=0.000<0.05], Incubator [χ2 (1 df, N= 26) = 18.49, p=0.000<0.05] and TB florescence microscopy [χ2 (1 df, N= 26) = 18.49, p=0.000<0.05]. Majority of the respondents had been using Centre of Disease Control and Prevention (CDC) as their quality assurance schemes (61.5%) followed by Central TB reference laboratories, Ministry of Health (26.9%) and (others please specify) who never participated in any quality assurance scheme (11.5%). majority of respondents had been sending their specimens for TB culture and sensitivity to research institution (KEMRI Centre for Respiratory Diseases) (69.2%), followed by those who indicated 'Any other' thus not sending any specimen for TB culture and sensitivity (26.9%) and to private or commercial laboratories (3.8%). None of the respondents had indicated sending their specimens for TB culture and sensitivity to either Central TB Reference laboratories Q/A (ministry of health) or a university (0.0%).

Keywords: *Diagnostic Capacity, Quality assurance programs, Tuberculosis*

50. Comparative awareness on Zoonoses between residents of Igembe Central at the human-wildlife interface and inhabitants of the non-wildlife zones of Tigania West, Meru County, Kenya

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Introduction: Zoonoses are infectious diseases transmitted from vertebrate animals to humans. Persons with low knowledge and exposure to wildlife and domestic animals or their products are at higher risk. Extensive research and public health surveillance for timely response through One Health framework is necessary to stop possible cross-species pathogen exchange between animals and humans. This study compared the knowledge on zoonoses between residents at the wildlife-interface zone of Meru National Park, and non-wildlife areas of Tigania West Sub County, Meru Kenya.
Methods: Data were collected simultaneously in both wildlife interface zone and non-wildlife zone and compared. Descriptive statistics were used to summarize the data for differences in awareness between the two areas. Results: The knowledge on zoonoses in the non-wildlife interface zone of Tigania West Sub-County was statistically significant at $p < .05$. Tigania West residents more aware of zoonoses than their counterparts living next to Meru National Park. χ^2 (1, N=525) =84.965, $p < .001$. Conclusion: The residents of Igembe Central had scanty knowledge on zoonoses despite closer proximity to the wildlife conservancy. This community was considerably at higher risk of contracting zoonoses than persons at the non-wildlife zones. Awareness creation through one health strategy is necessary as a deterrent measure.

Keywords: Zoonoses, one health, Meru National Park, wildlife interface zone, wildlife zones

51. Health-related quality of life: differences between human-wildlife interface and non- wildlife zones of Meru county, Kenya

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Background: EuroQol-five dimension-five level (EQ-5D-5L) instrument is one of the most applied patient reported outcomes questionnaire globally. However, its novel application to surveil, compare and report the Health Related Quality of Life (HRQoL) of different populations is rare.This study aimed to estimate and compare the HRQoL of residents at the interface of Meru National Park in Igembe Central and the non-wildlife zone of Tigania West Sub-Counties of Meru County, Kenya. Methods: Sample frames were constructed from Meru County Ministry of Health registers and respondents systematically sampled. Data were gathered through EQ-5D-5L and structured demographic questionnaires and analyzed. Associations between HRQoL variables and hypothesis were tested through chi statistic and odds ratios respectively. Results: The HRQoL dimension of worry statistically differed significantly by nearness to the National Park between the two populations at 95% CI. χ^2 (1, N=525) =35.5281, p< .001. Populations at the brink of Meru National Park were 3 times more likely to report problems in the worry dimension of the EQ-5D-5L than their counterparts in the non-wildlife zones of Tigania West (OR3.068, 95% CI: 2.109 to 4.463) p< .00001). Further studies are required to establish the cause of anxiety/depression in this area to improve population mental health.

Keywords: HRQoL, wildlife zones, non-wildlife zones, Meru County

52. 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 Sustainable development amidst Global Crises

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 major causes of deaths especially among young children in low- and middle-income countries. This has been augmented by antimicrobial misuse, over the counter availability, lack of adherence to physicians' instructions, drug misuse in animal industry, and Poor sanitation especially in informal settlements. This has majorly resulted to organisms changing the genetic make up to survive within different environments. Such microorganisms are distributed everywhere within environments posing great risk to children, adults as well as the aged, especially in informal settlements. Main objective: This study aimed at characterizing Antimicrobial Resistant Strains of Escherichia coli Isolated from Sanitation Environments of 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 5 antimicrobial drugs by Kirby disk diffusion method. The antimicrobial discs used included Imepenem (10µg); Ceftazidime (30µg); Cefotaxime (30µg); Cefoxitin (30µg) and Ciprofloxacin (5µg). Results: Forty-two (69%) of the samples had Escherichia coli. These recorded antimicrobial drug resistances were as follows: Cefoxitin 52.38%, Cefotaxime 42.86%, Ceftazidime 66.67%, Ciprofloxacin 61.90% and Imipenem 59.52%. Statistical analysis revealed a significance in comparison (Kruskal-Wallis tests) between the two strata. Statistic=19.87938408896494 (P 0.00052). Conclusion: This study showed that Escherichia coli isolated from Majengo is pathogenic and resistant to antibiotics. Detection of Escherichia coli pose a great risk in the spread of resistant strains in human. Recommendation: Proper sanitation and hygiene awareness practices should be provided through education to the residents of this area.

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

53. Characterization and antimicrobial susceptibility of *salmonella* isolates from food sources of animal origin in Meru municipality, Kenya

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Salmonella infections originating from food sources have become a menace to the world. Salmonella causes gastroenteritis and eventually death especially to children below five years of age and individuals who are immunocompromised. Antibiotics are the major therapeutic means used to mitigate Salmonella species. However, in the recent past, studies have reported that Salmonella species have developed resistance to common drugs available in the market. This study aimed at isolation and characterization of salmonella species from food sources of animal origin in Meru Municipality, Kenya. To achieve this collected samples were subjected to culture and sensitivity testing where seventy-six (76) meat samples were collected from butcheries, hotels, supermarkets, and slaughterhouses. Of these 14 (18.4%) were found positive for salmonella species. Additionally, 72 egg samples were collected from vendors and these yielded a two percent (2.1%) prevalence of salmonella species. In 80 milk samples collected from milk vendors in Meru township, all the samples were found free of salmonella species. Antimicrobial susceptibility testing indicated that majority of the salmonella isolates (40%) were resistant to more than four of the tested antimicrobial agents. The study recommends further studies to determine gene sequence and thus check for base pair differences among the salmonella isolates obtained. This will enable understand mutational changes which could be attributable to reported antimicrobial drug resistance among the isolates. Data obtained will enable policy change especially on use of antimicrobial agents especially during treatment of food animals. The study recommends working together of key players in the health sector, environmental sector and animal health sector in a view to improving the one health strategy in the study area, which may later be cascaded to all other counties in the country and beyond.

Keywords: *salmonella isolates; drug resistance*

54. Epidemiology and characterization of *echinococcus* in Samburu and Maasai Mara game park and surrounding environments in Kenya

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Echinococcus granulosus parasite exists in two distinct life cycle patterns; domestic cycle involving domestic dogs and livestock; and sylvatic cycle that involves wild canids and wild herbivores. The disease caused by this parasite is debilitating especially in human and it causes major economic loses to the countries affected. This study was carried out to characterize genotypes of Echinococcus species and the disease epidemiology in wildlife and domestic cycles. The study was conducted in Samburu and Maasai Mara game parks and areas close to the reserves. Humans in two pastoral communities, living in study areas were examined for presence of hydatid cysts. Additionally, animal organs were collected for inspection of hydatid cysts. Faecal samples were also collected for taeniid eggs examination, and those specimens used for genotypic analysis. A total of 4078 individuals were examined by ultrasound for presence of hydatid cysts. The prevalence of cystic *echinococcosis* (CE) was 1.2 % within Maasai Mara and 1.1% in Samburu. In addition, a total of 1977 organs were collected from slaughter houses and inspected for hydatid cysts, with 246 (12.4%) percent prevalence. recorded Different animals had varied frequencies of cyst burden with majority of the cysts found in liver and lungs. Nine hundred and six faecal samples of domestic dogs were screened and a taenia prevalence of 6.1% recorded. In wild life, 729 faecal samples of wild carnivores were also collected and screened for taeniid eggs with a positivity of 7.3 %. In Livestock, specific genotypes in Samburu were *Echinococcosis granulosus* (G1-3) the sheep strain, *Echinococcus canadensis* (G6/7) the Camel strain and Echinococcus ortleppi (G5) the cattle strain. Interestingly, In Maasai Mara livestock, all samples screened typed for *Echinococcosis granulosus* (G1-3), the most pathogenic genotype reported globally. In Samburu, genotypes in domestic dogs were E. granulosus (G1-3) (sheep strain), E. felidis (lion strain) with other Taenia species including T. multiceps, T. hydatigena, T. madoquae. For a few Taenia speciation was not possible. In Maasai Mara domestic dog samples, *E. granulosus* (G1-3), *E. felidis*, *E. ortleppi*, *E. canadensis*, *T. hydatigena* and *T. multiceps* were founds. In wild carnivores, specific genotypes including *E. granulosus* (G1-3) the sheep strain, E. felidis the lion strain, E. canadensis G6/7, *T. hyadtigena*, *T. Multiceps*, and *T. Saginata*, and Maasai Mara E. granulosus (G1-3) (the sheep strain), E. felidis, T. multiceps, and T. hyadtigena were identified. Overall, these results indicate possible interlink between domestic and wildlife Echinococcus cycles and active transmission of Echinococcus and other Taenia species. Finally, more studies on genomic differences between *Echinococcus granulosus* s.s genotype and *Echinococcus felidis* are required.

Keywords: *Echinococcus sp.; Taenia sp.; zoonoses; hydatid disease*

55. Wildlife-Human Conflicts and Community Perceived Benefits with Proximity to Meru National Park, Kenya

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Subtheme: Health interventions for Sustainable development amidst Global Crises

Abstract

Background: Communities and wildlife living in close proximity bear the brunt of direct impacts from human-wildlife conflicts (HWC). HWC can lead to hostility to animal species and loss of livelihoods. However, few studies have examined HWC and perceived community benefits with proximity to wildlife conservancies. We examined HWC and perceived community benefits of residents bordering Meru National Park, Kenya. Methods: Data were collected via a structured questionnaire and focused group discussion guide in a cross-sectional study. Ethical clearance was obtained from Meru University of Science and Technology Ethical Review Committee (MIRERC). Authority to carry out interviews was sought from the County Government of Meru. Data were coded and analysed through STATA and summarized using descriptive statistics. Results: Overall, 96.7 % of the study population were aware of human-wildlife conflict or had experienced it. The Elephant, monkey, hyena, lion and the leopard were the frequently reported conflict animals to cause crop damage, loss of livelihood, bodily injuries and destruction of property. Conclusions Only 26.6% of respondents were aware of benefits associated with proximity to the park. A multifaceted approach through KWS, community and government urgencies is essential in the management of HWC, to address HWC and reduce risk of zoonotic diseases.

Keywords: *Human-wildlife conflict, wildlife conservancies, community. Meru National Park*

SUBTHEME 6: Social Science Research in the Innovation Ecosystem

56. Building resilience in sexually abused children in Kisii county: social workers' perspective

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Subtheme: Social Science Research in the Innovation Ecosystem

Abstract

Child Sexual abuse (CSA) is both a social and public health concern worldwide. It is often associated with a number of deleterious psychological and behavioural outcomes for survivors. A mutual misapprehension about CSA is that it is a rare act perpetrated against girls by male strangers. In spite of a surfeit of research on CSA, little is known on the resilience process among the children survivors. In the recent past in Kenya, sexual abuse has been noted in schools most of which the perpetrators go scot-free. It occurs at all levels of society and affects not only girls but also boys in all levels of the society. The purpose of this study therefore was to explore the resilience process among the sexually abused children who form part of the vulnerable groups in Kisii County. The study utilized descriptive survey design. The sample size was 100 pupils, 100 parents,10 Key Informants and 10 practicing Social workers. The findings of the study reveal that in order to curb child sexual abuse, the risk factors such as poverty, parental negligence and harmful traditional cultural practices should be addressed. The Social workers also need to take up their roles in the prevention, restoration and resource provision to curb CSA. The study recommends on psycho-social therapy, cognitive behavioral therapy, offender registration, community notification, and mandatory background check for teachers, residency restriction and sentence lengthening as a mitigation strategy to ending sexual violence against pupils.

Keywords: *Poverty, Psycho-social therapy, Cognitive behavioral therapy, Resilience, and Social Worker.*

57. Pervasiveness of child sexual abuse in Kisii county during the Covid-19 pandemic

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Subtheme: Social Science Research in the Innovation Ecosystem

Abstract

Child sexual abuse (CSA) is both a social and public health concern locally and globally. A mutual mistaken belief on child sexual abuse is that, it is uncommon occurrence committed against girls by male strangers in both rural and urban areas in Kenya. Notwithstanding myriad research on CSA, little is known about its Pervasiveness. It occurs at all levels of the society affecting not only girls but also boys. The purpose of this study therefore was to investigate the pervasiveness rate of child sexual abuse among pupils during the COVID-19 pandemic. The COVID-19 plague is a international historic incident that will remain to affect approximately every facet of ordinary life, including affecting our economic, political, and healthcare eco-systems. The study was informed by the Attachment Theory which suggests that children's lives are centered initially on their parents, the family environment being their primary agent of socialization. Systematic random sampling was used to select the respondents to ensure that the sample was a representative. The study utilized descriptive survey design. The study population was 700 pupils out of which a sample size of 100 (14 percent) pupils was selected. The study used questionnaires administered to each respondent. The researcher administered the questionnaires individually to all respondents. The study found out that threats from perpetrators were preventing the disclosure of child sexual abuse. The research recommends that research, programs and policies should focus on child protection. The patriarchal narrative of manhood needs to change and boys should read from a different script on their roles and place in the society.

Key Words: Attachment theory, Patriarchal narrative, Socialization, perpetrators. COVID-19

58. Psycho-social support to children infested by jigger in Kisii county: social work perspective

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Subtheme: Social Science Research in the Innovation Ecosystem

Abstract

Social workers are key professionals in assessing social care need and providing psychosocial support. Nonetheless the needs in jigger infiltration containment and control are not well managed. Tungiasis is both a social and public health concern worldwide. It affects the victim's quality of life through localization in the foot causing walking difficulties that reduce the normalcy of the infested child. Both social and psychological problems such as low self-esteem and stigma has been identified among the children infested with jiggers. The purpose of this study therefore was to investigate the role of a social worker in the prevention of jigger infestation among children in Kisii County. The study utilized descriptive survey design. The sample size was 50 pupils, 50 parents,20 Key Informants and 20 practicing Social workers. The findings of the study reveal that in order to mitigate Tungiasis, the risk factors that contribute to their spread such as poverty, poor hygiene conditions, area sanitization, inadequate health facilities, sharing houses with domesticated animals, political negligence and controlled number of children in families should be addressed. social work practitioners should engage with children to assess challenges in social functioning, process information in ways that enhance their ability to maintain body hygiene, develop skills to curb tungiasis and create support for change. The study recommends a change of behaviour in the community and the superstitions perception on the causes of Tungiasis.

Key Words: Tungiasis, Social worker, Psychological problem, Stigma, Low self-esteem

59. Determinants of sanitation practices in rural settlements of Tigania East Sub-County, Meru County.

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Subtheme: Social Science Research in the Innovation Ecosystem

Abstract

Sanitation is one of the basic determinants of quality of life and human development index. Poor sanitation and hygiene practices are major causes of ill health and socio-economic problems, and portray a major development barrier in most developing countries. Meru County government loses 816 million shillings each year due to poor sanitation, with pit latrine coverage of 60%. Diarrhea and related illnesses account for 16% of deaths among the children below 5 years and stand second to pneumonia in Meru County. This study sought to assess the motivational determinants influencing sanitation practices in rural settlements of Tigania East Sub- County, in Meru County. A descriptive study design was used with a sample size of 150 households calculated using Fisher's formula. Cluster sampling technique was used in categorizing Tigania East Sub-County into its respective wards and simple random sampling technique employed in selection of households from the clusters. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 25 using descriptive and inferential statistics for quantitative, while qualitative data was presented thematically. Findings revealed that 70% of the respondents were not satisfied with using sanitation facilities in poor states. Absence of safety, privacy, poor design of the superstructure, inaccessibility of toilets, and cultural beliefs encouraged poor sanitation practices such as open defecation. Some of the residents believed that children faeces are safe and was disposed in the garden, bush and composite pit. This was influenced by behaviour of the people within the community due to lack of knowledge on effects on sanitation practices. The study recommends the need to address motivational determinants as they influence sanitation practices in rural areas through training to the residents. The study also recommends government collaboration with sanitation-related bodies coupled with health promotion activities by Public Health Officers to support the construction of improved toilets in the study area.

Keywords: *Motivational Determinants, opportunity determinants, ability determinants, Sanitation practices, Open defecation.*

60. Community toilets management strategies in promotion of public hygiene in municipality ward of Meru, Kenya

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Subtheme: Social Science Research in the Innovation Ecosystem

Abstract

Rapid population growth has significantly contributed to inadequate sanitation facilities especially in slums. The inadequacy in sanitation facilities results to poor hygiene thus promote spread of sanitation-related diseases such as diarrhea. This study investigated sanitation management strategies for promotion of public hygiene in slums. Three slums in Meru Municipality ward, namely, Mjini, Shauri Yako, and Majengo were identified as the target population for the study. Mixed methods approach was adopted in sampling. Each slum was treated as a cluster. Data was collected from 79 heads of households within the clusters and 5 key informants from the Municipality ward who included a municipal manager, assistant chief, Public Health Officer, MEWASS director, and Caritas director. The heads of the households were proportionally selected randomly from the clusters as determined using Fisher's formula. Qualitative data was collected from the key informants. Quantitative data was analyzed using the Statistical Package for Social Sciences (SPPS) version 25 to generate frequency tables while qualitative data was presented thematically. The findings showed poor sanitation and hygiene status of the slum dwellers due to the lack of good sanitation facilities that could enable them dispose their excreta effectively. The study showed that 86% of the slum population did not access adequate sanitation facilities where 5.1% used flying toilets and other 1.3% used bucket latrines. The correlation between comfortability of toilet users and the use of toilets with flies and odour was 0.351(P=0.000) thus comfortability to use sanitation facilities in the slums depended on the status of the toilets. The correlation between presence of caretakers for slum toilets and maintenance of toilets was 0.478 with a p-value of 0.000. The correlation between willingness to pay for sanitation services and the type of toilets provided was 0.094 (p=0.035). Presence of flush water and absence of flies in toilets registered a correlation coefficient of 0.350 (p=0.000). The study recommended consideration of better strategies to enhance better living conditions amongst the slum dwellers lacking access to adequate sanitation services. Further, the government need to put in place policies and regulations to ensure adequate water supply, sanitation and hygiene to the slum dwellers.

Key word: *Community toilets, public hygiene, management strategies*

61. Alcohol abuse and its impact on food security in Igembe South Sub-county

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Subtheme: Social Science Research in the Innovation Ecosystem

Abstract

Food security in Kenya has worsened substantially over the last 30 years, with high population and increasing food demand consistently exceeding modest agricultural production growth. There is a very strong link between agricultural productivity and alcohol consumption especially in the rural areas. The purpose of this study is to understand the demand patterns of alcohol and its impact on food security in Igembe South Sub-County. Cross sectional descriptive survey design was used to undertake the study. The target population was all the households in Igembe South Sub-County. The sample size of the study was 384 respondents. The study employed three sets of data collection instruments. Interviewer-administered structured questionnaire, observation checklist and key informant interview guide. Qualitative and econometric data analyses was carried out in this study to provide a deeper understanding of alcohol households' demand and how it affects the food security situation in Igembe South-Sub County. The results indicate that Alcohol consumption by the household head was associated with an increase in food insecurity, a statistically significant effect with an odds ratio of *1.593(95% CI 1.152 to 2.035, Wald* $\chi^2(1) = 50.015$, p *<0.05.* An ordinal regression model was highly statistically significant with P<0.005 and all the socio-economic variables being significant and Nagelkeke pseudo R-Square being 0.*75.* Patterns of alcohol consumption affected food security in the household. This was statistically significant in its predictive ability X^2 (11) = *140.834*, $p <$ .01. Nagelkerke R-Square for the model is 0.737. The study concludes that alcohol consumption can cause serious food security problems in the household and it recommends that the government needs to develop and implement firm policies for the control of sale and consumption of alcohol so as to help reduce alcohol intake among the general populace. The study also recommends that media also needs to play its part by promoting campaigns and messages that emphasize the risks involved in the use of alcohol.

Keywords: *Alcohol abuse, Food Security*

62. Assessment of women participation in sanitation value chain in low-income rural areas: a case study of South Imenti, Meru county

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Subtheme: Social Science Research in the Innovation Ecosystem

Abstract

Public participation is extensively acknowledged as predominantly indispensable to the success of sanitation and water projects in rural areas in developing countries. Women are the foremost users of water schemes in rural areas and have numerous ideas on how water and sanitation management can be enhanced. Women's participation in sanitation in South Imenti has recently surfaced as an area of interest in the past decade, there has been rapidly growing evidence of women lagging behind in taking part in sanitation. In this context, the study involved examining how management and knowledge of sanitation are gendered, determining women's participation in sanitation development, governance and management, and evaluating the challenges hindering their participation. Qualitative and quantitative research methods were used. In-depth interviews and questionnaires were used to conduct the study. Purposive sampling was used to select three locations in South Imenti sub-county and a sample size of 100 determined using Yamane's formula. Data was collected from December 2021 to March 2022. 75 respondents aged 18 years and above took part in the study. 58.6% (44) respondents filled the questionnaires and 41.3% (31) respondents were interviewed. The data was entered into statistical package for Social Sciences (SPSS) version 22 software and presented using descriptive statistics. The results showed that 80.4% (n=41) of the women in South Imenti were not fully taking part in sanitation projects, despite them being known as primary sanitation attendants at the household level. Women's contribution was very minimal in sanitation activities involving community members, besides, their contribution was greatly under looked. The study findings revealed various roles played by both men and women in the sanitation group. 20.8% (n=5) of men were in charge of decision making, chairing and directing meeting discussions, and mobilization of funds for sanitation projects. 16.7%(n=4) of men provided labour during the construction of a projects, 37.5%(n=9) coordinated day to day running of projects and 25%(n=6) organized for donors' visits as well contributed funds to the group and were key actors during elections. On another hand 80.4%(n=41) of women were involved in domestics chores like cooking for constructors, ensuring cleaningness of sanitation facilities and compounds as well 29.4% (n=15) of women welcomed and entertained guests during a meetings and led in prayers during meetings times.35.3%(n=18) of women were not included in policy and decision-making about sanitation projects since it was given a blind eye concealed under community beliefs, practices, and norms.The finding als revealed numerous determinants to women participation among them were financial rewards 27%(n=14),source of income 20%(n=10),influenced by leaders 14%(n=7) and fear of consequences 10%(n=5) .Various challenges hindered women participation where 49%(n=25)had

tight schedules ,age disparity 15.7% (n=8),low literacy level 31.4%(n=16)and lack of registration fees 29.4%(n=15) among others. Women's rights and freedoms in leadership and management abilities were hindered by old-fashioned cultural practices and busy schedules. Both men and women should be included in community sanitation projects to boost the sanitation sector in the attainment of its goals and specifically meet sanitation targets. This research study gives detailed rich information on women in sanitation, contributes to critical literature, and provides many insights for further research on women's participation in sanitation. It also gives a greater understanding of women's position in sanitation and reduces any kind of potential gender discrimination and promote policy implementation.

Keywords: *Sanitation practices; Gender in sanitation*

SUBTHEME 7: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

63. Determinants of students learning competencies in agriculture through hands-on experiences

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

The overall goal of this study was to assess the implementation of curricula for agricultural courses aimed at equipping students with the requisite emerging competencies that should make them self-reliant after training. Most technical and vocational colleges lack infrastructure such as agricultural laboratories, agricultural tools, equipment and farms for teaching the courses. In Kenya, there is currently no data indicating whether or not students study agricultural courses due to personal interest and conviction or because it was the only option available. The study sought to establish: ways in which teaching methodologies used by teachers' impact the practical competencies gained by learners through hands on experiences, and find out the perceptions of learners towards pursuing further studies and activities in agricultural disciplines. The study observed 89% of those who had two practical lessons in a term indicated that they can practice agriculture on their own. It is concluded that, most teachers engage resource persons in their teaching. Majority of the teachers do not also embark on field trips with their students to places where students can have a real experience of certain concepts or materials that cannot be made available in their school environment for studies. More studies should be carried to explore ways of infusing value based learning employing modern online techniques that enhance learners' competencies in their careers. However, the determinants of students learning competencies in agriculture through hands-on experiences during the changing pedagogies global.

Keywords: *teaching, learning, methodology, practical, competency hands-on-experiences*

64. The administrative use of information communication technology in management of secondary schools

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

This research sought to determine the management of public day secondary schools through infusion of information and communication technology. The study was carried out in Githunguri Constituency, Kiambu County, Kenya. The objective of the Study was to: determine the departments of day secondary school that have been functionally integrated with ICT, establish the strengths of integrating ICT in the running of a day secondary school. The study used descriptive research design. The study sample was 270 participants derived 22 public day secondary schools through stratified techniques. The study's main findings were inadequate awareness by principals on the need for use of ICT integration in management, inadequate ICT resources and related infrastructure and lack of technical support for heads of departments as well as low resource mobilization by board of management influenced ICT integration in public secondary schools to a great extent. The main conclusions of the study is poor attitude towards ICT integration and inadequate resources and lack of technical support were the main hurdles towards ICT integration in school. The study recommended that principals of secondary schools work with the ministry of Education together with the Kenya Institute of Curriculum Development should come up with tailor made ICT integration programs to impart relevant skills, knowledge and attitude to school administrators. Therefore, further studies could be done on the effectiveness of use of ICT in managing secondary school affairs.

Keywords: *Management, principal, department, resource mobilization and strength*

65. Tradition versus change in a time of pandemic: a reading of Meja Mwangi's the last plague

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

This paper explores the varied and complex ways in which allegiance to traditional beliefs and practices impacts a peoples' health in time of pandemic. Using Meja Mwangi's *The Last Plague* as a launching pad, I seek to examine the role of literature in creating awareness during moments of crisis within a society. This paper narrows down to the complexities and contradictions that come into play in the confrontation between indigenous African traditions and the H.I.V A.I.D.S pandemic as portrayed in Meja Mwangi's novel, *The Last Plague*. The paper draws from the sociological literary theory and especially the views of Ngugi wa Thiong'o on the relationship between literature and society. On one hand the paper engages with how the author portrays the impact of the plague on the socio-cultural norms, while on the other hand it addresses the inflexibility of the traditions and cultural beliefs and practices as an impediment to the struggle against the spread of the HI.V pandemic as presented in the novel.

Key Words: *HIV/AIDS, Tradition, Change, Pandemic, Plague, confrontation*

66. The necessity for up-scaling resource mobilization for implementation of competency based curriculum at basics education level

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

School resources comprise of necessary materials both financial and human. A growth towards evidence-based allocation and utilization of school resources is affected by inadequate capacity of the school managers, ministry of education, parents and non-governmental organizations. Inadequate teaching and learning resources limits individual schools' strength to make judicial decisions on equitable trade-offs in education resource demand, supply and consumption. This paper sought to identify the locally available resources for utility in competency-based- curriculum implementation; ways of improving the available resources for enhancing teaching and learning; and analyze factors militating against effective mobilization and utilization of resources at basic education level. Online surveys were used in collecting secondary data. Stratified sampling technique was used in obtaining data from journals, internet, textbooks and research reports. The findings showed that the rural urban migration factors significantly affect trained teachers from arid and semi- arid areas by moving away from their local homes to towns in search for jobs. When learners fail to interact adequately with trained teachers, the consequences are dire resulting to poor acquisition of competencies by learners. The paper established that more than 70% of the teachers teaching at Kakuma Refugee Camp were not sensitive to learner's plights. Furthermore, 60% of the tutors at Kakuma Refugee Camp are untrained in pedagogical and andragogical skills necessary for giving instructions in competency-based-curriculum. The critical mass of activities under CBC including disciplines such as arts, music, and sports all creates new opportunities of supply chains that present avenues for partnering with organizations that support basic education activities. The paper established that the cost of needed materials and trainings for improving implement the CBC was expensive and therefore; action research could explore avenues for economies of scale by sharing materials, orders and coordinating purchases between and among neighbourhood schools. In conclusion, the national and County government's department of preprimary and basic education should generate guidance on the use of alternative and low-cost materials for teaching so as to alleviate the persistence shortages of teaching resources.

Key Words: *resources, mobilization, utilization; competency-based-curriculum; enhancing teaching and learning,*

67. Role of information professionals in alleviating student plagiarism for academic integrity in Kenyan universities: a review of literature

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

Academic integrity is the commitment and demonstration of honest and moral behavior in an academic setting. This is most relevant at the university level as it relates to providing credit to other people when using their ideas. In simplest terms, it requires acknowledging the contribution of other people. Plagiarism is the act of taking someone else's work and passing them off as your own. Student plagiarism is a known problem facing universities around the world. Plagiarism is perceived to be a growing problem in Kenyan universities and these universities are being required to devote increasing time and resources to combating it. This fraud behaviour of students in Kenyan universities is of great concern today. As result of explosion of plagiarism among Kenyan university students, these universities have been using technologies to detect and combat deceitful plagiarism behaviour of students. As information literacy experts, information professionals are especially suited to take the lead in educating students about plagiarism and promoting academic integrity. Librarians working in Kenyan universities can develop information literacy programs to address the issue of student plagiarism. Through combining librarians knowledge of research and information literacy with subject heading, and integrating these skills into the curriculum, students will feel more empowered and competent in their academic assignments. This article will review literature on different types of plagiarism practiced by Kenyan university students and the factors that have necessitated this norm. The paper will also give recommendations on how information professionals can help in alleviating the plagiarism menace.

Keywords: *Information professionals; Plagiarism; Academic Integrity, Information Literacy*

68. Teacher-related factors and quality of education in secondary schools in Kiambu County, Kenya

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

Quality education is one that prepares the child for life and not just for examination and testing. The teacher is an important stakeholder in the providing quality education in schools. Teacher quality is the most critical factor that determines student achievement. However, teacher characteristics have not been exhaustively discussed in relation to quality of education in secondary education cycle in the country. A case in point is Kiambu County where the quality of secondary school education in has been quite low despite the county being a high economic potential area having high socio-economic status in comparison to other counties in Kenya. This study, therefore, sought to find out the connection between teacher factors and quality of education in secondary schools in Kiambu County. The study adopted the scientific management theory by Frederic Tylor and targeted 224 respondents, students, and teachers randomly selected from 120 schools in the area. Data was collected through questionnaires and was analyzed using both descriptive and inferential statistical analysis. The findings revealed that teacher-related factors had a significant correlation with the quality of education in Kiambu County secondary schools. It was, therefore, recommended that the principal and the school Board of Management must ensure that the calibre of staff recruited is qualified, competent and disciplined.

Keywords: *Quality Education, Teacher Factors, Teacher Quality, Secondary Education*

69. Online or not? The future of teaching science and research in Africa - case study, Kenya

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

The year 2020 forced the whole world to examine its working processes and systems and Sectors. One of the most affected systems was the Educational Sector. This is the most pivotal system which is key to the future of nations and survival of the human race. Africa which has 54 sovereign countries with differing economic status and economies was not spared. Comparative to the developing world, most African countries pre the Covid-19 outbreak, the education sector especially science and research called for stringent and important actions to upgrade to international standards. The closure of schools and institutions of tertiary educations following the pandemic disrupted and threw the sector into disarray. The educators were brought into an abrupt apprehension of the importance and relevance of the internet to the educational sector. But, are the systems in place? This is a process that has many connecting dots and joints which must work hand in hand for the Technological Age at hand for the African Continent.

Keywords: *Technology, Tertiary Education, Science and Research, Progress, Education Sector*

70. Enhancing partnerships for industry-led vocational training and education (e-pivot) in the horticulture value chains of Kenya

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

Horticulture is the fastest growing sub-sector in Kenya. It is expected to contribute the most towards the envisioned poverty reduction, and overall food security. It is generally a labour-intensive industry with high demand of skilled workers, trained supervisor and professional managers. Over six million Kenyans are directly and indirectly employed in horticulture, women constitute 75% of the labour force in the horticulture industry. Some of the limiting factors to the sector are availability of water and climate change. The current ATVETs and associated education institutions have a very general focus and there is lack of specialized workforce in horticulture. Through a consortium of 6 ATVETS and MUST we aimed to close those gaps, strengthening the capacity of the ATVETs through a strong collaboration between the education institutions and the private sector, strengthening linkages among the various actors to enable practical learning and innovation in the horticulture sector. This is being done through integrating the curriculum for horticulture, water and climate to suit the needs of the students and tailoring it to the local context. Each of the participating colleges invested in hands-on training through dedicated agricultural innovation hubs and creating strong links with the local stakeholders. To compliment curricula developed by the Curriculum Development Assessment and Certificate Council (CDACC), training manuals have developed for selected courses. The manual provides a practical way of integrating competence based training principles. In addition, tutors have been trained to enhance their capacity to design, deliver and evaluate competence based education. Problem based learning in the Kenyan context as well as joint learning session between Kenyan and Dutch students are non-traditional pedagogy methodologies being explored. While the project is still ongoing working in a consortium led by MUST is highly beneficial to the colleges and surrounding communities, and the quality of the teaching. There has increased interactions between the ATVET tutors and partners within the partnerships created by the project. Additionally, the ATVETs also created more partnerships relevant to their training and practical work.

Keywords: Competence based education, NUFFIC, CBC, CBE, Problem based learning, internationalization, horticulture, CBE, water, resilience, climate, ATVET

71. Phonological analysis of *Kĩtigania* borrowed words from the *Maa* Language: An optimality approach

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Subtheme: Innovative Pedagogies in STEM/STEAM Education amidst Global Crises

Abstract

The notion of loanwords in languages that are in a contact situation is a phenomenon that is very common and unavoidable. For languages of the world, language change is remorseless, inevitable and ceaseless. This is because every day there are new innovations, change of ideas and emerging technologies that force language to be dynamic so as to keep up with the changes. Even as languages borrow, linguistic borrowing which entails loan word adaptation is an overwhelmingly phonological process. This phonological analysis has not been adequately examined in *Kĩtigania* borrowing from the *Maa* language whereby both are in contact situation. That is why this article did a phonological analysis of *Kĩtigania* borrowed words from the *Maa* language using the Optimality Theory's markedness and faithfulness constraints. Data used in this article was collected using descriptive research design. Purposive sampling was done to select ten *Maa* and ten *Kĩtigania* speakers who were neither too old nor too young. These respondents had control over their articulators. Then interviews were conducted with all the respondents to elicit words borrowed to *Kĩtigania* and their meanings. The findings revealed that when borrowed segments are adapted to *Kĩtigania*, they undergo sound modification so that those adapted are faithful to those in the source language (Maa Language) and they are present in the *Kĩtigania* inventory. However, the loans undergo structure modification so as to fit the *Kĩtigania* syllabic structure. Nevertheless, markedness dominated faithfulness in *Kĩtigania* borrowing. Therefore, this article concludes that similarity of sounds between two languages brought by shared features as well as a language's inventory and syllabic structure play a big role in Kĩtigania borrowing. In addition, different repair strategies which result to phonological processes are employed in *Kĩtigania* borrowing. They include; deletion, substitution and voicing or weakening.

Keywords: *borrowing; optimality; markedness; structural well-formedness*

SUBTHEME 8: Business Management and Finance

72. Managerial networking and competitive advantage: the moderating influence of competitive intensity

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Subtheme: Business Management and Finance

Abstract

Because economic action is embedded in networks of inter-personal relations, many scholars have highlighted the importance of social ties in resource exchange for competitive advantage. Thus, through their networking activities and personal interactions, firm executives build social ties not only with business players but also with political entities. Conversely, at the centre of every industry's environment is the concept of competitive intensity defined by Barnett (1997) as the "effect that an organization has on other's survival, regardless of tactics involved". Taking into consideration that managerial networking is widely viewed as far more common, relevant and effective in emerging markets such as Kenya, and further noting that market turbulences in Kenya are generally attributed to competitive pressure brought about by trade liberalization, this study sought to first establish the influence of managerial networking on competitive advantage in medium and large garment companies in Kenya. Subsequently, the study sought to determine the moderating influence of competitive intensity on the managerial networking-competitive advantage relationship in the forestated companies. A cross-sectional survey design was adopted with a sample of 83 firms being drawn from a population of 170 firms. Data was collected through questionnaires where a response rate of 86.7% was attained. Descriptive analysis was undertaken to establish the characteristics of the industry in relation to levels of managerial networking, competitive intensity and competitive advantage. Inferential analysis thereafter, aided in establishing relationships between the variables. The study had hypothesised that competitive intensity negatively moderates the managerial networking - competitive advantage relationship. The findings, however showed that competitive intensity positively moderated the relationship. Consequently, this study recommends that under intense competitive pressure, firms need to identify redundant networks to abandon and strategic networks to retain and join. Further, organizations need to focus on utilizing network resources more effectively for greater ability to adapt and thrive.

Keywords: *Managerial Networking, Competitive Advantage, Competitive Intensity, Business Ties, Political Ties, Financial Ties*

73. Influence of performance expectancy on individual adoption levels of human resource analytics among human resource professionals in microfinance institutions in Kenya

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Subtheme: Business Management and Finance

Abstract

Performance expectancy is when individuals believe an innovation supports their performance. Myriad challenges facing organizations have forced them to innovate to remain competitive. Human resource analytics is one such innovation which measures human resource functions for purposeful alignment with the organizations' objectives. Earlier studies showed that 71% of respondents regarded human resource analytics as key. However, other studies found out that the uptake of human resource analytics was slow. The purpose of this study was to establish the influence of performance expectancy on individual adoption levels of human resource analytics among human resource professionals in Microfinance institutions in Kenya. The study was conducted in registered deposit taking Microfinance Institutions in Kenya. A cross-sectional survey was done on 500 human resource professionals. Stratified random and purposive sampling methods were used, obtaining a sample of 222 respondents. Questionnaires were used to collect data. The findings revealed that using human resource analytics improves job efficiency, making human resource professionals strategic. The study concludes there is a significant positive correlation ($R = 0.754$, $p = 0.00$) between performance expectancy and individual adoption levels of human resource analytics and that performance expectancy has positive significant effect on adoption levels ($\beta = 0.855$, $p = 0.000$). The study recommends that organizations align data analytical tools with management systems and also train its employees to increase the perceived usefulness of human resource analytics hence aiding with adoption.

Keywords: *MFIs, Adoption Levels, Human Resource Data, Human Resource Analytics, Performance Expectancy, Competitiveness*

74. Promoting innovations in SMEs - findings from Kenya

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Subtheme: Business Management and Finance

Abstract

This paper looks closely at the relationship existing between entrepreneurial activity, innovations and the development of Small and Medium Sized Enterprises (SMEs). Most SMEs result from implementing the entrepreneurial spirit, through which the entrepreneurs' activity which is conducted in different domains. One of the most important aspect is the innovation in SMEs as an indicator of the entrepreneurial activity, on the one hand and as a contributor to the organization's performance, on the other hand. This study therefore analyses the SMEs innovation activity over a period of time as an indication of entrepreneurship evolvement and manifested in Kenya as an East African country that integrated relatively recently into the East African Community Common market (EAC). The paper envisages looking at how innovations in SMEs from Kenya have evolved in the period 2010 to date. The innovative activities in SMEs are examined from a dynamic perspective and the analysis is based on the study of a number of aspects related to innovations, such as: types of innovative activities, investments in innovations, the intensity of renewing the existing products, the use of IT, the use of the Internet, etc. Based on these findings, the paper attempts to characterize the innovative activities in Kenyan SMEs and their evolution in time with emphasis on the recent times.

Keywords: SMEs, Kenya, innovation.

75. SMEs and Covid-19. The aftermath:

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Subtheme: Business Management and Finance

Abstract

The Corona-Virus (Covid-19) has had ruthless ramifications on all businesses (Small and Large) since its emergence in 2019/2020. It has devastated jobs and businesses across the globe. SMEs have had the worst experiences caused by this crisis, such as loss of revenue owing to disruptions in organizational structures, supply chains and huge losses as a result. This paper looks at how SMEs have engaged during the period of Covid-19 and the period thereafter. The study is conducted in the context of Kenyan SMEs using a sample of 500 SMEs from both manufacturing and services sectors.

The results indicate that SMEs are now more aware of its effects and relevance to their performance, survival and growth, hence the need for them to focus on innovative ways of cultivating sustainability, way beyond the pandemic.

Keywords: *Covid-19, businesses, SMEs, results, Aftermath*

76. Business and strategic planning: a comparative analysis of two critical aspects of success in business

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Subtheme: Business Management and Finance

Abstract

Small businesses firms remain the most competitive industry, and they require both business and strategic planning in order to remain competitive. Small enterprises, which include agriculture and rural businesses, have made significant contributions to the economy's growth, mostly through the creation of jobs. There have been a lot of failures and a lot of bad shows. Within the first few years, many small enterprises face the prospect of failure. Many small businesses thrive when they launch, but only a handful thrive for the rest of their lives and evolve into big businesses. It has been established that lack of both business planning and strategic planning thwart them from achieving their potential. This study therefore attempts to figure out the relationship between business planning and strategic planning on business success. Based on the study literature, it was established that the most successful businesses use strategic planning, and there is a high failure rate for those who do not. The recommendation is that the business owners should be trained in the skills of both business and strategic planning.

Keywords: *Business Planning, Strategic Planning, Comparative Analysis Business*

77. Relationship between competitive aggressiveness on performance of commercial state corporations in Kenya

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Subtheme: Business Management and Finance

Abstract

This study sought determine influence of Competitive Aggressiveness on performance of commercial State Corporations in Kenya. The study was guided by Resource-Based Theory. the study used a positivism research philosophy. The research study used descriptive research designs which was guided by hypothesis and focused on the frequency with which something occurs or the relationship between variables. The target respondents were three Managers from any department (finance, HR, administration or marketing) within the commercial state corporation. Therefore, the target population was 165 respondents from 55 commercial state corporations in Kenya. The study adopted a census of all the 55 commercial state corporations. The study collected both primary and secondary data and utilize both qualitative and quantitative data. Statistical Package for Social Scientists (SPSS) was used to help in data analysis. Simple linear regression model, and multiple linear regression model were used to assess the relationship between the study variables. From the results of the analysis the study concluded that and competitive aggressiveness influences both financial and non-financial performance of commercial state corporations. The study identifies that organizational structure moderates the relationship between intrapreneurship and performance. The study recommended that commercial state corporations should embrace intrapreneurship. Further managements of commercial state corporations should understand dimensions of intrapreneurship.

Keywords: *Competitive Aggressiveness, Intrapreneurship*

78. 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*

79. Camel herding and commerce: adaptation for reducing poverty through camel meat value additions

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Subtheme: Business Management and Finance

Abstract

Camel rearing among the pastoralist of Northern Kenya is both a socio-cultural and a livelihood phenomenon signifying perceived wealth and authority. This centuries old practice has otherwise enjoyed tranquility and serenity of its stature until various human, technical and environmental changes emerged in the recent years. The onset of climatic changes, marauding urbanization, schooling advances and alternative modern commerce is a beckoning realities to camel herding. The emergencies of these constraints is seemingly threating the camel herding practices in terms of socio-cultural significances, livelihood viability and sustainability as well as herding dividend. Consequently, this study attempts to navigate through the discourse around camel meat products value chains as a commercial adaptation towards improving camel pastoralists livelihoods. This enterprising approach is buttressed in transforming institutional, socio-psychological and technical interventions through research. The objective of the study is to validate viability of camel meat marketing value chains in order to improve camel herders dividend from camel rearing. The key result areas (KRAs) entails characterization of camel meat Value Chain Nods (VCNs), synergization and effectiveness for herders, marketers, butchers, processors and consumers focusing on meat cut, bones, *nyirinyiri*, fat and bone marrow. Descriptive research design employed PESTEL, SWOT and FIEST models for analyzing external, internal and sustainability variables respectively. Data collective tools were FGD (n=47), Interview (n= 47) and questionnaire (n=340) in Isiolo County. The focus of the validation is to understand current practices with a view of enhancing camel meat value addition, value modification and value optimization for stakeholders. Expected research output and outcomes are publications, learning and sharing dissemination workshop as well as poverty reduction, improved quality of life for camel herders and policy influencing.

Keywords: *Value additions, poverty reduction, adaptation, herding, commerce*

SUBTHEME 9: Public Policy and Governance

80. Ideological features in Kenya Supreme Court judgments

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Subtheme: Public Policy and Governance

Abstract

Legal discourse is characterised by unique grammatical, lexical and stylistic features which are meant to enhance clarity and precision in the legal content. However, from a critical perspective, some of the discursive and stylistic features used alienate the common person and elevate judges and lawyers to an ideological pedestal. This study undertook a Critical Discourse Analysis of Kenya Supreme Court judgements on election petitions and civil cases with a view to investigate the discursive features used to represent legal ideology. The study was guided by Critical Discourse Analysis theory and a qualitative research design was used. The population for this study comprised the judgements made by the Kenya Supreme Court since its inception in 2010. Purposive sampling was used to identify five judgements on election petitions and civil cases. Guided by the CDA theory, features representing legal ideology were explored and discussed. The features include use of lexical stylistic features, performative verbs, legitimation, presuppositions, argumentation, interrogative forms, metaphors, precedence and predication. These features were meant to create precision and authority in the Supreme Court judgements. However, from a critical perspective, it was imminent that the features led to elevation of judges and lawyers as custodians of justice while the ordinary person was excluded from the legal process. The insight from this study is applicable to Forensic Linguistics and legal drafting. Judges and lawyers ought to use language in such a way that the common person is not excluded. Technical terminology should be used when necessary more so in contexts that involve only the legal personnel. In legal contexts that involves the ordinary person, plain language should be used.

Keywords: *ideology, discursive features, legal discourse, critical discourse analysis, Supreme Court judgements, election petitions, civil cases*

81. Teacher training pathways for competency based curriculum (CBC) in the university education in Kenya

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Subtheme: Public Policy and Governance

Abstract

The education reform in Kenya recommended phasing out of the 8-4-4 education system to embrace the 2-6-3-3-3 competency based curriculum (CBC). The embraced curriculum has three learning pathways or pillars at senior secondary and university education. The three pathways are Talent Pillar, Languages and Social Sciences Pillar, Science, Technology, Engineering and Mathematics (STEM) pillar. The Higher Education Curriculum Framework (HECF) and universities are yet to provide clear policy guidelines for training teachers and align their skill and competencies with the CBC curriculum framework. The phenomenon is compounded by the fact that, the Ministry of Education through teacher service commission without any empirical data suggested the bedrock of education training programs, the Bachelor of education arts (B. Ed, arts) and Bachelor of Education science (B.Ed. arts) programs to be eradicated in favor of Bachelor of Arts (B.A) and Sciences (B.Sc.) as the pathways to teaching profession through a Post Graduate Diploma in Education (PGDE). The Teachers Service Commission is championing multi-tasking competences where those graduates teaching in secondary schools should be trained to teach more than the traditional two teaching subjects. The Basic Education Curriculum Framework (BECF) has categorized Junior and Senior Secondary School levels which the training of teachers in the university education program must align itself with. While students study all the compulsory subjects in junior secondary, they branch to specialize in their preferred pathways at senior secondary levels. The recruitment of students to both public and private universities for teaching career is based on high school credentials that have now to consider talent including talents in sports, creative and performing arts. The study was designed to explore the teacher training programs embracing talent for university education in order to address both the needs of Junior and senior secondary schools under the three pillars embraced in the Competency Based Curriculum (CBC) in Kenya.

Keywords: *Competency Based Curriculum (CBC), Bachelor of Education (B.Ed.) Program, Talent Pillar, Bachelor of Arts (B.A) Program, Bachelor of Science (B.Sc.) Program*

82. Determination of the effect of human capital on service quality of accredited universities in Kenya.

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Subtheme: Public Policy and Governance

Abstract

Design/Methodology- 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.*

83. Social media and fake news: boon or bane for journalism?

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Subtheme: Public Policy and Governance

Abstract

The upsurge and growth in the uptake of social media has had a profound impact on journalism as it has traditionally been practised. Social media has permeated all aspects of human activities and brought with it negative as well as positive effects on society. It has not only affected the way we communicate, socialize and work, but also view the world. This new media has affected the way the profession of journalism is practised. It has made it possible for persons without any training in journalism – bloggers to write and post stories without any censorship. Some of the stories are sensational fabrications lacking facts and professional editorial input – they are fake news. Social media has enabled persons without any publishing knowledge to publish newspapers, magazines and books without going through the editorial vetting process. It has enabled journalism to become a free-for-all trade where anyone who is IT savvy can write and post content that will be readily consumed by an international audience. This is done in utter disregard of journalistic code of practice and is devoid of professional ethics. The end result has been a plethora of publications which are poorly written, poorly edited and utterly lacking in authenticity and artistic creativity as we have always known it. Not all is bleak however. Social media has come with a number of advantages that have impacted the way we work, behave and relate. Social Media has had a positive effect on society; be it in business, or in education, it has helped us to stay updated on current affairs and new developments, communication and health. Through social media, there has been an increase in the uptake of skills, new technology and information dissemination. It has revolutionized the work of journalism and made communication easier and faster. This paper has used library and internet research to evaluate the impact of social media on journalism and to suggest possible solutions to the problem of proliferation of fake news.

Keywords: *Social media. Positive effects • Negative effects • Publish . Vetting • Free for all • Audience • Online media. Content. Professional ethics*

AUTHOR INDEX