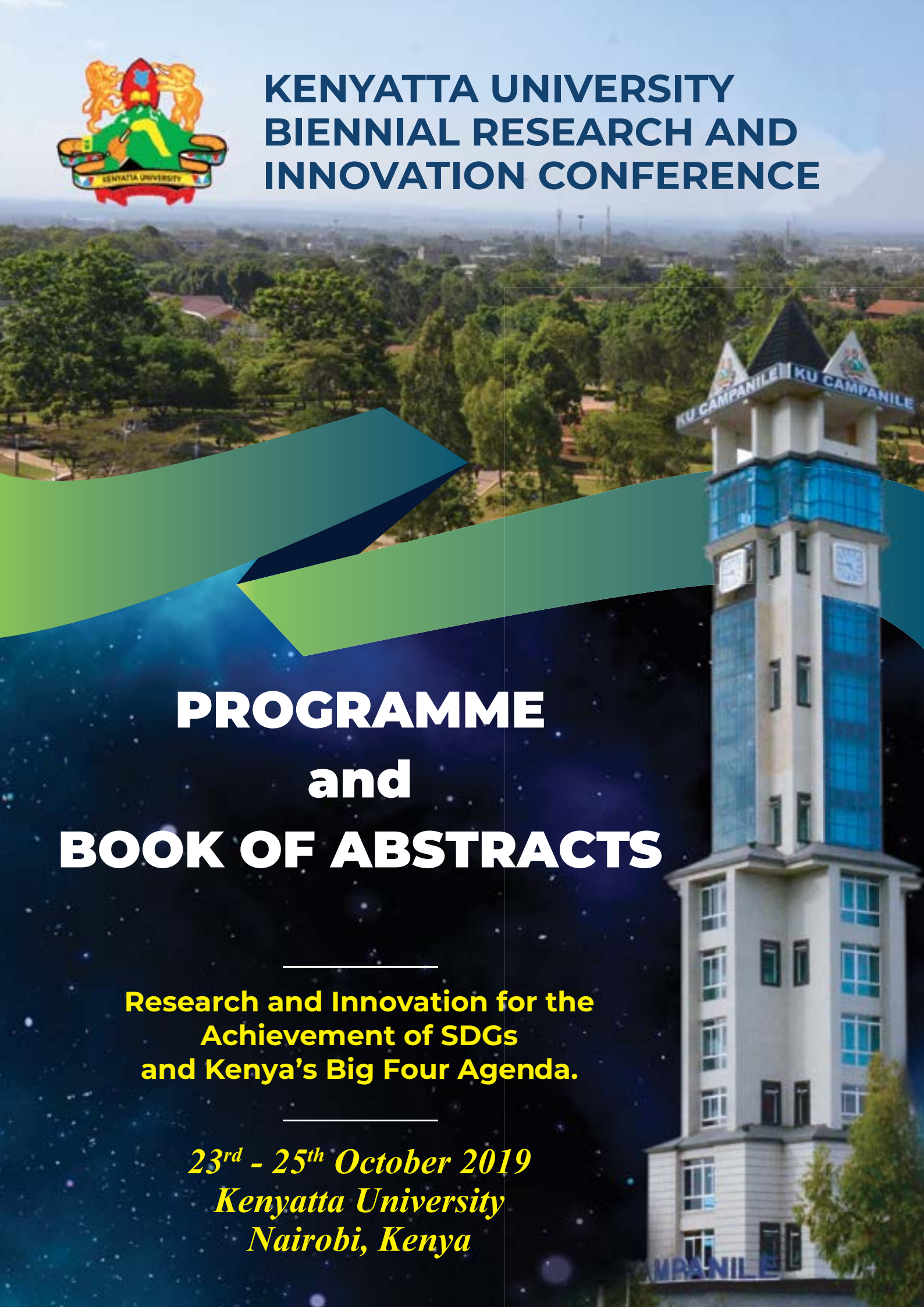
KENYATTA UNIVERSITY BIENNIAL RESEARCH AND INNOVATION CONFERENCE



PROGRAMME and BOOK OF ABSTRACTS

Research and Innovation for the Achievement of SDGs and Kenya's Big Four Agenda.

23rd - 25th October 2019
Kenyatta University
Nairobi, Kenya

UNIVERSITY FUNDAMENTAL STATEMENTS

VISION STATEMENT

The Vision of Kenyatta University is to be a dynamic, inclusive and competetive centre of excellence in teaching, learning, research and service to humanity

MISION STATEMENT

The Mission of Kenyatta University is to provide quality education and training, promote scholarship, service, innovation and creativity and inculcate moral values for sustainable individual and societal development

IDENTITY STATEMENT

Kenyatta University is a community of scholars committed to the generation and dissemination of knowledge and cultivation of wisdom of the welfare of society

CORE VALUES

Truth, Creativity, Excellence, Self Reliance, Innovation, Equal Opportunity, Corporate Governance, Institutional Culture, Competitiveness, Academic Freedom and Respect for Diversity

PHILOSOPHY STATEMENT

Sensitivity and responsiveness to societal needs and the right of every person to knowledge

KENYATTA UNIVERSITY BIENNIAL RESEARCH AND INNOVATION CONFERENCE

23rd - 25th October 2019

Kenyatta University
Nairobi, Kenya.

CONFERENCE THEME:

RESEARCH AND INNOVATION FOR THE ACHIEVEMENT OF SDGs AND KENYA'S BIG FOUR AGENDA.

TABLE OF CONTENTS

CONFERENCE SUB-THEMES

- Health and wellbeing
- Food security and sustainable agriculture
- Transformative, inclusive and equitable quality education
- Gender and development
- Infrastructure development, energy and industrialization
- Environment, natural resources, climate change and sustainability
- National values, social cohesion, peace and development
- Visual and performing arts, music, sports, hospitality, tourism and development

CROSS-CUTTING ISSUES

- Partnership for impactful research and development
- Innovation management, technology transfer and entrepreneurship

LOCAL ORGANIZING COMMITTEE

Conference Host

Prof. Paul K. Wainaina, Ph.D.
Vice Chancellor, Kenyatta University

Chairman LOC

- Prof. Frederick Q. Gravenir
  DVC Research, Innovation and Outreach

Secretary LOC

- Prof. Vincent O. Onywera, Ph.D, ISAK 2
  Registrar Research, Innovation and Outreach

Resource Mobilization

- **Dr. Rose Otieno - Convenor**
- Dr. Gabriel Warmi
- Mr. Jones Wambua
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- Mr. Patrick Wang'ombe
- Mr. Laban Migudi

Exhibition

- **Dr. George Kosimbei - Convenor**
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- Dr. Onesmus Thuo
- Ms. Anne Kariuki
- Mr. Kenneth Njoroge
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- **Prof. Grace Bunyi - Convenor**
- Dr. Esther Munyiri
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- Ms. Ruth Kinyingi

Scientific

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- Dr. Gladys Mwangi
- Dr. Teresa Mwoma
- Dr. Emmanuel Shikuku
- Dr. Vincent Were
- Dr. George Owino
- Mr. Franklin Mwango
- Ms. Martha Wainaina
- Ms. Sylvia Anzagi
- Ms. Tindi Sweeny

Secretariat

- **Ms. Martha Wainaina - Convenor**
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- Ms. Violet Tindi Sweeny
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- Mr. David Werimo

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United Nations Educational, Scientific and Cultural Organization

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National Commission for Science, Technology and Innovation

EXHIBITORS

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MESSAGE FROM THE CHIEF GUEST

I am pleased to preside over and celebrate the research and innovation during the Kenyatta University's Biennial Research and Innovation Conference whose theme is, "Research and Innovation for Achievement of Sustainable Development Goals and Kenya's Big Four Agenda". I wish to thank Kenyatta University most sincerely for organizing this meeting. On my own behalf and on behalf of the Kenya National Qualifications Authority (KNQA), I congratulate Kenyatta University leadership for ensuring that researchers from around the world congregate here every two years to present their findings and innovations for sustainable development.

Hosting this conference is a bold initiative that deserves commendation. And this is not the only conference we have witnessed at Kenyatta University in 2019. Three months ago the university hosted a pre-conference on the Competency Based Curriculum (CBC). I challenge all university and tertiary education stakeholder to continue supporting the CBC as the Government rolls it out. I believe that quality education will lead to the formation of quality researchers and hence growth and development in our country.

The KNQA is committed to work with relevant stakeholders including universities in coordinating and harmonizing various levels of education as well as creating a database of all qualifications in the country. We as an authority have developed an accurate, reliable and robust national database of all qualifications in the country that will allow for comparability, equation, recognition and information sharing of qualifications globally. This will improve accountability as well as promote academic and research excellence in Kenya and beyond.

I am pleased to note that this conference is coming at a time when the Government is rolling out the Big Four Agenda in-line with Kenya Vision 2030. As KNQA, we take keen interest in research and innovation because they are the backbone of the development agenda of any society. Universities are therefore expected to contribute to nation building as well as responding to global obligations such as the UN Sustainable development goals (SDGs) through research, innovation and community outreach. The role of universities in sustainable development including Kenya's Big 4 Agenda is most valuable for the public and private sector in several ways including:

a. Contributing to fundamental research and innovation
b. Education and training
c. Creating space for open exploration of ideas
d. Combining existing knowledge
e. Community outreach

I wish you fruitful deliberations and look forward to the outcome of this conference.

DR. JUMA MUKHWANA

DIRECTOR GENERAL AND CEO,
KENYA NATIONAL QUALIFICATIONS AUTHORITY

MESSAGE FROM THE CHAIRMAN OF COUNCIL

I am delighted to welcome all of you to the Kenyatta University Biennial Research and Innovation Conference. I wish to sincerely thank Kenyatta University management and the Senate for organizing this conference. On behalf of the Kenyatta university council and on my own behalf we are pleased to witness this occasion and are proud of the progress made on many fronts within the university.

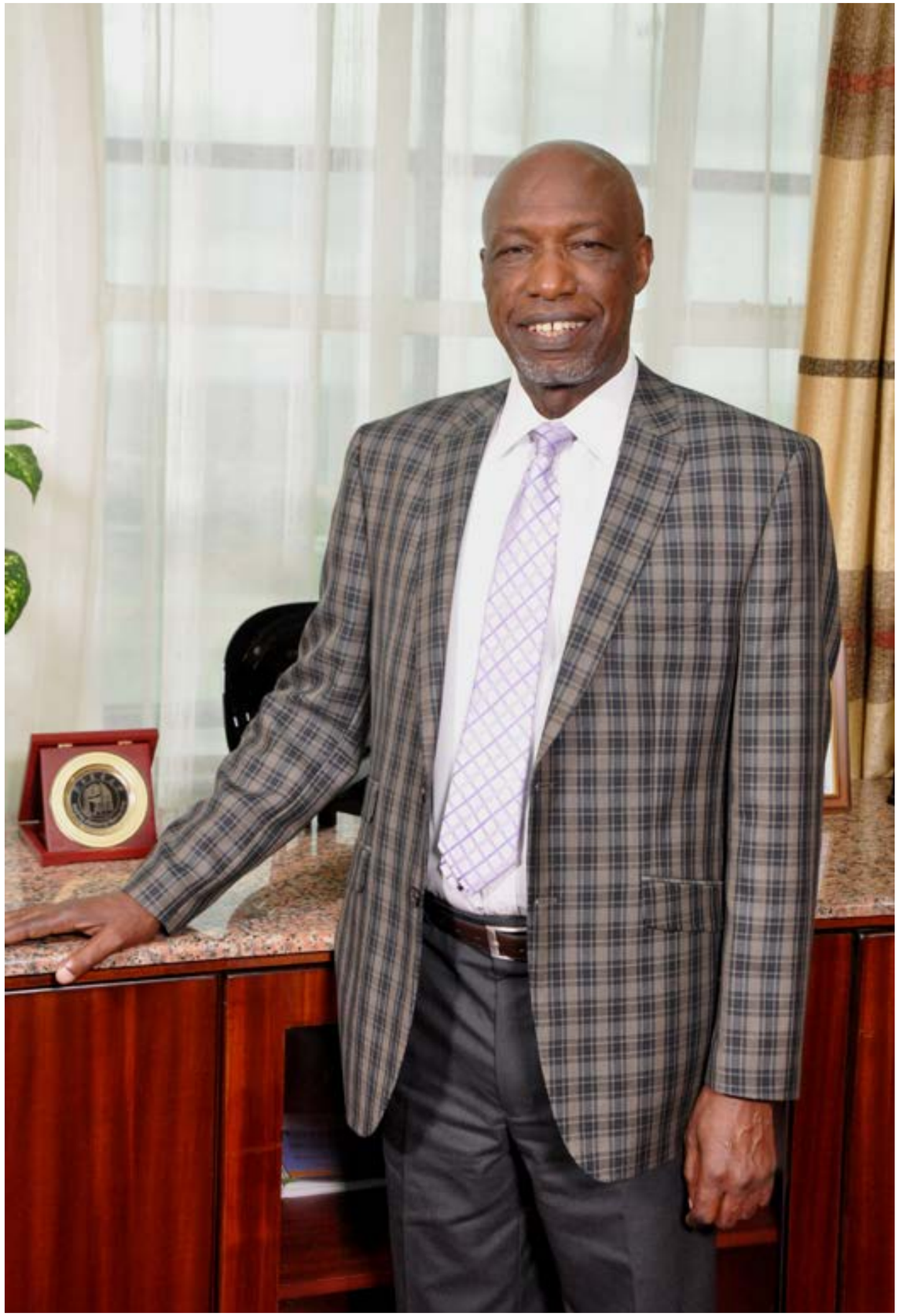
The Kenyatta University Biennial Research and Innovation Conference (KUBRIC) – 2019 is happening at a time when the Government is implementing the Kenya's Big Four Agenda in line with Kenya Vision 2030 as well as Sustainable Development Goals. It is also taking place when the Government is rolling out the Competency Based Curriculum. I therefore want to commend the University for organizing this event that has brought together the academia, researchers, practitioners, policy makers and other the stakeholders across the world to share of scientific information.

This conference is testimony to our standing as a world-class research institution that is committed to our core mandate. The purpose of research is to inform action and research findings have implications for policy and practice. One challenge, however, that often plagues progress in research is the slow translation of findings into practice. There is sometimes a disconnect between those who conduct research and those who are positioned to implement the research findings. We are currently facing the fourth industrial revolution which brings with it a series of social, political, cultural, and economic upheavals that will unfold over the 21st century. Building on the widespread availability of digital technologies that were the result of the third industrial, the fourth industrial revolution will be driven largely by the convergence of digital, biological, and physical innovations informed by research. As a University council we are committed to support the university to achieve its core mandate through the provision of necessary resources.

We wish you fruitful deliberations

PROF. SHEM E.MIGOT- ADHOLLA,
CHAIRMAN OF COUNCIL, KENYATTA UNIVERSITY

Image courtesy of : hfgroupcco.ke/documents/HF-Annual-Report-Final-2014.pdf



MESSAGE FROM THE VICE CHANCELLOR

It gives me great pleasure to welcome you to Kenyatta University for our Biennial Research and Innovation Conference (KUBRIC) - 2019. This international biennial conference whose theme is, "Research and Innovation for Achievement of Sustainable Development Goals and Kenya's Big Four Agenda", provides a forum for academia, researchers, practitioners, policy makers and other the stakeholders across the world to share of scientific information including new innovations. This conference is testimony to our standing as a world-class academic and research institution that is committed to our core mandate.

Kenyatta University's Strategic and Vision Plan commits the University to distinguished scholarship, reputable research, innovation and community service. We continue to provide the necessary infrastructure and support to all our researchers so that they can excel in their work. Our commitment to research is in line with our overarching goal to encourage more postgraduate studies, increase the production of research outputs as well as expand the pool of researchers who can contribute to knowledge production and generation in our society.

The University remains committed to providing quality education and training, promote scholarship, service, innovation and creativity and inculcate moral values for sustainable individual and societal development. Research and innovation forms the backbone of any economy. Kenya's economy revolves around various sectors, which contribute to economic growth and job creation either directly or indirectly. The linkages between these sectors forms the basis on which Kenya's economic blueprint Vision 2030 and the Big Four Agenda are anchored. The Academia, is one of the key sectors of an economy and therefore serves as a strategic vehicle for achieving the Sustainable Development Goals. The deliberations we are going to have during this three day conference will therefore not only impact on Kenya's economy, but also transcend our borders to the rest of the world. This research and innovation conference will therefore provide us with the opportunity to uniquely contribute to the sustainable development of our nations, and I therefore urge all of us to share our valuable research findings and insights.

I would like to congratulate and thank the Local Organizing Committee for their commitment and strong drive in organizing this conference. I am very certain that this occasion will be able to provide a platform towards strengthening our relationships in knowledge sharing while at the same time provide the necessary thrust in joint research collaborations and product commercialization within the research community and beyond. It is my aspiration that this conference will be a foundation for the growth of new ideas towards a better tomorrow. Last but not least, I would also like to thank all the conference industry sponsors and the delegates. With your continued support and interest in us, I am sure that the quest of making KU a top class university is not going to be impossible to achieve.

PROFESSOR PAUL K. WAINAINA, Ph.D.
VICE CHANCELLOR, KENYATTA UNIVERSITY

MESSAGE FROM THE CHAIR LOC, DVC - RIO

On behalf of the Local Organizing Committee, I am delighted to warmly welcome you to the Kenyatta University Biennial Research and Innovation Conference to be held from 23rd – 25th October, 2019 at the University's Main Campus located along the Thika-Nairobi Superhighway. The conference theme 'Research and innovation for the achievement of sustainable development goals and Kenya's Big Four Agenda' has been carefully selected in order to provide academia, private sector, government and other stakeholders with the opportunity to review and discuss the state of knowledge and practice in the priority areas of development in line with Africa's development agenda, the sustainable goals and Kenya's Big Four Agenda; to identify solutions in the gaps identified in the prioritized research themes and sub-themes as well as to strengthen interactions, networking, collaborations and linkages for inclusive and sustainable development. We are privileged to host various specialists, experts, practitioners and scholars, I express my gratitude to our three distinguished key note speakers Prof. Washington Yotto, Head of the Centre for Transport Studies at Imperial College London and Chair of Positioning and Navigation Systems; Prof. Elizabeth Bukusi, Chief Research Officer at the Kenya Medical Research Institute (KEMRI), and Research Professor at the University of Washington (Departments of Obstetrics and Gynecology and Global health); Prof. Hamadi Boga, Principal Secretary State Department for Crop Development and Agricultural Research; panelists and invited guests for taking time off their busy schedules to give us their perspectives on their respective areas of expertise, I hope that you shall find the speakers and topics most informative. I equally acknowledge the delegates, exhibitors, participants and our invited guests for enriching the conference with their presence.

The three-day technical program will be preceded by a pre-conference scientific workshop on Tuesday 22nd October, 2019 that will focus on research ethics, scientific communication and writing targeting early career researchers and postgraduate students. The pre-conference workshop will provide participants with basic skills to effectively communicate their research either through publishing, presentation at scientific congresses, conferences and seminars while the topic on research ethics will seek to addresses the application of ethical principles or values to the various issues and fields of research, treatment of research participants both human and animals as well as aspects of scientific misconduct.

Three panel sessions focusing on Universal health coverage, agriculture and food security and affordable housing and manufacturing will be spread across the 3-day conference, running alongside the four parallel sessions which present the delegates with an opportunity to be involved in interesting discussions and interactions intended to contribute to realisation of the national and regional development frameworks. An equally exciting social program has been prepared during which delegates can network, exchange information and perspectives, and generally enhance contacts and friendships with one another.

Finally, I would like to express my sincere gratitude to all members of the local organizing committee, sub-committees andeverybody else involved in themeticulous organization of this conference. My deepest appreciation goes to all our sponsors and partners for supporting us to make the conference a remarkable event.

I wish you all a very successful Conference with fruitful discussions.

WELCOME TO KENYATTA UNIVERSITY!!

PROFESSOR FREDERICK Q. GRAVENIR
DEPUTY VICE-CHANCELLOR,
RESEARCH, INNOVATION AND OUTREACH,
KENYATTA UNIVERSITY (RIO)

MESSAGE FROM THE CHAIR SCIENTIFIC COMMITTEE

On behalf of the Scientific Committee of the Kenyatta University Biennial Research and Innovation Conference 2019, I wish to welcome you all to our meeting. As evidenced by our program and the speakers, this conference aims at providing innovative approaches to the achievement Kenya's Big Four Agenda as well as Sustainable Development Goals from a wide range of perspectives. The theme of the conference "Research and Innovation for the achievement of Sustainable Development Goals and Kenya's Big Four Agenda" is meant to stir up debate and discussions on the role of researchers, industry, practitioners as well as policy makers in contributing to our national development agenda and global commitments. With several sub-themes, the scientific sessions are planned to include areas of tremendous importance and includes speakers drawn from all over our country Kenya and abroad.

We are pleased to note that we received over 250 abstracts with close to 400 delegates from around the globe participating in the conference. The scientific program is therefore going to be a delight. We have a mix of plenary and break away sessions, exhibitions as well as pre-conference workshops. The scientific committee has blended the presentations and we hope you find the program interesting and informative. The audience has a major role in this conference as majority of the scientific discussions are related to debates and issues that we face daily. Active participation will therefore go a long way in making the various scientific sessions highly interesting. I am confident that with your contribution, whether in a plenary oral or visual presentations, in discussions, comments or questions, the conference will provide a great forum for exchanging ideas and information. I am sure that you will enjoy this conference, and find it a stimulating and informative meeting. I take this opportunity to request you to actively participate to add to the richness of this conference and make it memorable event.

I sincerely express my gratitude and thanks to Prof. Paul Wainaina, the Vice Chancellor Kenyatta University and Prof. Frederick Gravenir the Deputy Vice Chancellor (Research Innovation and Outreach) for their mentoring guidance and support in making the scientific schedule and proceedings a big success. I also extend my thanks to all the members of the Local Organizing Committee (LOC), members of the Scientific Committee as well as the Secretariat for their wholehearted support for the scientific proceedings.

Wishing you a wonderful scientific week at Kenyatta University.

PROF. VINCENT O. ONYWERA, PH.D, ISAK 2

REGISTRAR RESEARCH, INNOVATION AND OUTREACH AND CHAIRMAN SCIENTIFIC COMMITTEE

KUBRIC 2019

PLENARY KEYNOTE SPEAKERS

Professor Elizabeth A. Bukusi,

MBChB, M.Med (ObGyn), MPH, PhD, PGD (Research Ethics), MBE, CIP.

Professor Elizabeth A. Bukusi earned her general medical degree and Masters in Obstetrics and Gynecology degree from the University of Nairobi. She then earned a certificate in international health, MPH and a PhD from the University of Washington's Department of Epidemiology; a post graduate diploma in Research Ethics from the University of Cape Town and a Masters in Bioethics from Centre for Bioethics and Culture at the Sind Institute of Urology and Transplantation in Karachi. She is a certified IRB Professional. She is a Chief Research Officer at the Kenya Medical Research Institute (KEMRI), a Research Professor at the University of Washington (Departments of Obstetrics and Gynecology and Global health), an honorary lecturer at Aga Khan University in Nairobi (Department of Obstetrics and Gynecology) and Volunteer Clinical faculty – Professor at the University of California San Francisco (Department of Obstetrics, Gynecology & Reproductive Sciences). Her primary areas of interest in research focus on sexually transmitted infections, reproductive health, and HIV prevention, care and treatment and she has a keen interest in research and clinical ethics/ research regulatory systems. She is a member of the Kenya National AIDS Control Council HIV prevention Task force and a member of the Board of Management of the South African Medical Research Council). She is also a board member of AVAC. She serves on the Advisory Board of International Centre for Reproductive Health (ICRH), is a trustee for the HIV Trust, and an Elected Fellow of the African Academy of Sciences (FAAS).

Prof Washington Yotto Ochieng,

FREng, CEng, FICE, FCIHT, FRIN, FCInstCES.

Professor Ochieng is the Head of the Centre for Transport Studies (CTS), and Chair Professor in Positioning and Navigation Systems at Imperial College London. CTS is one of the largest transport research and education groups in the world covering all modes of transport including planning, demand modelling, design, intelligent systems, operations, safety/security, environment and economics. As Head of CTS, Ochieng is responsible for its research mission, strategy and delivery. He is a Chartered Engineer and Fellow of the UK's Institution of Civil Engineers, Chartered Institution of Highways and Transportation, the Royal Institute of Navigation and the Chartered Institution of Civil Engineering Surveyors. He is a Member of the United States Institute of Navigation and Associate of the International Association of Geodesy. He has successfully supervised 40 PhD students, published more than 150 papers in the leading international scientific journals and acquired research grants of more than UK£12 million. Ochieng has made very significant contributions globally to the design of complex safety-critical engineering systems, including space-based navigation and intelligent transport systems. Ochieng's leadership in research is evidenced by both discovery of new ideas/concepts and their impact both in advancing science and practice as well as experience in providing expert input for policy and standards development. Ochieng's exceptional contribution to Engineering was recognized in 2013 by election to the prestigious Fellowship of the Royal Academy of Engineering.

Prof. Hamadi Iddi Boga

Prof. Boga is the Principal Secretary of the State Department for Crop Development and Agricultural Research in the Ministry of Agriculture, Livestock, Fisheries and Irrigation in the Government of Kenya. He is the former founding Principal of Taita Taveta University and was its Vice Chancellor between 2007 and 2017. He was a Professor in the department of Botany at the Jomo Kenyatta University of Agriculture and Technology. His skills and interests are in biology, agricultural science, sequencing, microbiology, molecular biological techniques and RNA genes. He also has an interest in microbial ecology of insects' guts, soils and soda lakes and has worked with termites, the soda lakes of Kenya, mangrove swamps, agricultural and forest soils and also on Mount Kenya glacier. He has a PhD in Biology from Universität Konstanz in Germany.

PROGRAMME

22nd October 2019

Pre-conference workshop for postgraduate students and early career researchers

TOPICS:

i) Scientific Writing and Communication
ii)Research Ethics

VENUE:

Kenyatta University Business and Students Service Centre
TIME: 8.00 a.m. – 4.00 p.m.

23rd October 2019

8.00 a.m – 8.30 a.m	**Registration of Delegates**
8.30 a.m. – 10.00 a.m.	**Official Opening Ceremony**
	• Welcome Remarks - Prof. Vincent Onywera - **Registrar (Research, Innovation & Outreach) and Chair, Scientific Sub-Committee** • Brief Remarks - Prof. Frederick Gravenir - **DVC (Research, Innovation & Outreach) and Chair, Local Organizing Committe**e • Remarks - Prof. Paul K. Wainaina - **Vice-Chancellor and Conference Patron** • Remarks - Prof. Shem E. Migot-Adholla- **Chairman of Council, Kenyatta University** • Speech and Official Opening of Conference - **Dr. Juma Mukhwana - The Director General and CEO, Kenya National Qualifications Authority**
10.00 a.m. – 11.00 a.m.	**HEALTH BREAK AND PHOTO SESSION**
11.00 a.m. – 11.50 a.m.	**Session Chair: Prof. Judith Kimiywe** –Chair, Kenyatta University Ethics Review Committee **Rapporteur: Dr.Juliet Makanga** -Department of Pharmacology and Clinical Pharmacy, Kenyatta University **Keynote speaker: Prof. Elizabeth A. Bukusi**, MBChB, M.Med (ObGyn), MPH, PhD, PGD (Research Ethics), MBE, CIP - Chief Research Officer at the Kenya Medical Research Institute (KEMRI) **Title of presentation: Bioethics in Research and Innovation: Is this key for SDG and Kenya's Big Four Agenda?**
11.50 a.m. – 1.00 p.m.	**Panel Discussion: Focus on Universal Health Coverage** **Moderator: Ms.Ankey Doris –Kenyatta University Television** **Panelists:** 1. **Prof. Elizabeth A. Bukusi** - Chief Research Officer at the Kenya Medical Research Institute (KEMRI),Kenya 2. **Dr. Rashid Amani** - Chief Administrative Secretary, Ministry of Health, Kenya 3. **Dr. Eva Njenga** - Consultant Physician/Endocrinologist and Chairperson Kenya Medical Practitioners and Dentist Board 4. **Prof. Mikael Fogelholm** - Professor of nutrition science, University of Helsinki, Finland 5. **Prof.Vincent O. Onywera** - Professor of Exercise and Sports Science, Kenyatta University, Kenya 6. **Dr. Andrew Mulwa** - CEC for Health Services, Makueni County, Kenya
1.00 p.m. – 2.00 p.m.	**LUNCH BREAK AND VISIT TO EXHIBITION STANDS**

2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS I				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Sub theme: Health and well-being **Track 1: Non - communicable Diseases** **Session Chair: Dr. Harun Kimani** **Rapporteur: Dr. James Ogutu** *Mujaheed Abubakar, Hassan Abdullahi, Zakariya Ali Muhammad, Abdulrazak Mohammed Hussein And Abdulkahar Lawal* **Title: Ethnobotanical Survey On Medicinal Plants Used For The Management Of Diabetes Mellitus In Hadejia Town, Nigeria.**	**Sub theme: Gender and development** **Track 1: Gender Leadership and Development** **Session Chair: Dr. Pacificah Okemwa** **Rapporteur: Dr. Sarah Fedha** *Prof Grace Wamue-Ngare* **Title: The Two-Thirds Gender Principle: A Constitutional Illusion for Women's Leadership in Kenya**	**Group 3. Visual and Performing arts, Music, sports and development** **Session Chair: Prof. Elijah Gitonga** **Rapporteur: Dr. Edna Thangu** *Ogunseemi, O. E. Aribamikan C. G.*	**Subtheme: Environment, Natural resources, Climate change and Sustainability** **Track 1: Session Chair: Prof. Simon Onywere** **Rapporteur: Dr. Christine Majale** *Felix Lamech Mogambi Ming'ate1, Mũsingo Tito E. Mbuvi And Nahama, Eric Teata* **Title: Promoting Secondary School Students' Learning Of Soccer Skills Through Science Process Skills – education**	**Symposium 1** **Title: Neglected Aspects Of Non-Communicable Diseases Control In Kenya** **Session Chair: Dr. Eva Njenga** **Rapporteur: Dr.Catherine Karekezi** ***Presentation 1:*** ***Tentative title: Living with NCDs impact on health and well-being NCDAK member living with an NCD (to be identified)***

23rd October 2019

2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS I				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Jane Kinuthia, Dr. Phillip Wambua, Dr. David Kiiru **Title: Depression And Employee Productivity.** *Ms Charlote Midiwo, Daniel Okun, Samson Gwer, Gordon Ogweno* **Title: Plasma Carbonic Anhydrase Ii Levels Associated With Increased Complications In Sickle Cell Disease.**	*Enoch Harun Opuka, Catherine Ndungo, Mary Runo* **Title: Gender Mainstreaming of The Deaf – The Case of Uasin Gishu** *Christine Njue and Eucharia Kenya* **Title: Women Scientists as Role Models: Forging Forward with The Girl-Child Education Agenda in Africa** *Pacificah Florence Okemwa* **Title: Women, Care Giving And Recognition: A Case Of Domestic Workers' Role In Development In Kenya**	*Dr Esther Kagure Munyiri Edgar Ndubi and Sisinio Muthengi* **Title: Developing And Marketing Cultural Tourism In Kenya Using Geographic Information System** *Angeline Wangui Kinyanjui* **Title: Tourism Resilience And Business Continuity In The Hotel Sector In Kenya** *Jockey Baker Nyakaana*	**Title: Preparation For Partnerships In The Establishment Of Forest Resources And Resource User's Boundaries In Kenya** *Frank Van Steenbergen* **Title: Roads: Instruments For Rainwater Harvesting, Food Security And Climate Resilience In Arid And Semi-Arid Areas** *Shamsu I. I, Safianu R., Abdulkahar L.Abdallah, M. S.*	**Presentation 2: Tentative title: Impact of air pollution on human health** *Dr. A Mbandi, Stockholm Environment Institute* **Presentation 3: Tentative title: Role of nutrition in NCD control** *Dr. Peter Mokaya, Organic Consumers Alliance* **Presentation 4: Tentative title: Aspects of mental wellness and control of NCDs** *NCDAK member (to be identified)* **Presentation 5: Tentative title: Role of palliative and rehabilitative care in control of non-communicable diseases** *Dr Zipporah Ali, Kenya Hospices and Palliative Care Association (KEHPCA)*

23rd October 2019

2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS I				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Stephen Odhiambo Ogweno **Title: My heart Ke. – Integrating Technology And Primary Health Care In Cardiovascular Health Promotion.** *Owino, George Evans (PhD) , Dipondo, Dinah & Juma, Moses* **Title: Socially Constructed Meanings Of Healthy Foods And Physical Activity And Their Implications For Ncd Prevention.** *Nicholas Odhiambo Onguto, Isaac Mwanzo, Peterson Warutere*	**Track 2: Gender, livelihoods and Development** *Amenger Henry Serumun* **Title: Poverty and Gender Inequality in Nigeria: Implications for Sustainable Development** *Samuel Kimani Kiumbuku, Mary Wamuyu Baaru, Jane Wanza Mutinda* **Title: Gender Analysis of Livelihoods Adaptive Capacity to Drought in Semi-Arid Makueni County in Kenya.**	**Title: Enabling Community Participation In The Tourism Value Chain: An Evaluation Of The Handicraft Industry In Uganda.** *Leah. W. K. Maringa* **Title: Influence Of Organizational Culture On Women Career Advancement In Three To Five Star Hotels In Nairobi City County.** *Michael Kiyogo and Doris Alago* **Title: Building On The Tourism Circuit In Kenya: The Role Of Market Development Strategies In Hotel Industry** *Ndungu David M.,Tteresa Kinuthia & Alice Nzioka*	**Title: Early Dry Season Species Diversity, Population Size And Habitat Association Of Birds In Kano, Northern Nigeria** *Waswa Wangai Nalwa* **Title: Potential Of Roof Catchment Rainwater Harvesting And Management Implications At Kenyatta University Kenya** *Karugia Elijah S. Kamau* **Title: Impact Of Conservation Status Dynamics On Resilience And Productivity Of Herbaceous Forage In Kivaa And Ntugi Watersheds In Eastern Kenya.** *Dr. Regina Ntabo*	

KUBRIC 2019

23rd October 2019

2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS I				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Socio - Demographic And Work-Related Factors Associated With Self-Reported Injuries Among Welders In Nairobi. *George Omolloh, Evans Changamu, Lucy Kiruri, Kibe Macharia* **Title: Moving Domain Qm/Mm Methods For Determination Of Interactions Between Human Estrogen Receptor Alpha And Endocrine Disrupters.** *Veronica Ngatia, Dr. Beatrice Kathungu* **Title: Social - Emotional Intelligence As A Moderator Of Health And Well-Being.**	*Dr. Muthoni Mainah, Dr. Patrick Mbataru* **Title: Impact of Gender Shift In Floodplain Farming on Local Livelihood And Food Security In Kiambu County** *Nathaniel Kabala and Pacificah Florence Okemwa* **Title: Impacts Of Insecure Livelihoods On Men's Participation In Development: A Case Of Mukuru Informal Settlement In Nairobi County, Kenya**	**Title: Value Co-Creation On Guests' Loyalty In Classified Vacation Hotels In Mombasa County, Kenya** *Catherine Muyama Kifworo* **Title: The Role Of Tourism Entrepre-neurship In Bridging The Gender Gap And Promoting Sustainable Development: Challenges And Opportunities** *Wanjiku Joseph Thukia* **Title: The Role Of Universities In Sustainable Development Goals: The Erasmus+ Program Focus**	**Title: Bioprospecting Of Endophytic Bacteria From Selected Kenyan Mangrove Plants As Potential Sources Of Enzymes And Antimicrobial.** *Samuel Kimani Kiumbuku, Mary Wamuyu Baaru, Jane Wanza Mutinda* **Title: Spatial And Gendered Perception Of Impacts Of Rainfall Variability On Rural Livelihoods: In-ter-Household Assessment Of Three Livelihood Zones In Lower Eastern Kenya.**	

23rd October 2019

2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS I				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Social - Emotional Intelligence As A Moderator Of Health And Well-Being. *Ochoo L.awrence, Nyenge Raphael* **Title: Electro - magnetic Field Technology as Profiler for Cancer Diagnosis and Treatment Monitoring** *Regina Wachuka Mbugua and Sumesh Chander Chhabra* **Title: Anti-proliferative Potential Of Selected Kenyan Aromatic Plants Against Breast And Prostate Cancer**		*Omoke Japheth Omae* **Title: The Efficacy Of Talent Management Adoption On Enhancing Tourism And Hospitality Product (Classification And Standardiza-tion) In Five Star Hotels In Nairobi County** *Dr. Edgar Otsembo Ndubi, Dr. Shem Wambugu Maingi, Dr. Mary Mutisya Mutungi* **Title: Role Of Customers' Brand Perceptions On Place Brand Equity In Western Kenya Tourism Circuit** Sisinio Muthengi **Title: The Nature Of Urban Tourism Development; Using The Destination Transition Possibilities For Nairobi City County, Kenya**	*Adamu Ahmed* **Title: Climate Change In Extreme Northern Nigeria: Evidence From Rainfall Trend In Sokoto**	

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23rd October 2019

2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS I				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Alkali B. Agwu, E. Sarkinfada, F. Takalamawa A. **Title: Phenotypic and genotypic determination of Acinetobacter baumannii from patients with prolonged hospital stays in three tertiary hospitals of Kano metropolis, northwest Nigeria**		*Prof. Jockey Baker Nyakaana* **Title: Fort Portal: Uganda's Tourism City?** *Isika, Juliet Kaindi Oigo, Elizabeth Bosibori and Wanduara, Mercy V. W.* **Title: Body Shape And Apparel Fit Using Personal Measurements Of Kenyan University Female Students** *Monica Toto* **Title: Utilization Of Community Based Tourist Attractions And Their Contribution To Regional Development In Busia County**		
4.30 p.m. – 6.00 p.m.	**HEALTH BREAK AND VISIT TO EXHIBITION STANDS**				

24th October 2019

8.00 – 8.30 a.m	**Registration of delegates**
8.30 a.m. – 9.10 a.m.	**Session Chair: Prof. Fuchaka Waswa -** Agricultural Science and Technology, Kenyatta University **Rapporteur: Dr. Esther Munyiri -** Department of Hospitality and Tourism Management, Kenyatta University **Keynote Speaker: Prof. Hamadi Boga -** Principal Secretary State Department for Crop Development and Agricultural Research **Title of presentation: Food and Nutrition security and Kenya's Big Four Agenda**
9.10 a.m. – 10.10 a.m.	**Panel Discussion: Focus on Agriculture and Food Security** **Moderator: Ms.Ankey Doris – Kenyatta University Television** **Panelists:** 1. **Prof. Hamadi Boga** - Principal Secretary State Department for Crop Development and Agricultural Research 2. **Dr. Peter Mokaya** – Director Organic Consumer Alliance,Kenya 3. **Prof. Judith Kimiywe** - Professor of Food,Nutrition and Dietetics,Kenyatta University, Kenya 4. **Hon. Johora Mohamed Abdi** –CEC Agriculture, Irrigation, Livestock, Fisheries and Veterinary Services, Mandera County 5. **Mr. Joseph Karuri** - Pioneer Feeds
10.10 a.m. – 10.30 a.m.	**HEALTH BREAK AND VISIT TO EXHIBITION STANDS**

10.30 p.m. – 1.00 p.m.	**PARALLEL SESSIONS II**				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Subtheme: Food security and sustainable agriculture **Track 1: Agronomy** **Session Chair: Dr. Catherine Muui** **Rapporteur: Ms. Christine Wanyonyi** *Juma Peter Muchemi, Francis W. Kariuki, Dr. Benson M. Mwangi*	**Subtheme: Environment, Natural resources, Climate change and Sustainability** **Track 2:** **Session Chair: Prof. Simon Onywere** **Rapporteur: Dr. Joseph Kurauka**	**Subtheme: Food security and sustainable agriculture** **Track 2. Plant Nutrition** **Session Chair: Dr. Joseph Gweyi-Onyango** **Rapporteur: Dr. Mwende Ngie** *Rosepiah Munene and Joseph P Gweyi - Onyango.* **Title: Impact of Nitrogen Fertilization on Plant Growth and Selected Secondary Metabolite Concentrations in Three Vegetable Amaranth Varieties In Kenya** *M. John, S. Nguluu, C.W. Muui , R.M. Muasya and J. Matata*	**Subtheme: Food security and sustainable agriculture** **Track 4. Crop Protection I** **Session Chair: Dr. Ruth Gathu** **Rapporteur: Dr. Syvia Henga** *Muui, C.W., Muasya, R. M., Nguluu, S., Kambura, A., Barasa, M. and Gacheri, K.* **Title: Seed Borne Fungal Pathogens Associated With Farmer Saved Sorghum (Sorghum Bicolor L.) Seeds In Kenya**	**Symposium 2** **Title: Kenya-Finland Education And Research Alliance (Kenfin-Edura) Project: Does My Neighborhood Affect My Diet And Physical Activity Patterns?** **Session Chair: Prof. Vincent Onywera Prof. Mikael Fogelholm** **Rapporteur: Dr.Joy Wachira** **Presentation 1: The Kenya - Finland Education and Research Alliance (KENFIN-EDURA) Project: An overview** Vincent Onywera and Mikael Fogelholm

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10.30 p.m. – 1.00 p.m.	PARALLEL SESSIONS II				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Optimizing Water And Land Resources Use Through Integrated Rice-Fish Farming in Bunyala Irrigation Scheme, Busia County *Hillary C. Rotich, Francis W. Kariuki, Moses P.H. Gathaara* **Title: The Influence of Supplemental Irrigation on Fruit Yield and Quality in Relation to Soil Types, Makueni County** *C. W. Muui, F. Kilonzo and M.W. Barasa* **Title: Influence Of Urban and Peri Urban Agricultural Systems on Crop Production in Selected Areas, Kenya**	*Omenda Jane* **Title: Response Of Soil Organic Carbon And Acid Phosphatase Enzyme Activity To Phosphate Rock And Organic Inputs On Acidic Soils Of Central Highlands Of Kenya** *Obadiah H. Ngigi, Ibrahim Macharia, Eric Bett* **Title: Demand For Environmental Conditional Credit As Incentive For Natural Resources Management In Kenya; The Case Of Action Research In Sasumua Sub Watershed, Kenya**	**Title: Effect of Different Micro-Nutrients (Zn, Fe, Cu And Mn) on Sorghum Yields in The Semi-Arid Areas of Kenya.** *D. Nduwimana, B.O. Mochoge, And C. Masso* **Title: Effectiveness of Different Nitrogen Fertilizer Rates on Maize Grain Yield and Nitrogen Use Efficiency in Western Kenya** *Kenneth Mutoro* **Title: Interactive Effects of Nitrogen Levels and Accessions on Growth of Spider Plant in Juja District, Kenya** *K. Sitienei, Evelyn C. R. Cheramgoi, J. K. Borel, D. M. Kamau and M. Kabole*	*Agong, S. O., Mwangi, M., Kahuthia-Gathu, R. and Waceke J. W.* **Title: Influence of Potato Production Practices of the Occurrence of Potato Late Blight** *Kavutu, A. M., Mwangi, M., Kahuthia-Gathu, R. and Waceke J. W.* **Title: Biocontrol Potential of Antagonistic Bacteria Against Agrobacterium Tumefaciens on Roses in Kiambu County, Kenya** *Wamani, A., Muthomi, J., Mutitu, E., and Waceke, J. W.*	**Presentation 2: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: The methods-** *Noora Kanerva and Victor Okoth* **Presentation 3: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: Physical activity lifestyle and barriers -** *Muhoro Munuhe and Joy Wachira* **Presentation 4: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: Sociocultural factors** *Moses Wanjala, Dinah Dipondo and George Owino*

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10.30 p.m. – 1.00 p.m.	PARALLEL SESSIONS II				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	MichomaJ.M., Mugwe J. N., Korir, N., Mwangi M **Title: Increasing Yellow Passion Yields by Managing Water Stress Using Hydrogel, Polythene and Grass Mulches in Embu and Kiambu Counties, Kenya** *Nicholas Mawira Gitonga, Ezekiel Mugendi Njeru, John Maingi.* **Title: Optimizing the Use of Bradyrhizobium Inoculants to Promote Soybean Production in Organic And Conventional Farming Systems** *Siso N. O., Moranga V. O., Omolo P. O., Lusike W., Nderitu A. M., Opiyo G. and Yahuma N*	*John Bosco Namwamba, Yaw Twumasi, Kelvin Kiwale, Benir Mbabasi, Anne Ntombela, Eusebius Barasa Ngera, Susan Nekesa Ngera and Allan Maina Namunguba* **Title: Environmental Rehabilitation Of Kapkangani - Chepsonoi Surface Water Systems And Ecosystems** *Mary Mwangi, Fathiya Khamis, Jonathan Mulemba, Franklin Kinyua and Romano Mwirichia*	**Title: Evaluation of Dharani Groomer Herbal Powder (Foliar Spray) for Enhancing Mature Tea Shoot Attributes And Nutrients Uptake in Kericho** *Karanja Anne, Sommer Rolf, Onwonga Richard, Mochoge Benson, Shisanya Chris, Kihara Job* **Title: Unlocking the Potential of Controlled Release Urea on Nitrogen Mineralization and Maize Yield in a Maize-Soybean Cropping System in Western Kenya** *Ndeleko-Barasa E.M, Mucheru - Muna, Ngetich, K.F.* **Title: Response of Phosphate Rock Fertilizer on Maize Yields In Acidic Soils of Tharaka-Nithi County**	**Title: Efficacy of Microbial Antagonists in Management of Bacterial Wilt of Tomatoes under Field Conditions** *Esther Waithira Kamau, Maingi J. M, Mworia G.E and Masinde P.W* **Title: Invitro and Invivo Studies of Warburgia Ugandensis Lyophilized Crude Extract with Trichoderma Asperellum on Phytophthora Infestans and Alternaria Solani** *W. Muthoni, R. Kahuthia-Gathu, M. Mwangi1, J.W. Waceke* **Title: Biological Control of Fusarium Wilt Disease in French Beans Using Pseudomonas Fluorescens** *Peter Shango, Nchore, S.B and Mwangi M*	**Presentation 5: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: Dietary patterns** *Esther Anono, Maijaliisa Erkkola and Sophie Ochola.* **Presentation 6: School children's physical activity: Some novel pedagogical aspects in physical education** *Tiina Laiho and Timo Vuorimaa*

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10.30 p.m. – 1.00 p.m.	PARALLEL SESSIONS II				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Evaluation of Production Levels Of Netherland, South Africa And Perulima Varieties of Gooseberry . *Michael A Sakha, and Joseph P Gweyi-Onyango, Joyce Jefwa* **Title: Good Agricultural Practices In Mushroom Cultivation Value Chain In Kenya: The Role of Agronomic Inputs** *A. M. Nderitu, Omolo P. O., Kirigwa V., Moranga V. O., Siso N. O., Opiyo G. and Yahuma N.*	**Title: Bioprospecting Cellulases From Organic Wastes For Bioethanol Production In Kenya** *Kokwaro, E, Mwayuli , G and Boera, P* **Title: Mollusc Shells And Fish By-Products From Lake Victoria: A Valuable Resource Not A Nuisance Waste Product** *Mercy Kiruia, Kennedy Obierob, Joy Obando* **Title: Effects Of Land Use On Spring And Streamflow Water Quality In River Malaget Sub-Catchment, Kericho County, Kenya** *Tsuma M, Makokha M and Obando J*	**Track 3. Breeding And Molecular Techniques** **Session Chair: Dr. Patroba Ogola** **Rapporteur: Dr. Ann Carol Karanja** *Inuwa Badamasi, Robinson Odong, Charles Masembe* **Title: Key Pathological Biomarkers Reveal Potential Effects of Pollution on Commercial Fish Species in Lake Victoria** *Mwangi J.W, Mathew P.N, Oduor R* **Title: Phenotypic and Molecular Characterization of Vigna Radiata (L) Wilckzek (Mung Bean) in Machakos, Embu and Tharaka Nithi Counties in Eastern Kenya.** *Muchemi P. K, Kamau. W.*	**Title: Assessment and Detection of Maize Chlorotic Mottle Virus Stability in Maize Seeds in Kenya** *Elizabeth Kago, Zachary M. Kinyua, Paul O. Okemo and John Maingi* **Title: InVitro Evaluation of Organic and Inorganic Amendments Against Different Strains of Ralstonia Solanacearum** *Kariuki A. N., Waceke J.W. and Maina M.* **Title: Bio-Control Agents for Management of Root Knot Nematodes on Tomato in Kenya** *Waswa, S.J., Waceke, J.W. and Nchore, S.B.*	

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10.30 p.m. – 1.00 p.m.	PARALLEL SESSIONS II				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Comparison on Performance of Bulb Onions Grown Under Greenhouse and Open-Field Environments in Kisumu County, Kenya *Aggrey Shitsukane Shisiali, Gladys Wanjiru Kimondo Title: Design And Development Of Solar Powered Hybrid Vegetable Dryer.* **Title: Design And Development Of Solar Powered Hybrid Vegetable Dryer.**	**Title: Evaluating Demographic Influence On The Water Rest Levels In Boreholes In Ka-miti-Marengeta Sub Catchment Nairobi-Kenya** *John Nyangena, Simon Onywere and Chris Shisanya* **Title: Vegetation Response To Drought In Chyulu-Amboseli Ecosystem Of Kenya**	*J, Shem. B. N, Stanley Kimaru1, Mathew P. N, Mwangi.W. J, Joyce. W, Florence. M* **Title: Genetic Response of Selected Maize Germplam Screening For MLND Resistance In Kenya** *Oduor RO, Mbinda W Runo SM, Murilla G, Mugendi J, Muriira G, Ogoyi D, Ochieng J and, Mathabe PMK, Ngugi MP* **Title: Advancing Crop Productivity Through Modern Biotechnology** *Ezenwosu, Samuel, Uchechukwu* **Title: Evaluation of Lambda-Cyhalothrin Behavioural Responses and Hepato-Nephro Biomarker Enzymes Effects in Clarias Gariepinus**	**Title: Occurrence and Abundance of Plant Parasitic Nematodes on Tree Tomato (Solanum Betaceum Cav.) in Kiambu and Embu Counties, Kenya** *Musango, J. K., Waceke, J. W., Kahuthia-Gathu, R.* **Title: Potential of Local Fungi In Management of Potato Cyst Nematodes on Potato in Kenya**	

1.00 p.m. – 2.00 p.m.	LUNCH AND VISIT TO EXHIBITION STANDS				
2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS III				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Subtheme: Transformative, inclusive and equitable quality education **Track 1: Inclusivity and Special Needs Education** **Session Chair: Dr. John Ndiritu** **Rapporteur: Dr. Gladwell Wambiri** **Dr. Charity Limboro** *Gidarity Kidiga Mugiluri* **Title: Disability And Co-Curriculum Participation: Analysis Of Suitability Of Co - Curriculum Resources For Learners With Disabilities In Public Inclusive Settings.** *Gidarity Kidiga Mugiluri*	**Subtheme: National values, social cohesion, peace and development** **Session Chair: Dr. Peter Wafula** **Rapporteur: Dr. Anne Okungu** *Bam, Clement Liambee* **Title: Examining The Nexus Between Social Values, Conformity And Deviance For National Security.** *Hazande Fanen* **Title: National Values And Social Cohesion: A Panacea For The Attainment Of Peace And Sustainable Development In Nigeria** *Dr. Tabitha G Murerwa*	**Subtheme: Health and Well being** **Track 2: Infectious Diseases** **Session Chair: Prof. Alloys Orago** **Rapporteur: Dr. Juliet Makanga** *Mr. Hussaini Muhammad Aikawa* **Title: Assessment Of Knowledge Regarding Prevention Of Hepatitis B Infection Among African Undergraduate Students Of Health Sciences In Davangere, Karnataka-India.** *Lucas Luvai A. Asaava ,Moses Mwangi , Edwin Mwangi ,Ernest Juma,Ruth Moraa,Adan Halakhe,Willie Abela Githui,Michael M. Gicheru*	**Subtheme: Food security and sustainable agriculture** **Track 5. Crop Protection II** **Session Chair: Dr. Shem Bonuke** **Rapporteur: Dr. Everlyn Samita** *Imbayi B., Kahuthia-Gathu R., and Mwangi M.* **Title: Use of Pheromone Traps in the Management of Fruit Flies (Diptera: Tephritidae) on Mangoes Mangifera Indica in Central Kenya.** *Imbayi B., Ignatius Stella, Kahuthia-Gathu, R., and Mwangi M.* **Title: Pesticide Use Practices In Horticultural Crops Production In Central Kenya.** *M.W. Barasa, R. Kahuthia-Gathu, M. Mwangi and J. W. Waceke*	**Subtheme: Food security and sustainable agriculture** **Track 7. Soil Fertility And Productivity** **Session Chair: Dr. Jayne Mugwe** **Rapporteur: Mr. Erick Oduor Otieno** *Dennis Beesiga mukama, Benson Mochoge, Nicholas Korir, Komi K. M. Fiaboe, Fathiya M. Khamis, Sevgan Subramanian, Musyoka M. Wangu, Torto Baldwyn, Ekesi S and Chrysantus M. Tanga* **Title: Impact of Feedstock C/N Ratio on Black Soldier Fly Larval Yield and Organic Fertilizer Quality**

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2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS III				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Linking Inclusive Practices, Adaptation, And Participatory Education With Attainment Of Sustainable Development Goals *Gidarity Kidiga Mugiluri* **Title: Barriers To Participation Of Pupils With Disabilities In Co-Curriculum Activities In Selected Inclusive Public Primary Schools Of Lugari Sub-County, Kakamega County** **Track 2: Education in institutions of higher institutions of Learning** *Mr. Richard Wambua, Ms. Faith Cheptoo Byegon*	**Title: Successful Business Relies On Effective Team With A High Level Of Team Cohesiveness.** *N.O. Hashima, D. Otwomab, C. Grupenc* **Title: Big Science For National And Regional Unity** *Amenger, Hyacinth Sena Odey, Clarence Odey* **Title: Education For Peace And Security And Sustainable Development In The 21st Century Nigeria** *Mugo Muhia, Peter Muhati. Gachigua Sammy G.*	**Title: Isolation Of Zoonotic Nontuberculous Mycobacteria Among Dromedary Camels And Household Members In Samburu County, Kenya.** *Alkali Bashir Agwu E, Adamu Almustapha Aliero Muhammad Hassan Abubakar* **Title: Risk Factors And Bacteriological Assessment Of Patients On Prolonged Hospital Admission At Murtala Muhammad Specialist Hospital Kano State, Nigeria.** *Zakariya A. M., Adamu A.Sabo , Nuhu A., Mujaheed A Title: Survey Of Medicinal Plants Traditionally Used In The Treatment Of Malaria In Kafin Hausa, Jigawa State*	**Title: Management Of Insect Pests of Tomato Using Indigenous Antagonistic Fungi In Kenya** *Dr. Umar Adamu Ahmed* **Title: A Decade of Free Parasitic Nematode of Hadejia's Cultivated Rice: A Miracle From The Plant or The Field?** *Nyang'au, D, Atandi, J., Cortada, L., Nchore, S., Mwangi, M. and Coyne, D.* **Title: Occurrence, Abundance and Distribution of Plant Parasitic Nematodes Associated with Bananas (Musa Spp.) at Different Altitudes in Kenya**	*A.W. Karanja, J.M. Maingi and E.M. Njeru* **Title: Using Lignocellulo-lytic Bacteria to Bioconvert Organic Residue to Bioorganic Fertilizer for Sustainable Crop Productivity** *Morris Muthini, Mercy Martha Muindi1, Ezekiel Mugendi Njeru, Steven RunoJohn Maingi* **Title: Biodiversity and Abundance of Arbuscular Mycorrhizal Fungi in Lower Eastern Kenya** *Abel O. Anyega, Nicholas Korir, Martha W. Musyoka, Sevgan Subramanian, Sunday Ekesi, J. J. A. Van Loon, M. Dicke and Chrysantus M. Tanga*

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2.00 p.m. – 4.30 p.m..	PARALLEL SESSIONS III				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Impact Of A Social Media Teaching Tool On The Learning Of Educational Statistics At The Kenyatta University. *Dr Rosalia M. Mumo and Isika Mwangangi* **Title: Opportunities And Challenges In Developing The 21st Century Teacher: A Case Study Of Kenyatta University Mentorship Programme In Matungulu Sub County, Machakos County-Kenya** *Dr. Daniel W. Muthee, Dr. Salome Nyambura, Kenneth Njoroge Kiambuthi, Robert Kahiga, Mercy Mwaniki*	**Title: Politics And Architecture: Do Kenya's County Assemblies' Design Carry Democratic Socio-Political And Cultural Symbolism?** *Mugo Muhia, Peter Muhati. Gachigua Sammy G.* **Title: Hansard Production Human Resource Capacities In County Assemblies In Kenya And Their Impact On Democratic Governance** *Mr. Justus O. Kiche, Dr. Solomon P. K. Muhindi, Dr. Ruth W. Thinguri*	*Edwin Omondi Juma, Prof. Margaret Keraka, Dr. Anthony Wanyoro* **Title: Survey Of Medicinal Plants Traditionally Used In The Treatment Of Malaria In Kafin Hausa, Jigawa State** *Edwin Omondi Juma, Prof. Margaret Keraka, Dr. Anthony Wanyoro* **Title: Maternal, Fetal And Placental Conditions Associated With Preterm Title: Title: Births Using Barros' Clinical Phenotypes Classifications In A Tertiary Hospital In Kisumu County, Kenya.** *Osir Otteng, Dr. Peres N. Wenje and Prof. Michael Kiptoo*	**Track 6. Feeds And Animal Production** **Session Chair: Dr. Purity Nguhiu** **Rapporteur: : Mr. Anthony Njiru** *A.N. Maina, I.M. Osuga, L.K. Munga, J.M. Munguti, S. Subramanian, K. K. M. Fiaboe, J. J. A. Van Loon, M. Dicke, S. Ekesi And C.M. Tanga* **Title: Performance of the African Catfish (Clarias Gariepinus) Fed on Diets Containing Black Soldier Fly (Hermetia Illucens) Larvae Meal** *Mary A. Opiyo, James Jumbe, Charles C. Ngugi, And Harrison Charo-Karisa*	**Title: Influence of Insect-Based Organic Fertilizer Soil Amendments on The Growth and Yield of Phaseolus Vulgaris, Solanum Lycopersicum and Brassica Oleracea Var. Acephala in Kenya** *P. O. Omolo, Opiyo G., Yahuma N., Nderitu A. M. ., Moranga V. O., and Siso N. O* **Title: Effects of Soil Fertility-Climate Interactions on Performance of Spider Plant in The Lake Victoria Region** *Omenda, J.A., Ngetich, K.F., Mucheru-Muna, M.W., Kiboi, M.N Mugendi, D.N.* **Title: Response Of Soil Organic Carbon And Acid Phosphatase Enzyme Activity To Phosphate Rock And Organic Inputs On Acidic Soils Of Central Highlands Of Kenya.**

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2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS III				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Strategies In Higher Education For Building An Enhanced, Diversified And Transformative Workforce For The 21st Century Job Market **Track 3: Curriculum mplementation** *Wanyama Ogutu* **Title: Dynamics Of Art & Craft Curriculum In Enhancing The Child Growth & Development** *Ongek Margaret, Benedicta Tabot* **Title: Implementation Issues In Competency Based Curriculum In Schools In Kenya: A Review Of Literature** **Track 3: Education management** *Ignatius N. Munyiri, Dr. Ruth W. Thinguri & Dr. Paul Edabu*	**Title: Ascertaining The Influence Of Government Dynamics On Juvenile Criminality In Nakuru Sub-County, Kenya** *Waweru Bernard K., Maranga V. N., Rahab Mugambi* **Title: The Relationship Between Social Demographic Factors And Job Stability Of University Catering Employees In Nairobi City County, Kenya**	**Title: Role Of Economic Empowerment For Intended Health Intervention Beneficiaries In Low - Income Populations: A Look At The Voluntary Medical Male Circumcision Programme In Siaya County** *Mary W. Kagika, Sumesh C. Chhabra, James Nonoh and Ahmed Hassanali* **Title: Antimicrobial Activities And Characterization Of Bioactive Constituents From A Kenyan Plant, Capparis Fascicularis Dc.**	**Title: Dietary Probiotics Modulates Non-Specific Immunity and Gut Microbiota of Nile Tilapia (Oreochromis Niloticus) Cultured In Low Input Ponds** *Irene Githinji , Ethel Monda, Hamed Hassanali and Margaret Nganga* **Title: Quantification of Ochratoxin - A In Poultry Feeds and Chicken Products, and Screening Of Essential Oils Of Selected Plants For Inhibiting Fungal Growth**	**Track 8. Toxicity And Production Biosafety** **Session Chair: Dr. George Omwenga Rapporteur: Mr. Joel Masanga** *Abdulrazak, M. H. Mujaheed, A.* **Title: Anti-Salmonella, Cytotoxicity and Gc-Ms Analysis of Leaves Extracts of Carica Papaya** *Obiageli Constance Ejilibe, Helen Ogochukwu Nwamba Christopher Didigwu Nwani* **Title: Comparative Evaluation Of Biochemical Responses of Bufo Regularis (Reuss, 1833) Tadpole Exposed to Butaforce and Termex Pesticides** *Ezenwosu, Samuel, Uchechukwu.*

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2.00 p.m. – 4.30 p.m.	PARALLEL SESSIONS III				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Title: Influence Of School Managers' Compliance With Disaster Risk Management Policy In Public Secondary Schools In Nairobi City County Kenya *Adamgbe Kenneth* **Title: Impact Of Communal Crises On Educational Development Of North-East Senatorial District Of Benue State-education** *Mr.Ominde Eliud Shani, Dr. Atieno Kili K'odhiambo* **Title: Kantianism As a Determinant Of Discipline In Secondary Schools In Kenya – education**			*C.O. Odhiambo, RR Sharma, CC Ngugi and L Munga* **Title: Length Weight Relationship And Relative Condition Factor of the Native Mountain Catfish (Amphilius Uranoscopus Pfeffer, 1889) In a Tropical Stream (Thego), Mount Kenya.**	**Title: Extent And Intent of Farmers For The Use Of Agrochemical Substances And Implication For Food Security.** *Dorcus Mbithe D. Kigaru, Francis Mundia Mwangi, and John Gachoya* **Title: Contamination of Meat With Heavy Metal in Butcheries in Selected Outlets in Nairobi County, Kenya** *Mwangi, P. Nderitu* **Title: Assessment of the level of training and awareness regarding food hygiene requirements among employees in African indigenous restaurants in Nairobi City County, Kenya.** *Faith Onyangore, Odipo Osano, And Julius Ochuodho* **Title: Aberration Of Iron Levels In Oreochromis Niloticus And Clarias Gariepinus After Exposure To Aflatoxins**
4.30 p.m. – 5.00 p.m.	**HEALTH BREAK AND VISIT TO EXHIBITION AREA**				

25th October 2019

8.00 a.m. – 8.30 a.m.	**Registration of delegates**
8.30 a.m. – 9.10 a.m.	**Session Chair: Dr. Peter Kamau –** Dean School of Architecture and the Built Environment, Kenyatta University **Rapporteur: Arch. Franklin Mwango -** Chairman, Architecture and interior design **Keynote speaker: Prof Washington Yotto Ochieng, FREng, CEng, FICE, FCIHT, FRIN, FCInstCES** **Title of presentation: Using Navigation Data in Innovative Ways to Solve Real World Problems**
9.10 a.m. – 10.10 a.m.	**Panel Discussion: Focus on affordable housing and manufacturing** **Moderator: Ms.Ankey Doris –Kenyatta University Television** **Panelists:** 1. **Prof Washington Yotto Ochieng** – Head of the Centre for Transport Studies (CTS), and Chair Professor in Positioning and Navigation Systems at Imperial College London, UK 2. **Mr. Charles Hinga Mwaura** – Principal Secretary, State Department of Housing and Urban Development, Ministry of Transport, Infrastructure, Housing and Urban Development, Kenya. 3. **Mr. Hitan Majevdia**- CEC for Lands , Urban planning, Urban renewal, Housing and building services, Nairobi City County, Kenyal 4. **Arch. Prof. Alfred Omenya** - Environmental Architect and Principal Researcher, Eco-Build Africa 5. **Mr. Erick M. Munchuku** - City Planning, Extension and Design Officer, UN-Habitat 6. **Mr. John Kabuye** - Building Surveyor and Sustainability Consultant. CEO Kenya Green Building Society
10.10 a.m. – 10.30 a.m.	**HEALTH BREAK AND VISIT TO EXHIBITION STANDS**

25th October 2019

10.30 a.m. – 1.00 p.m.	PARALLEL SESSIONS IV				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Subtheme: Infrastructure development, energy and in-dustrialization **Track 1:** **Session Chair: Architect Franklin Mwango** **Rapporteur: Mr. Laban Migudi** *Kennedy Anyona* **Title: Experimental Model Investigating Potential Of Geothermal Fluid Velocity In Recycling Polyethylene Terephthalate: Case Study Of Olkaria** *Peter Ng'ang'a*	**Subtheme: Cross cutting issues Innovations management, Technology transfer and Entrepreneur-ship** **Session Chair: Dr. Susan Musembi** **Rapporteur: Mr. Patrick Gatobu** *Doris Alago and Janet Muthimi* **Title: Knowledge Management And Entrepre-neurship In Universities** *Dr. June Madete, Arti Ahluwalia, Carmelo De Maria, Licia Di Pietro, Jacopo Ferretti, Andrés Díaz Lantada , Mannan Mridha, Philippa Ngaju Makobore, June Madete, Albo Aabloo, Arni Leibovits*	**Subtheme: Health and Well Being** **Track 3: Health Prevention And Promotion** **Session Chair: Prof. Priscilla Kabue** **Rapporteur: Dr. Samuel Chege** *Kirimi F. Aagaard, Hansen J. Irungu S.Musyoka, Kamere I. Karekezi C. and Otiende J.* **Title: Combining Sdgs 3 And 4 – A Model For Promoting Health Living Through Health Promotion In Kenyan Primary Schools.** *Vincent Onywera, Kristi Bree Adamo , A.William Sheel , Judith Waudo , Michael Boit Mark Stephen Tremblay*	**Subtheme: Food security and sustainable agriculture** **Track 9. Socio-Economic /Policy I** **Session Chair: Dr. Lucy Ngare** **Rapporteur: Ms. Everlyn sang** *Danladi Yusuf Gumel, Prof Ahmad Makmom Bn Abdullah Dr. Alias Mohd Sood* **Title: Measuring the Vulnerability of Paddy Farmers to Climate Change Variability in Peninsular Malaysia** *Dr. Maurice E. Tyokever*	**Subtheme: Food security and sustainable agriculture** **Track 10. Socio-Economic /Policy II** **Session Chair: Dr. Negat Bekele** **Rapporteur: Mr. Christopher Njuguna** *Nganga, W. Beatrice, Nge'tich, K. Onesmus, Macharia, M. Joseph, Noah Adamtey, Ngetich, K. Felix* **Title: Foreign Direct Investment Model Of Economic Infrastructure And Trade Openness**

KUBRIC 2019

25th October 2019

10.30 a.m. – 1.00 p.m.	PARALLEL SESSIONS IV				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Mas'ud Bello, Ph.D. **Title: The Development Of Trade In Hides & Skin And The Dominance Of Multinational National Corporations In Zamfara, Northern Nigeria** *Kenneth Kagoiya* **Title: Nano Satellite System And Protocol Applications In Marine Communication And Networks Interoperability.** **Track 2:**	**Title: Ubora: Collaborative Open Design For Safer Medical Devices** *Evans T. Mwasiaji* **Title: Business Strategy And Competitiveness Of Medium Scale Manufacturing Enterprises In Kenya** *Idowu Owoeye, David Kiiru, & Jedidah Muli* **Title: Recognition Practices And Employees' Performance: Understanding Work Engagement As A Mediating Pathway In Kenya Context.** *Isa Modibbo, Olayiwola Abdulhakeem, Abdullahi Shuaibu* **Title: A Constraint -Satistaction Based Timetable System For University Lectures Allocation**	**Title: Emerging Evidence Of The Physical Activity Transition In Kenya.** *Wambua Charles Kyangu* **Title: Effectiveness Of Telephone Counselling In Crisis Intervention Among Callers To Helpline Centres In Nairobi County, Kenya.** *Mwaro Samuel Chitechi* **Title: Psychosocial Wellbeing And Workplace Diversity Using The Social Identity Theory.**	**Title: Challenges of Food Security in Nigeria** *Katyona, Hubert Keghnen* **Title: Sustainable Agriculture: A Panacea for Achieving Sustainable Development Goals in Nigeria.** *Tyokever Eugene Amaakaven Tyokever Maurice Emberga* **Title: Migrant Farming By Fulani Herdsmen: Implications On Nigeria's Food Security** *Harun O. Odhiambo, Victor Wasike, Nasambu Okoko, Martin Barare, Lusike Wasilwa, Fatuma Omari, Aurillia Manjella*	**Title: A Spatial Multi-Criteria Evaluation For Selection Of Optimal Locations For The Use Of Organic Resources In The Upper Tana Region Kenya** *Jackline Imali Caroline Mwaniki* **Title: Contribution Of The Hospitality And Tourism Industry To Food Security In Kenya.** *Hannington Ochieng, Ric Coe , John Ojiem* **Title: Farmer And Researcher Methodologies Trade-Offs In Participatory Large N Research: The Case Of Common Bean Adaptation Trials In Western Kenya**

25th October 2019

10.30 a.m. – 1.00 p.m.	PARALLEL SESSIONS IV				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Dr. Peter Mwangi, Dr. Karanja Kabare and Dr. Karanja Patrick **Title: Effect Of Supplier Collaboration On Performance Of Retail Stores In Kenya. A Survey Of Supermarkets In Nairobi City County**	*Kabochi S.K., Gicheru M.M., Mwangi B. M., Michuki G.N., Onyango I.A.* **Title: Composition Of Mosquitoes In Ecological Habitats Of Lake Baringo Basin During Unprecedented Flooding** *Kabochi S.K., Gicheru M.M., Mwangi B. M., Michuki G.N., Onyango I.A.* **Title: Organization Culture Orientations And Employees Turnover Among Private Members Golf Clubs Within Nairobi City County- Kenya"** *Muteshi, K. Hilda Murigi, Elishiba Muthoni* **Title: Connecting Farmers To The Market Through Agricultural Marketing Automation For Food Security And Sustainable Development**	*Florence Guantai* **Title: The Impact Of Minimum Wage Legislation On Earnings And Well Being Of Domestic Workers In Langata Sub-County.** June Madete and Noel Waithaka **Title: Smart Walking Stick.** *Dr. Lucy W. Maina and Dr. Leah Wanjama* **Title: An Assessment Of Older Person's Health And Well-Being In Kiambu County, Kenya.** *Vincent Onywera and Mikael Fogelholm* **Title: Factors Influencing Active Transportation To And From School Among Children In Nairobi City County, Kenya.**	**Title: The Impact Of African Indigenous Vegetables In Promoting Education Among Students And Improving Livelihoods Of Young Smallholder Farmers In Busia County, Western Kenya** *Mwaura Gg, Mugwe Jn, Bett Ek, Ngetich Fk, Kiboi Mn, Muriuki A, Mugendi Dn* **Title: Perceived Benefits Of Organic-Based Inputs For Soil Fertility Improvement In The Central Highlands Of Kenya** *Menge Esther Kerubo* **Title: Food Security And Sustainable Agriculture Feasibility In Kenya**	*Karugia Elijah and Muriuki Martin* **Title: Eco-Cultural Calendar And Mapping As A Tool For Addressing Food Security And Climate Change Challenges: Case Study Of Kivaa Location In Machakos County, Eastern Kenya** *Waswa F, Mwetu Kand Chemutai R* **Title: Effects Of Soil Fertility And Other Drivers On Land Use Changes And Human Well-Being In Ruiru Sub-County, Kiambu, Kenya**

KUBRIC 2019

25th October 2019

10.30 a.m. – 1.00 p.m.	PARALLEL SESSIONS IV				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Kahindo J. M., Sumesh, C., Musau, R.Odalo, J. O. and Thoruwa, T. Dr. Robert Kagiri **Title: Physico - Chemical And Fuel Properties Of Fatty Acid Ethyl Esters From Jatropha Curcas Oil Transester-ified Using Rhizoclonium Grande And Citrus Senensis Bioethanol** *F.O. Wanjalaa, N.O. Hashima, D.Otwomab,* **Title: Applications Of Nuclear Science Technology In Kenya**	*Nguhiu Purity, Kabuage Lucy, Warutere Peterson, Kabui Kelvin and Kanina Powell* **Title: Collaborative Research Approach For Control Of Emerging Neglected Zoonotic Diseases In Kiambu County, Kenya** *Jackline Nyerere and Purity Muthima* **Title: Construction And Governance Of Transnational Higher Education Research Partnerships In Kenya And Uganda**	*Korir Chepkirui Sharon* **Title: Equity In Utilization Of Health Care Services In Kenya.** *Janet Surum* **Title: The Kenya-Finland Education And Research Alliance (Kenfin-Edura) Project: Does My Neighborhood Affect My Diet And Physical Activity Patterns?** *Sylvester William Hayker, Everlyne Amile Okubo, Caleb Mireri, Lucy Joy Wachira, George Evans Owino, Geetam Tiwari, Winnie Mitullahan and Vincent Onywera* **Title: The Place Of Life Skills Education In The Promotion Of The Well-Being Of University Students In Kenya.**	**Title: An Empirical Assessment of Engendered Determinants and Indicators for Monitoring, Evaluation and Impact Assessment of Sustainable Agriculture and Food Security in Kenya** *C. N. Wahome, J. Maingi, O. Ombori And E.M. Mugendi* **Title: Cultivar Diversity, Smallholder Banana Production Practices And Awareness Of Tissue Cultured Technologies In Kisii, Nyamira And Embu Counties, Kenya**	*Vera Obonyo, Joshua Rumo, Rosemary Ngesa and Patrick Kanyi* **Title: Application Of Knowledge Management Practices For Sustainable Food Security In Kenya** *Muchemi P. K, Kamau. W. J, Shem. B. N, Stanley Kimaru, Mathew P. N, Mwangi.W. J, Joyce. W, Florence. M* **Title: The Relationship Between Level Of Education, Farmers Varietal Prevalence, Control And Distribution Of Maize Lethal Necrosis In Bomet County** *Lilian Motaroki, Gilbert Ouma* **Title: Current Coping And Adaptation Strategies To Drought In the Taita Hills, Kenya**

25th October 2019

10.30 a.m. – 1.00 p.m.	PARALLEL SESSIONS IV				
	KUBRIC Room 1	KUBRIC Room 2	KUBRIC Room 3	KUBRIC Room 4	KUBRIC Room 5
	Charles Njoroge Willy Muturi and Oluoch Oluoch **Title: Stock Market Price and the Performance of the Residential Property Market in Kenya**	*Eunice Wangari Mureithi1, Dr. Jesse Maina Kinyua and Dr. Kirema Nkanata Mburugu* **Title: Influence Of Organizational Leadership On Implementation Of Strategic Plans In Universities In Mount Kenya Region, Kenya** *F.Q. Gravenir and O.M.Thuo* **Title: The Innovation Dilemma in University Missions: Unlocking the Potential of Universities in Knowledge-based Development in Kenya** *Idah Maina, Doris.A.Alago and Michael Agengo* **Title: Understanding The Role Of Tax Education On Tax Compliance In Kenya**	*Veronica Ngatia and Dr. Beatrice Kathungu* **Title: Social - Emotional Intelligence As A Moderator Of Health And Well-Being.** *Dr. Hanna Vuorimaa* **Title: Does Pcychology have a role in health promotion - interdis-ciplinary ways to promote behavior change**	*Nancy Kwamboka Omori* **Title: Physi-cochemical Character-istics Of Mangrove Honey From Kilifi County, Kenya** *David Kisa Cheruiyota1, Dr. Peter Mwaura and Dr. John Kipkorir Tanui* **Title: Does Bixa Ollerana Value Chain Government Policy Influence The Relationship Between Place Strategy And Sales Performance?**	*Fuchaka Waswa, Ronald Yego, Kennedy Mwetu* **Title: Land Use Land Cover Changes And Implications On Food Production Planning In Ruiru Sub-County, Kenya** *Dr. Adamu Ahmed Dr. Mus`Abu Shu`Aibu* **Title: Risk Analysis In Fadama Farming; Prospects And Challenges Of Farming Livelihood In North-Eastern, Nigeria** *V. O. Moranga, Siso N. O., Omolo P. O., Nderitu A. M., Opiyo G. and Yahuma N.* **Title: Effect of Spacing Regimes on Performance of Onions** *Dr. Haladu Haruna Kaugama* *Bello Abba Ahmed* **Title: Challenges of Millet and Sorghum Value Chain Actors in Jigawa State, Nigeria**
1.00 p.m. – 2.00 p.m.	**LUNCH AND VISIT TO EXHIBITION STANDS**				

2.00 p.m. – 3.00 p.m.	
	Master of Ceremonies: Dr. Mildred Nawiri – Director, Centre for International Programmes & Collaborations **Brief Remarks - Prof. Frederick Gravenir,** DVC (RIO) and Chairman, Local Organizing Committee **Reading of the Communique - Prof. Vincent Onywera**, Registrar (Research, Innovation & Outreach) and Chair, Scientific Sub-Committee **Closing Remarks - Prof. Paul K. Wainaina**, Vice-Chancellor and Patron KUBRIC **Presentation of Certificates of Participation -Prof. Paul K. Wainaina**, Vice-Chancellor and Patron KUBRIC

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CONFERENCE ABSTRACTS

SUB - THEME: HEALTH AND WELLBEING

SURVEY OF MEDICINAL PLANTS TRADITIONALLY USED IN THE TREATMENT OF MALARIA IN KAFIN HAUSA, JIGAWA STATE

Zakariya A. M. [1], Adamu A. [1], Sabo I. [2], Nuhu A. [3], Mujaheed A. [1]

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The objectives of this study was to assess the traditional medicine practice, collect and document informations on medicinal plants traditionally used in the treatment of malaria in Kafin Hausa. Data was collected using an open ended semi-structured questionnaire by oral interview. Respondents were sampled purposively comprising of farmers, herbalists, traditional medicine practitioners, traditional birth attendants and nomads. Ethnobotanical indices were used to analyze the data. A total of 43 respondents were interviewed. Traditional medicine practitioners 15 (34.9%) were the highest respondents which was closely followed by farmers 14 (32.6%). Majority of the respondents 13 (30.2%) were within the age range of 41-50 and 27 (62.8%) of the total respondents had no formal education. Malaria was treated traditionally using medicinal plants by 37 (81.4%) of the respondents. A total of 15 plant species belonging to 12 families was recorded with Buseraceae having the largest number of species. Senna occidentalis had the highest number of citation (28) and an RFC of 75.7%. Boswellia dalzielii and Vitex doniana were among the plants with fidelity level of 100%. Informant consensus factor of 0.87 was recorded. The result of this study gave an insight into the importance of traditional medicine practice and provided a background data on the medicinal plants traditionally used in the treatment of malaria in Kafin Hausa.

Keywords: Medicinal plants; Malaria; Ethnobotany; Kafin Hausa

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ROLE OF ECONOMIC EMPOWERMENT FOR INTENDED HEALTH INTERVENTION BENEFICIARIES IN LOW-INCOME POPULATIONS: A LOOK AT THE VOLUNTARY MEDICAL MALE CIRCUMCISION PROGRAMME IN SIAYA COUNTY

Osir Otteng, Dr. Peres N. Wenje and Prof. Michael Kiptoo

This study examined the place of socio-economic factors in the voluntary medical male circumcision (VMMC) campaign to check the spread of HIV/AIDS in Siaya County. It interrogated the perspective of VMMC clients and their “important others” on their economic situation and its potential influence on the overall uptake of VMMC. Using multi-stage sampling, the study employed purposive sampling procedures to get the desired specific study areas and groups. Bondo and Rarieda counties, Siaya’s only regions that border Lake Victoria, were purposively selected because the study had a special bias towards areas with high concentration of fishing activities. Samples were drawn from among the residents of six beaches

using a sample frame comprising male members aged 18 to 49 years. Supervisory and operational staff involved in the VMMC campaign were also respondents. Two questionnaires were administered – one on 127 male residents, comprising, mainly, fishermen and those engaged in subsistence trade along the beach such as motor-cycle transport and carwash operators, fish loaders, and the other on 36 implementers, including medics, paramedics and other enlisted staff operating on the ground. Two focus group discussions with separate sets of four female and four male residents of the beaches were done. In-depth interviews were conducted with senior officers of the programme's key implementing agency; and the overall government officer in charge of the programme in the county. Results were drawn from direct and indirect questions touching on socio-economic issues as brought out in the questionnaires, focus group discussions, and key informant interviews. The findings demonstrate that in addition to conventional prevention and treatment, combating HIV/AIDS though VMMC, in low- and middle-income populations requires reasonable interest in the people's social and economic issues and conditions. It makes a strong case for empowering both the direct and indirect beneficiaries to bolster the various interpersonal communication strategies in the VMMC implementation.

EQUITY IN UTILIZATION OF HEALTH CARE SERVICES IN KENYA

Korir Chepkirui Sharon

Background: The right to health is a basic need to every individual in the world and rightfully Kenya. A healthy nation plays a very significant role in enhancing growth and development. However, the presence of horizontal inequity in utilization of healthcare services hinders these. This study contributed to literature by measuring the magnitude of horizontal health inequity in utilization of healthcare services in Kenya and its determinants using a secondary data set obtained from the Kenya Household Health Expenditure and Utilisation Survey (KHHEUS), 2013.

Methods: The Concentration Index (CI) method was used to measure the magnitude of horizontal health inequity in utilization of healthcare services while a regression model was used to establish the determinants of inequity in healthcare utilization.

Results: From the analysis, the results revealed that inequity was existent to both areas of service delivery that is outpatient and inpatient services with CI's of and 0.00039114 and 0.01705421 respectively. Determinants to health utilization were age, sex, one's health status, employment status, education level and insurance status.

Conclusion: The study concluded that to eliminate the level of inequity the government has to come up with workable policies to improve the socio-economic factors. Ultimately the government should make health care services affordable to its citizens to achieve universal healthcare coverage in Kenya leading to equity.

Key Words: Equity, Utilization, Horizontal, Health Care, Concentration Index, Outpatient Service, InpatientService

MOVING DOMAIN QM/MM METHODS FOR DETERMINATION OF INTERACTIONS BETWEEN HUMAN ESTROGEN RECEPTOR ALPHA AND ENDOCRINE DISRUPTERS

George Omolloh*†, Evans Changamu*, Lucy Kiruri* and Kibe Macharia*

**Kenyatta University*
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Human Estrogen Receptor alpha (hERa), a fundamental protein responsible for the detection of the sex hormone estrogen and regulating downstream gene expression is, usually, activated upon binding of a natural hormone. The hERa has flexibility to interact with many synthetic and natural chemicals, referred to as endocrine disruptive chemicals (EDCs). Malfunctioned estrogen receptor pathways have been indicted for causing breast cancer. In silico screening of a series of small molecules for endocrine disrupting capacity based on their interaction with the Human Estrogen Receptor alpha (hERα) was conducted to determine whether they would constitute a risk factor in breast cancer incidence. The force field polarization model, Moving Domain Quantum Mechanics/Molecular Mechanics (MoDQ3M), was used to describe the electric fields and electronic polarization effects inside the hERα protein. Molecular dynamics on the wildtype, polarized proteins, and in silico mutated proteins were conducted for five nanoseconds on both the agonist and antagonist poses using Desmond engine from DE Shaw research. Docking was performed using Glide as implemented in Schrodinger 2015.1 suite. Analyses were carried out in order to understand the underlying molecular mechanism using techniques including force field polarization, molecular dynamics, ligand-protein residue interaction and free energy landscape analysis. These showed that the mutated residues changed the overall electrostatic environment of the system along with the ligand-protein interactions. Mutation on two residues were carried out in silico, and the results were compared between the wild type and mutant for both the agonist (PDB ID: 2B1Z) and antagonist (PDB ID: 3ERT). The mutation of N537Y on the agonist and N532D on the antagonist within the ligand binding domain of the protein altered the interaction of the top ranked EDC compounds giving an MM-GBSA binding energy of –5.531 kcal/mol and –8.047 kcal/mol, better than that of the wild type for the antagonist. Glide docking studies gave top-ranked EDCs as DES, Genistein, Nonylphenol-9, DDE, BPA with glide scores (kcal/mol) of -10.332, -11.127, -8.627, -8.735, -9.007, respectively, on the agonist and -10.459, -10.119, -8.612, -8.507, -9.988, respectively, on the antagonist. Similar EDCs ranks were also realized for the mutants. It was also realized that Genistein, Oxybenzone, Vinclozolin, E216, DDE, Nonylphenol-9, and DES were more stable in the active form (higher occupancy averages) than in the inactive configuration showing the probability of activation of the protein receptor.The insights from this study could be of great relevance while designing new drugs for the treatment of breast cancer. Design would have to ensure stability in the antagonist more than the agonist and the same time counter the effect of mutation on the antagonist system. It is suggested that products that lead to exposure to Genistein, Oxybenzone, Vinclozolin, E216, DDE, Nonylphenol-9, and DES be avoided as much as possible because of their possible effects on the protein receptor.

EXPLAINING NON-COMMUNICABLE DISEASE RELATED BEHAVIOR IN KENYA: SOCIO-ECONOMIC PATTERNS OF FOOD CONSUMPTION AMONG ADOLESCENTS IN NAIROBI CITY COUNTY-KENYA

Esther Anono [1], Sophie Ochola [1], Maijaliisa Erkkola [2], Noora Kanerva [2], Hanna Walsh [2], Lucy-Joy Wachira [1], George Owino [1], Muhoro Munuhe [1], Dinah Dipondo [1], Moses Wanjala [1], Victor Odhiambo [1], Vincent Onywera [1], Mikael Fogelholm [2],

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Background: Unhealthy dietary patterns are a risk factor for non-communicable diseases. Epidemiological data, mainly from developed countries show that food consumption is related to one's socioeconomic status with higher-quality diets associated with those in high socio-economic status (HSES) while energy-dense diets consumed by those in the low socio-economic status (LSES). The relationship with socio-economic status has not been fully investigated in developing countries. This study aimed to investigate the associations between socio-economic status and adolescent food consumption patterns among adolescents in Nairobi City County.

Methods: Cross-sectional data was collected using a pre-tested 7 day Semi-quantitative food frequency questionnaire from 133 randomly selected adolescents aged 10 to 14 years living in a LSES (Kayole) and a middle income status (MSES) (Lang'ata) in Nairobi City County as part of the KENFIN-EDURA research project. Linear regression analysis was used to determine the association between socio-economic status and food consumption.

Results: Overall, the mean frequency consumption of fruits (p=0.001), dairy (p=0.001), meat and chicken (p=0.007), sugary drinks (p=0.008) and fast foods (p=0.035) by the adolescents was significantly higher in Lang'ata compared to Kayole as observed in the age and sex adjusted correlations. Conclusions: The adolescents from Lang'ata had a more varied diet compared to their counterparts from Kayole. Unhealthy food consumption patterns found in both areas. Efforts to promote healthy eating among the adolescents are thus crucial, and particularly among the adolescents from middle income households, to prevent nutrition related non communicable diseases.

Keywords: Adolescents, diet, socio-economic status, Nairobi

THE PLACE OF LIFE SKILLS EDUCATION IN THE PROMOTION OF THE WELL-BEING OF UNIVERSITY STUDENTS IN KENYA.

Janet Surum

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Mental health awareness lies central to the health and well-being of individuals. Amidst the rise of issues questioning the level of mental health awareness of university students, like suicide the place of mental health education has been slowly gaining entry as a common course in some universities in Kenya. In as much as reading, writing and arithmetic are core to the curriculum in Kenya, Life skills education is inevitable. Many of the life challenges that university students face require other types of skills like; Stress management, anger management, and self-awareness and communication skills and many other skills. The purpose of the study is to reaffirm the significance of life skills education in promoting the well-being of university students. The study was anchored on two main objectives,; (i) to analyze the place of life skills Education in the Promotion of well-being of university students ,(ii) to reinforce the need for the introduction of life skills education as a core course in the curriculum of universities in Kenya. The study is qualitative in nature, where secondary data from different studies were compared.

ANTIMICROBIAL ACTIVITIES AND CHARACTERIZATION OF BIOACTIVE CONSTITUENTS FROM A KENYAN PLANT, CAPPARIS FASCICULARIS DC.

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Many antibiotics have been rendered ineffective due to resistance by disease causing bacteria and fungi, making a growing number of virtually untreatable infections. This has resulted in great difficulty in the control of diseases such as tuberculosis, cholera, dysentery and pneumonia. Plants are potential sources of new antimicrobial agents. Capparis fascicularis DC. (Cappaaraceae) is one of the plants used in traditional medicine in Kenya against infectious diseases, including wounds, common cold, sexually transmitted diseases for example gonorrhea, among others. Different parts of this plant were extracted with aqueous and organic solvents and were screened against selected strains of bacteria and fungi. Ethyl acetate extract of the root bark of this plant was most active and its fraction, CFR showed MIC value between 62.5 and 500 µg/ml. Its further chromatographic fractionation gave a fraction, F2 which presented MIC values ranging between 31.25 and 500 µg/ml on bacteria. The best activity was against Bacillus subtilis and Escherichia coli (MIC value = 31.25 µg/ml). This fraction was further fractionated but the sub-fractions obtained had

lower MIC values between 125 and 500 µg/ml on bacteria suggesting that the constituents of fraction, F2 work in synergy. Fraction, F2 was subjected to GC-MS and LC-ESI-MS analysis which led to identification of nine major compounds. Among the nine compounds, five were discovered to be bioactive. This is the first time that C. fascicularis has been scientifically examined and its traditional use authenticated.

EXPLAINING NON-COMMUNICABLE DISEASE RELATED BEHAVIOR IN KENYA IN THE CONTEXT OF SOCIOECONOMIC POSITION, LIVING AREA AND FAMILY – PHYSICAL ACTIVITY PATTERNS AND BARRIERS

Muhoro Munuhe[1], Lucy-Joy Wachira[1], Vincent Onywera[1], Sophie Ochola[3], George Owino[4], Noora Kanerva[2], Maijaliisa Erkkola[2], Esther Anono[3], Hanna Walsh[2], Mikael Fogelholm[2].

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Background: Physical activity transition to declining activity levels now poses a public health concern because of its contribution to a rising prevalence of non-communicable diseases. Active lifestyle enabling environments and PA behavior are associated with socioeconomic status, home and neighborhood activities and characteristics, and perceptions about the neighborhood. The study investigated perceived barriers to PA in a low-income suburb (Kayole) and a middle-income suburb (Lang'ata) in Nairobi City County. Methods: Data was collected from adolescents and their parent/guardian. PA was assessed using questionnaires and variables included the type of activities engaged in on a typical week, active transportation and perceived barriers to active transportation. Data was analyzed using logistic regression.

Results: Adolescents' in Lang'ata Sub-County were more likely to participate in activities in recreation parks (P=0.0414) and attend social events (P=0.0003) compared to those in Kayole Sub-County. Boring routes (P=0.0224) and there being no safe places to park bikes (P=0.0410) were significant barriers to active transport in Kayole Sub-County compared to Lang'ata Sub-County. Males had a higher likelihood of participating in outdoor sports (P=0.0003) while females were more likely to attend to household chores (P=0.0125). Among the adults, Lang'ata residents found it easier to drive instead of walking or biking (P=0.0099) and were more likely to participate in activities in a recreation park (0.0377) than Kayole residents. Presence of dangerous crossings (0.0064), garbage and bad smell (0.0094), crime (P<0.0001) and absence of walking/running/biking paths (0.0160) were more likely to be perceived as barriers to active transport in Kayole compared to Lang'ata. Males had a higher likelihood of exercising in the gym (P=0.0015) and participating in outdoor sports (P=0.0376).

Conclusions: Aspects of adolescents' and parents' activities and perceptions were associated with living in the low and middle-income areas as influencers of PA. These associations should be further explored to appropriately inform policy and practice in curbing declining PA levels.

Keywords: Adolescents, barriers, physical activity, active transport, Nairobi

NON-COMMUNICABLE DISEASE RELATED BEHAVIOR IN THE CONTEXT OF SOCIOECONOMIC POSITION: FOOD CONSUMPTION PATTERNS AMONG ADULTS IN KAYOLE AND LANG'ATA SUB-COUNTIES NAIROBI, KENYA

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Kenya is undergoing a rapid transition resulting in unhealthy dietary consumption associated with rise in Non-Communicable Diseases (NCDs). Socio-economic status is generally associated with the quality of diet. There is limited information on how socio-economic status of households influences the diet of adults and how dietary patterns are associated with BMI status in Kenya. The aim of this study was to investigate the association between frequency of food groups' consumption and BMI status of adults. Methods: A cross-sectional study was conducted among 87 randomly selected adults from a low socio-economic area (Kayole) and a middle income area (Lang'ata) in Nairobi City County, Kenya. Data were collected using a semi-quantitative 7-day food frequency questionnaire. This study was part of the KENFIN-EDURA research project. The association between food consumption and BMI status was determined using Linear Regression Analysis. Results: The overall prevalence of obesity was at 26.4%. There was no association between food consumption patterns and BMI status. These preliminary findings may be explained by the fact that food portion size and not frequency of food consumption may be more important in influencing the BMI status in this population. Physical activity may also be important in influencing the BMI status among the study population. Conclusions: Studies investigating the association of food portion size and the level of physical activity and BMI status as well as dietary patterns are recommended to provide information to design appropriate strategies to reduce the high level of obesity among adolescents living in urban areas.

Key words: Adults, diet, socio-economic, BMI, Nairobi

SOCIAL- EMOTIONAL INTELLIGENCE AS A MODERATOR OF HEALTH AND WELL-BEING

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Health is not just abscence of a disease but it is a resource that individual use to achieve satisfaction of their needs, realize their full potential, cope with environmental demands and improve productivity. Well-being on the other hand indicates the ability to judge life in a positive way and the ability to recover back to positivity and full functioning after an adverse experience. People are experiencing emotional challenges despite improved technology, formal education and better health care. Mental ill-health encompasses depression and anxiety disorders, loneliness and low social connectedness, poor emotional impulses control that are resulting in unhealthy behaviours especially among the emerging adults in Kenya. This in turn has raised concerns on the quality of relationships among university relating partners with rising cases of violence and ill-intentions between partners. Social-emotional intelligence skills have been found to be critical in facilitating emotional awareness of self and others, emotional management of self and others, social awareness and relationship management, self control and responsible decision making. In our study, we are investigating the relationship between social-emotional intelligence and the quality of romantic relationship among the students in Nairobi county universities. Adopting and incorporating the findings from this study and other similar studies, by individuals and institutions can be extremely empowering. Social-emotional skills can facilitate individual partners to assess their strengths and weaknesses, regulate their emotions and thoughts and in turn manage their behavior. These skills also enhance empathy, facilitate accurate, appropriate and effective communication, improves confidence and self esteem, facilitates assertiveness and problems solving skills and informed decision making.

NEGLECTED ASPECTS OF NON-COMMUNICABLE DISEASES CONTROL IN KENYA

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Institutional affiliation: Non-Communicable Diseases Alliance Kenya (NCDAK)

Symposium chair: Dr Eva Njenga, Non-communicable Diseases Alliance Kenya (NCDAK)

Tentative title: **Role of palliative and rehabilitative care in control of non-**communicable diseases
Synopsis of the Symposium Theme

Kenya faces an increasing burden of non-communicable diseases (NCDs): mainly cardiovascular diseases, diabetes, cancer, mental illness and chronic respiratory diseases that threaten national health and development. NCDs account for 55% of hospital admissions, 50% of hospital deaths and 33% of total deaths. NCDs mainly affect the economically active population group and pose a threat to public health, social and economic development.

While NCDs and their risk factors are affected by poverty and social determinants of health, catastrophic out of pocket expenditure on NCD care drives many Kenyan families into poverty. NCDs thus threaten the attainment of the Sustainable Development Goals and Kenya's Big 4 Agenda.

Although, health systems in Kenya, previously geared to manage acute infectious conditions, are being adapted to integrate and address the increasing NCD burden, certain aspects of NCD control are often neglected. This symposium aims to demystify these neglected aspects of NCD control: including nutrition, environment, mental wellness, palliative and rehabilitative and palliative care and their role in health and well-being.

COMBINING SDGS 3 AND 4 – A MODEL FOR PROMOTING HEALTH LIVING THROUGH HEALTH PROMOTION IN KENYAN PRIMARY SCHOOLS

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Introduction: Kenya faces an escalating burden of non-communicable diseases (NCDs), which, if left unchecked, threaten achievement of universal health coverage (UHC) and sustainable development goals (SDGs). Health promotion can avert NCDs by empowering communities on healthy living though structural changes of the obesogenic environment are also essential. The life-course perspective entails that interventions during early stages of life, including school age, provides the best return of investment.
Findings: The Promoting Healthy Living Model (PHL) is a primary school health promotion intervention for long-term prevention of NCDs. It is based on a three-year project: Promoting Healthy Living through Schools implemented in Kenyan primary schools across six Counties reflecting socio-economic, cultural and lifestyle diversities of Kenyan communities. This knowledge and skills based intervention focuses on healthy eating and physical activity as key variables for healthy living by empowering school community as change agents for prevention of NCDs. PHL is based on educational principles; adapted to local priorities and contexts; it is inclusive, interactive and promotes changes in knowledge, competences and empowerment. Impact and Relevance

Primary schools provide an entry point for preventive community health services. Enhanced health promotion capacity of pupils and teachers enable them to impact on practices and behaviours of their communities. Integration of the PHL Model into the competency-based school curriculum is an innovative way of promoting healthy living for prevention of NCDs thus contributing to achievement of UHC in Kenya through a joint focus on SDG 3 (Health) and SDG 4 (Education).

Keywords: Primary Schools, Health promotion, Prevention, Lifestyle, Non-communicable Diseases.

PLASMA CARBONIC ANHYDRASE II LEVELS ASSOCIATED WITH INCREASED COMPLICATIONS IN SICKLE CELL DISEASE

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Introduction: Erythrocyte carbonic anhydrase II (CA-II) the bicarbonate exchanger causes acidification of the red blood cell hence triggering the dissociation of oxygen from oxyhemoglobin. Mutant hemoglobin S favors sickling in this hypoxic state.

Objective: We sought to determine the relationship between plasma levels of CA-II and the sickle cell disease (SCD) state and related clinical complications.
Materials and Methods: We enrolled 20 children with SCD (12 males and 6 females, aged 6 months-12years) and 20 gender matched controls (aged 6 months- 12 years) into the study. After assessment of complete blood count, sickling and hemoglobin electrophoresis, CA-II levels were determined by enzyme linked immunosorbent assay (ELISA). We applied the Student t test to determine differences in CA-II levels between cases and controls, and between SCD children with complications and those without.
Result: The mean CA-II levels were significantly elevated in children who suffered from sickle cell disease (116.4±50.03ng/ml) compared to healthy controls (77.6±42.29ng/ml) (p=0.0001). CA-II mean levels was significantly enhanced in children who suffered from clinical complications of sickle cell disease (126.1±51.3ng/ml) compared to healthy controls (79.8±12.5ng/ml) (p=0.0001).

Conclusion: CA-II is elevated in children with SCD likely on compensatory blood gas transport mechanisms. CA-II appears to be associated with clinical complications in SCD and may help predict clinical course and guide optimal and timely interventions.

Keywords: Carbonic anhydrase, Erythrocyte, Hemoglobin S, Hypoxia, Polymerization

ASSESSMENT OF KNOWLEDGE REGARDING PREVENTION OF HEPATITIS B INFECTION AMONG AFRICAN UNDERGRADUATE STUDENTS OF HEALTH SCIENCES IN DAVANGERE, KARNATAKA-INDIA.

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Background: Hepatitis B is an inflammatory disease of the liver which is caused by Hepatitis B Virus. It is a global problem, with 66% of all the population living in areas where there are high levels of infections. Hepatitis B infection may be due to lapses in the sterilization of instruments as well as improper waste management. Knowledge regarding Hepatitis B and safety precautions is needed to minimize the health care setting's acquired infections among health personnel and students of health Sciences.

Objectives: (a) To assess the knowledge regarding Hepatitis B among African Students of Health Sciences (b) To associate the knowledge of the students regarding Hepatitis B with their selected demographic variables.

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DEPRESSION AND EMPLOYEE PRODUCTIVITY

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According to the WHO 2017 report, depression is the most common ailment in the world with 450 million people affected globally. It has also been ranked as the greatest contributor to global disability at 7.5%. In the same report, Kenya was ranked fourth in Africa with 1.9 million people suffering from depression. Persistent exposure to stressful situations which can arise from within an individual or from external pressures at work or at home leads to development of depression. Depression has been linked to presenteeism which if left unaddressed could lead to absenteeism. Presenteeism results in reduced employee productivity through; reduced quality of work, impaired initiative, taking additional time on task, decreased motivation, low quantity of work and weakened social functioning with workers. Work stressors such as excessive work load and work demand, lack of administrative support and others have been linked to worsened depression. For organization to get maximum return on investment on their human resource, it is critical that the effect of depression and work stressors on employee productivity be well understood. This paper reviews existing literature on this portent with the aim of formulating suitable stress management strategies which can be used to not only improve employee productivity but their overall health. An all-inclusive literature review of articles and reports published between the year 2008 and 2018 on depression and employee productivity was conducted. A conceptual model on effect of depression on employee productivity and possible data collection and data analysis techniques are proposed at the end of the study.

ETHNOBOTANICAL SURVEY ON MEDICINAL PLANTS USED FOR THE MANAGEMENT OF DIABETES MELLITUS IN HADEJIA TOWN, NIGERIA

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Diabetes mellitus (DM) is a common deadly disease that affects mankind in both the poor and developed countries of the world. It is rather unfortunate that the number of people suffering from this disease particularly in Nigeria is on the increase. An ethnobotanical survey was conducted to document common medicinal plants used for the management of Diabetes mellitus in Hadejia town, Jigawa State - Nigeria. The interviews were designed to record information about the medicinal plant used to treat diabetes mellitus and their local names, methods of preparation, parts of the plant used, administration in of medicines and the demographic characteristics of the participants in the study. A total number of sixty (60) respondents were interviewed, with 45% within the age range of 31 - 40 years, 38.3% within the age range of 41 - 50 years, while 10% were within the age range of 51 - 60 years. Most of the respondents were married (91.6%), male (71.6%) farmer (23.3%) and traditional medicine practitioners (26.6%). Also, the majority of the respondents were attending Islamic school (50%), some were not having a formal education with percentage of (33.3%). Also A total number of sixteen (16) plants belonging to 12 families were described as being used for the management of diabetes mellitus in Hadejia town. The families Amaryllidaceae, Fabaceae, Myrtaceae, and Combretaceae were the most frequently mentioned families in this study, while leaves, stem bark, and roots were the most frequently used plant parts. The informant consensus factor (ICF) has shown a high degree of consensus (0.67) among the respondents. This work was carried out in order to provide background data on the medicinal plant used traditionally for management of diabetes mellitus in the study area.

Keywords: Ethnobotany, Diabetes mellitus, Medicinal Plants, Hadejia

ISOLATION OF ZOONOTIC NON TUBERCULOUS MYCOBACTERIA AMONG DROMEDARY CAMELS AND HOUSEHOLD MEMBERS IN SAMBURU COUNTY, KENYA

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Background: Zoonotic nontuberculous Mycobacteria (NTM) infect a wide range of domestic animals, wildlife and man causing various diseases. The aim of this study was to isolate and identify the Mycobacteria from camels and associated household members and to assess zoonotic risk in Samburu East, Kenya.
Materials and methods: This was a cross sectional, one-health approach study involving lactating camels (n=611) from 83 households and slaughtered camels (n=1600). A semi-structured questionnaire was administered to each of the household and symptomatic household members (n=48) were identified. All samples were analysed at KEMRI/CRDR enhanced BSL2 laboratory.

Results: Fifty five, 23.1% (55/238) camel milk samples were AFB positive after culture. One hundred and thirty two, 8.25% (132/1600) suspect granulomatous lesions were found. Twenty seven, 1.69% (27/1600) were AFB positive after culture. Seven, 14.58% (7/48) human sputum samples were AFB positive and included M. fortuitum (1), M. szulgai (2) and four unknown Mycobacteria species. A majority of the NTM isolates were found to be M. fortuitum (62.9%) in post mortem lesions and M. szulgai (52.7%) in milk, the other species identified include M. scrofulaceum (11%), M. marinum (3.7%), M. intracellulare (3.7%), M. gordonae (3.7%). The MIC (µg/mL) for ethambutol, rifampicin and isoniazid was 1->8, 1->64 and >1 respectively. Higher odds were found for culture positivity among camel breed (OR=3.4) and source of replacements of camels (OR=2.1, 3.2).

Conclusions: A variety of NTM were isolated from lymph nodes of the thoracic cavity. The interaction between camels and humans and consumption of raw camel milk explains the similarity of isolates and drug susceptibility. It is important to note that isolates were highly resistant to first-line TB drugs.

Keywords: Nontuberculous Mycobacteria, dromedary camel, epidemiology, Kenya

EMERGING EVIDENCE OF THE PHYSICAL ACTIVITY TRANSITION IN KENYA

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Background: The increase in the prevalence of child obesity and physical inactivity in developed countries is worrying. Comparable data to examine the physical activity (PA) transition threat in African countries like Kenya are lacking.

Methods: We assessed PA levels of Kenyan children from urban (UKEN) and rural (RKEN) environments as a model to examine evidence of a PA transition. Children aged 9-12 years participated in the study with n=96 and n=73 children from UKEN and RKEN respectively. Pedometers were used to estimate children's daily step count. Parental perception regarding their child's PA patterns was collected via questionnaire (n=172).

Results: Children from RKEN were more physically active than their UKEN counterparts with a mean weekday step count (± SE) of 17,601 ± 671 vs. 14,245 ± 584 ($p<0.0001$) and weekend steps of 38,664 + 2924 vs. 26,556 + 3448 ($p<0.009$) for RKEN vs. UKEN children respectively. 51% of the UKEN children spent over 2 hours per week playing screen games.

Conclusions: Results of this study are indicative of a PA transition in Kenya. Further research is needed to gather national data on the PA patterns of Kenyan children to minimize the likelihood of a serious public health problem due to physical inactivity.

Key words: Health, physical activity

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EFFECTIVENESS TELEPHONE COUNSELLING IN CRISIS INTERVENTION AMONG CALLERS TO HELPLINE CENTRES IN NAIROBI COUNTY, KENYA

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This study was conducted against the background that the growth of mobile phone usage and ownership has affected the delivery of mental health services to the world population. Following this trend, several helplines had been installed in Kenya to help people cope with psychological crises. Despite their presence, little was known as to whether the population utilized them maximally and whether they assisted in overcoming or reducing psychological crises. The purpose of this research was to establish the effectiveness of telephone counselling in crisis intervention among callers to helpline centres in Nairobi County, Kenya. The study utilized a cross-sectional analytic design which helps in making inferences regarding a given population at a given point in time. Purposive sampling was used to select a sample of 103 participants (caller clients= 63; counsellors=40) based on inclusion criteria of clients who made a call to selected helpline that lasted 15 minutes and for counsellors were selected based that work on selected helpline. Purposive non-probability sampling method was used using inclusion criteria of clients of calls that lasted more than 15 minutes and whose aim was crisis intervention and for counsellors engaging directly with callers in a helpline. Data was collected using semi-structured questionnaires administered over the phone to the client callers and directly to the telephone counsellors by the researcher. Quantitative data was analysed using descriptive statistics like mean and standard deviation and inferential statistics like one way ANOVA. The findings were presented using frequency tables and pie charts. Qualitative data was analysed thematically and presented in narrative form. The findings showed that frequent calling of helplines was predicted by previous call to a helpline. There were no significant differences between the levels of satisfaction among callers to different helplines. Telephone counselling was highly preferred because of reducing turnaround times between experiencing crises and getting intervention; and various suggestions for addressing technical, institutional and personal challenges affecting telephone counselling were suggested. The research may be useful to administrators of the helplines and the telephone counsellors because it may inform policy and it contributes to the body of knowledge.

Key Words: Counsellor, Effectiveness, Crisis intervention, Helpline, Telephone Counselling.

MYHEART KE. - INTEGRATING TECHNOLOGY AND PRIMARY HEALTH CARE IN CARDIOVASCULAR HEALTH PROMOTION.

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Introduction: Cardiovascular diseases are the leading killer non-communicable diseases in Kenya. The project MyHeart Ke. targeted youth in universities aged 18-24 years in Nairobi Kenya and aimed at informing the youth about cardiovascular health. With the use of disruptive approaches and the use of a habit forming app,MyHeart Ke, the project hypothesized that the use of MyHeart Ke. App will be able to influence the habits of the study population.

Methods: The project used a mixed method approach applying the use of baseline and endline survey while also using interviews and regular data collection from MyHeart Ke. App data analytics.All the 400 participants from participating universities: Kenyatta University And Jommo Kenyatta University Of Agriculture And Technology, underwent a training after the baseline survey and were exposed to MyHeart Ke App for one year between June 2017 and June 2018. Data was collected on awareness levels on cardiovascular diseases and on the uptake of healthy lifestyle practices as suggested by the use of MyHeart Ke App. The data was analyzed using Microsoft Excel.

Results: 92% of the project participants stayed in the project for the whole year and 79.9 % had experienced a behavioral change. The results showed that 77.1 % of the projects participants were likely to change their lifestyles after interacting with MyHeart Ke mobile app and they had better understanding of cardiovascular health.

Conclusion: Taking the obtained results into consideration, the project clearly indicates that with the use of technology, we have shown that 7 in every 10 individuals can retain and adopt healthy habits if health education is fused with technology as a tool for primary health care. Technological adaptations such as the habit formation apps like MyHeart Ke, should be used more for primary health care as tools and drivers for effective primary health care programmes.This will intern help achieve Sustainable development goal 3 under the indicator 3.4 on non communicable diseases and achieve one of the big 4 agenda on health with primary focus on primary health care and universal health coverage.

ABERRATION OF IRON LEVELS IN OREOCHROMIS NILOTICUS AND CLARIAS GARIEPINUS AFTER EXPOSURE TO AFLATOXINS

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Presentation prefference: Poster

Background: Fish is high in omega 3, protein and iron that the human body needs to stay healthy. Excess or deficiency of minerals may seriously disturb biochemical processes and upset internal homeostasis, leading to various diseases and disorders. The specific objective of the study was to determine the iron levels changes after exposure to aflatoxins and field assessment from river Nyando of Oreochromis niloticus and Clarias gariepinus.

Materials and methods: Laboratory procedures for fish from both sources to determine metal levels were carried out at Kenya Industrial Research and Development Institute (KIRDI) in Kenya where the concentration of element iron in fish tissue were measured using atomic absorption spectrophotometer (AAS) analyst 800 (Parkin Elmer Instrument, USA). The completely randomized design was used where the main plot was the treatment and the subplots were the fish species obtained from Sagana. ANOVA was performed to compare means and tukey to separate the means having set the significance levels at $p<0.05$. Gen stat version 12, SPSS version 21 and excel 2010 were used in data analysis.

Results: The results showed that iron availability was lower after treatment with aflatoxin compared to

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controls and fish obtained from River Nyando with a mean of 3.66± 0.84 mg/kg in fish bred at Sagana. The treatment had a significant influence in fish bred in Sagana.

Conclusions: Therefore toxicants affect the nutritional value, quantities and composition of food and therefore all relevant agencies to conduct food quality tests from farms before processing and distribution to wider markets for human consumption.

Keywords: Abberation,fish, diet, aflatoxin,iron,nutritional.

RISK FACTORS AND BACTERIOLOGICAL ASSESSMENT OF PATIENTS ON PROLONGED HOSPITAL ADMISSION AT MURTALA MUHAMMAD SPECIALIST HOSPITAL KANO STATE, NIGERIA

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Background: Prolonged hospital admissions of patients remain a challenge to healthcare providers and seekers in resource limited settings. Bacteria contributes significantly to the burden of Infection related overstay. The study was aimed at evaluating of healthcare associated infection, the potential risk factors and bacteriology of patients on prolonged hospital admission at Murtala Muhammad specialist hospital Kano state (MMSHK), Nigeria.

Methods: Descriptive cross sectional and retrospective designs involving bacteriological Analysis was conducted at MMSH. One hundred forty (140) swabs of urine sample and other related samples were collected from four different wards and were processed by standard microbiological methods, 277 health records were assessed showed Prolong hospital admission and Factors that influence prolongs hospital admission; data were summarized using descriptive statistics.

Results: The Prevalence of HCAIs was 41.43% and prolonged hospital stay 50.5% at 95% C.I: (0.4466-0.5658) F-value 12.03, p-value0.0001 respectively. Site of infection showed wound/ SSI had the highest41.4%. Esherichia coli (22.4%) were the predominant organisms among the Gram-negative bacteria. The factors that influence prolong hospital admission were Lack of qualified staff, (A0R=4, 27, 95%C.I: 2.78-7.68) staff training (AOR=6, 82. 95%C.I: 5.01-9.83), were statistically associated with Potential factors associated with prolonged hospital stay.

Conclusions: This study gives insight into the prevalence of HCAI; prolong admission and potential risk factors. Hence any effort to control the observed high burden and prolong hospital admission should be considered for better output.

Keywords: Healthcare associated infection, Bacteriological analysis, prolonged hospital admission, Murtala Muhammad specialist hospital Kano

PSYCHOSOCIAL WELLBEING AND WORKPLACE DIVERSITY USING THE SOCIAL IDENTITY THEORY

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Employees being one of the key internal resources of an organization, the diverse workforce should be managed prudently (Papaleo, Cangiano, and Calicchia, 2013). This concept paper therefore has three study objectives; one is to demonstrate how different diversity factors can develop at the workplaces using the social identity theory, the second is to examine the implications of these diversity factors if unchecked and lastly to assess the corrective and preventative measures to the negative effects of the diversity factors at workplaces. The researcher relies on secondary sources to draw conclusions and therefore the diversity concept and its pros and cons at the workplace are explicitly highlighted; the theoretical framework and its associated principles are discussed; Aspects of psychosocial wellbeing are presented and practical and social implications are outlined. Reviewed literature shows that if the diversity factors are unchecked in the workplaces by ineffective management systems it can result into mental and emotional ill-health which can then manifest itself negatively in the outward by means of unwanted or unethical actions. Psychosocial ill-health among employees leads to a poor safety climate in the workplace (Jha, Varkkey, Agrawal, and Singh, 2017). A number of studies in this area of occupational health and safety have focused on the workplace health programs inclined to physical wellbeing but none in the Kenyan context has explored how the diversity of the Kenyan population affects the emotional and mental wellbeing of the workforce. The paper will act as a red-light for the companies and organizations to understand the need to effectively manage their diverse human resources by controlling the negative impacts which might result into friction at workplaces. The paper pinpoints the need of good personal interrelationship that will enhance a good balance between the societal interactions, family and working life for the both individual and organizational wellbeing. The paper successfully applies the social identity theory to demonstrate how different diversity factors can grope up and take root in a workplace which can eventually overshadow the organization culture.

Key words: Interpersonal relationships, organization culture

Paper type: Conceptual paper

EXPLAINING NON-COMMUNICABLE DISEASE RELATED BEHAVIOR IN KENYA IN THE CONTEXT OF SOCIOECONOMIC POSITION, LIVING AREA AND FAMILY

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Background: In lower middle-income countries, non-communicable diseases (NCD; e.g. type 2 diabetes) lead to more disability and deaths than malnutrition and infections together. As a country develops, NCD´s start to affect more individuals in lower socioeconomic positions - thus creating health inequalities.
Materials and methods: We aimed at collecting novel and important data on determinants of NCD-related lifestyles in a lower-middle income (Kayole) and higher-middle income (Langata) areas in Nairobi City. We aim to study the interactions between culture and sociodemographic characteristics as determinants of physical activity, dietary quality, and overweight/obesity.
Results: In both areas, 70 families with one child aged 11 to 14 years old were randomly selected to participate to the study. The data was collected between March and June 2019. Usual consumption of 170 food items was collected, using a food frequency questionnaire (FFQ). For the children, 24h recall was also conducted in order to validate the FFQ. Participants' weight, height, waist circumference, and mid-upper arm circumference were measured. Children's physical activity was measured, using accelerometres over 7 consecutive days. Further, active transportation habits were queried from all participants' with a validated questionnaire. Parenting practices on lifestyle habits and the sociodemographic characteristics of the families were also queried. The roles of family and obesity-related cultural norms as potential modulators of health behavior, were examined in focus group discussions and in-depth interviews.
Concusions: Despite the heavy study protocol, the study was well-received in both areas and reached high participation rate.

Keywords: lifestyle transition, obesity, low socioeconomic position, food frequency questionnaire, accelerometer, cultural norms.

FACTORS INFLUENCING ACTIVE TRANSPORTATION TO AND FROM SCHOOL AMONG CHILDREN IN NAIROBI CITY COUNTY, KENYA

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Introduction: There is evidence that non-motorized transportation also known as active transportation (AT) has several health and environmental benefits like improved health and air quality. Objectives: This study sought to determine the factors that affect children's use of AT to school in low socio – economic status (LSES) regions in Nairobi City County. Methods: Data was collected from a sample of 352 children of ages 10 – 12 years old as part of the Physical Activity and Active Transport (PAAT) project. Barriers to AT for the children were assessed using questionnaires. Results: Majority 242 (68.9%) of the children from LSES regions in Nairobi City County reported high rate of AT. Even though safety is a crucial factor, it seems the children do not have an alternative to AT given the relatively higher rates of AT 211(60.1%), 122(34.8%) moderate rate while only 18(5.1%) low rate of AT. When the barriers (environmental, psychosocial and safety) were considered, there was statistical significant difference (p=0.001) among children's rate of AT in LSES parts of Nairobi city county. Conclusions: The current state of Nairobi City County's transport infrastructure does not encourage AT. Children in LSES regions of the county still record high AT rates on the face of environmental, psychosocial/planning and safety barriers inherent. The study suggests further research on the relationship between safety and AT modes by children to school and other destinations in Nairobi City County. Recommendations for Further Studies and Intervention: Future studies should be structured to focus on a broader range of ages and environments to enhance interventions tailored for specific groups. Given the context specific nature of the current study, further investigation of the highlighted relationships in different counties in Kenya would be beneficial.

Keyword: Non motorised transport, walking, cycling, active transport

THE KENYA-FINLAND EDUCATION AND RESEARCH ALLIANCE (KENFIN-EDURA) PROJECT: DOES MY NEIGHBORHOOD AFFECT MY DIET AND PHYSICAL ACTIVITY PATTERNS?

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The world continues to experience an increase in obesity and sedentary behaviors in both sexes and at all ages. Countries in the Sub-Sahara Africa are showing similar transitions in lifestyle behaviors. Increasing levels of obesity with declining levels of physical activity increase the risk of non-communicable diseases, particularly type 2 diabetes and cardiovascular diseases. This symposium will have four presentations with integrated topics that begin with the global trend towards sedentarism, links with universal health coverage in Kenya considering various socioeconomic levels particularly in Nairobi City County.
Prof. Vincent Onywera from Kenyatta University, Kenya and Prof. Mikael Fogelholm from the University of Helsinki, Finland will be the symposium co-convenors and will introduce the symposium.

Presentation 1: The Kenya-Finland Education and Research Alliance (KENFIN-EDURA) Project: An overview- By Vincent Onywera and Mikael Fogelholm

Presentation 2: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: The methods
By By Noora Kanerva and Victor Okoth

Presentation 3: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: Physical activity lifestyle and barriers
By Muhoro Munuhe and Joy Wachira

Presentation 4: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: Sociocultural factors
By Moses Wanjala, Dinah Dipondo and George Owino

Presentation 5: Explaining non-communicable disease related behavior in Kenya in the context of socioeconomic position, living area and family: Dietary patterns:
By Esther Anono, Maijaliisa Erkkola and Sophie Ochola

Presentation 6: School children's physical activity: Some novel pedagogical aspects in physical education By Tiina Laiho and Timo Vuorimaa

Vincent O. Onywera *is a professor at the Department of Physical Education, Exercise and Sports Science, Kenyatta University. His area of research interest is physical activity and active transportation.*

Mikael Fogelholm *is the Professor in Public Health Nutrition and the Department of Food and Nutrition, University of Helsinki, Finland. His area of research interest is dietary patterns, dietary guidelines and the interactions between diet, physical activity and obesity.*

Noora Kanerva *works at Nightingale Health Ltd as a Senior Data Scientist and holds docentship in nutrition epidemiology at the University of Helsinki. Her areas of interest are dietary patterns and obesity.*

Sophie Ochola *is a senior Lecturer in Public Health Nutrition at the department of Food, Nutrition and Dietetics , Kenyatta University. Her area of research interest is maternal, child and adolescent nutrition , dietary intake and its relationship with obesity*

Ari Haukkala *is a University lecturer at the Faculty of Social Sciences discipline of Social Psychology, University of Helsinki. His main interest is the use of theory-based behavior change techniques to improve people's well-being and health.*

Lucy-Joy Wachira *is a lecturer at the department of Physical Education, Exercise and Sports Science in Kenyatta University. Her area of research interest is physical activity and obesity.*

Maijaliisa Erkkola *is an adjunct professor in Nutrition at the Department of Food and Nutrition, University of Helsinki, Finland. Her areas of expertise are dietary assessment methods, research on diet in families, and on sociodemographic differences in diet.*

George Evans Owino *is a lecturer at the Department of Sociology, Kenyatta University. His research interest deals with the way people construct meanings and define activities, events and phenomena through social interaction and how these meanings and definitions interlink with behaviour.*

Timo Vuorimaa *is the Principal Lecturer in the Haaga-Helia University of Applied Sciences, Vierumäki, Finland. His area of research interest is exercise physiolology.*

Tiina Laiho *is the Lecturer in Haaga-Helia University of Applied Sciences, Vierumäki, Finland. Her research interest is physical activity and wellness.*

Esther Anono *is a Masters student in the department of Food, Nutrition and Dietetics Kenyatta University. She is currently working on her research work in the KENFIN-EDURA project.*

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Moses Wanjala *is a master's student in the department of sociology at Kenyatta University. He is currently working on his thesis research work in the KENFIN-EDURA project.*

Victor Okoth *is GIS analyst part-time trainer in the School of Environmental Science at Kenyatta University. He is interested in the application of geospatial technologies in analyzing spatial data through mapping software and designing digital maps with geographic data.*

Hanna Walsh *is masters student in the department of food and nutrition, University of Helsinki, Finland and a project coordinator in the KENFIN - EDURA Project.*

PHYSICOCHEMICAL CHARACTERISTICS OF MANGROVE HONEY FROM KILIFI COUNTY, KENYA

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The Kenyan mangrove honey from the coastal region is usually priced higher than honey from other areas of the country because consumers prefer its distinctive taste, flavor and medicinal value. Though some physicochemical characteristics of the mangrove honey have been reported, the volatile organic compounds present which are responsible for its characteristic flavor are not known. The objective of this study was to determine the physiochemical properties and volatile organic compounds in Kenyan mangrove honey.

Twenty (20) honey samples, weighing approximately 250g each were collected randomly from farmers in different locations in Kilifi County and packed in 500cm3 plastic bottles. These samples were transported to the laboratory and stored in a refrigerator at 4o C. Volatile organic compounds were extracted by Ultra-sound-assisted solvent extraction (USE), then determined using Gas chromatography-Mass spectrometry. The physicochemical characterization was done using standard methods recommended by International Honey Commission.

Data was analyzed using the SPSS program version 21. Mangrove honey was analyzed for moisture content, pH, free acidity, electrical conductivity, proline, HMF, invertase, diastase, specific sugars, color and volatile organic compounds. The moisture content means ranged from 23.40±0.00 to 19.23±0.06. The pH means ranged from 4.45±0.05 to 4.00±0.00. The electrical conductivity means ranged from 0.54±0.00 to 0.32±0.00. The acidity means ranged from 30.21±0.15 to 22.20±0.00. The proline means ranged from 734.36±4.23 to 602.24±2.68. The mean HMF range was 2.86±0.14 to 0. The mean invertase range was 9.55±0.10 to 5.54±0.11. The diastase means ranged from 11.48.47±0.06 to 8.11±0.64. Honey volatile organic compounds were extracted, identified and compared with those extracted and identified from the mangrove flower. From the identified VOCs, 35 of these were both in honeys and in mangrove flower. Among the 35 identified volatile organic compounds, 21 were similar in all analysed mangrove honey samples.

These VOCs can be used as markers of mangrove honey, thus help protect consumers fraudulently labeled mangrove honeys.

AN ASSESSMENT OF OLDER PERSON'S HEALTH AND WELL-BEING IN KIAMBU COUNTY, KENYA.

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New research has provided baseline data on health status of older people in Kiambu County, Kenya. Health programming for older people has consistently been undermined by a lack of data and vital statistics pertaining to their health status owing that this population is excluded from most general population surveys including demographic health surveys (WHO, 2015). Yet, one dimension of successful ageing is the compression of ill health and morbidity to the latter part of life (Bowling and Dieppe, 2005). Goal 3 of the Sustainable Development Goals (SDGs) aims to 'ensure healthy lives and promote wellbeing for all at all ages' (UN, 2016). Measurement of older persons' health is thus an important step towards achieving this goal. The study adopted a cross-sectional survey design and utilized multi-stage sampling procedure to arrive at the desired sample. 82 enumeration areas were picked randomly enabling the listing upon eligibility of all households with an older person above 60 years and creation of a sampling frame. The frame was then used to select 800 older persons from the 82 EAs utilizing combination of proportionate and systematic random sampling. A pre-developed self-report standard tool for assessing older people health was used to collect data in the pilot county of Kiambu. Findings indicate that at least a third experienced moderately good health whilst 35% reported poor health overall. Only 3% report having very good health while 6% believe their health is very bad. Leading chronic condition are hypertension reported by 36% of older persons, alongside 27% who suffered arthritis and 11% who reported a medical diagnosis of diabetes. These conditions disproportionately affected older women than men. The study recommends formulation of a health and ageing policy in Kenya to address unique health realities and needs of older persons with a focus on prevention of NCDs and lifestyle change.

Key words: Health, self-reported health status, older persons.

SMART WALKING STICK

June Madete and Noel Waithaka

Visual impairment is primarily a disability one is born with, but under other circumstances it may be caused by various factors like lifestyle and old age. Primarily the white cane is used to survey surrounding while also informing people that the user is blind. The cane can effectively survey obstacles on the ground, any obstacle above the knee, the device may not be used to survey. similar case with guide dogs, the dog may not assist in detecting overhead obstacles, they are normally trained to navigate around particular routes. It is because of the above short comings of the previous methods that the smart walking aid concept was conceived. The sensors used detect both overhead and ground obstacles as well as provide feedback to the user, hence making user experience better. Smart walking stick is an improved version of the white cane used by the visually impaired. This device uses a feedback system to help detect obstacles, ultrasonic sensors and proximity sensors are used in combination to provide a better angular coverage. The ultrasonic sensors detect obstacles close to the ground while the Passive Infrared sensor detects overhead obstacles. The ECM 40-20-13SA motor and buzzer are activated when obstacles are detected and this alerts the user, the design of the frame is detachable and in stent form. This makes the stick light as well as small enough to fit in a bag when detached. The device is intended to assist the visually impaired to maneuver around by using obstacle detection technology.

Keywords: Assistive products, smart, blindness, smart device, visual impairments.

RISK FACTORS AND BACTERIOLOGICAL ASSESSMENT OF PATIENTS ON PROLONGED HOSPITAL ADMISSION AT MURTALA MUHAMMAD SPECIALIST HOSPITAL KANO STATE, NIGERIA

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Background: Prolonged hospital admissions of patients remain a challenge to healthcare providers and seekers in resource limited settings. Bacteria contributes significantly to the burden of Infection related overstay. The study was aimed at evaluating of healthcare associated infection, the potential risk factors and bacteriology of patients on prolonged hospital admission at Murtala Muhammad specialist hospital Kano state (MMSHK), Nigeria.

Methods: Descriptive cross sectional and retrospective designs involving bacteriological Analysis was conducted at MMSH. One hundred forty (140) swabs of urine sample and other related samples were collected from four different wards and were processed by standard microbiological methods, 277 health records were assessed showed Prolong hospital admission and Factors that influence prolongs hospital admission; data were summarized using descriptive statistics.

Results: The Prevalence of HCAIs was 41.43% and prolonged hospital stay 50.5% at 95% C.I: (0.4466-0.5658) F-value 12.03, p-value0.0001 respectively. Site of infection showed wound/ SSI had the highest41.4%. Esherichia coli (22.4%) were the predominant organisms among the Gram-negative bacteria. The factors that influence prolong hospital admission were Lack of qualified staff, (A0R=4, 27, 95%C.I: 2.78-7.68) staff training (AOR=6, 82. 95%C.I: 5.01-9.83), were statistically associated with Potential factors associated with prolonged hospital stay.

Conclusions: This study gives insight into the prevalence of HCAI; prolong admission and potential risk factors. Hence any effort to control the observed high burden and prolong hospital admission should be considered for better output.

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Keywords: Healthcare associated infection, Bacteriological analysis, prolonged hospital admission, Murtala Muhammad specialist hospital Kano

ABERRATION OF IRON LEVELS IN OREOCHROMIS NILOTICUS AND CLARIAS GARIEPINUS AFTER EXPOSURE TO AFLATOXINS

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Presentation prefference: Poster

Background: Fish is high in omega 3, protein and iron that the human body needs to stay healthy. Excess or deficiency of minerals may seriously disturb biochemical processes and upset internal homeostasis, leading to various diseases and disorders. The specific objective of the study was to determine the iron levels changes after exposure to aflatoxins and field assessment from river Nyando of Oreochromis niloticus and Clarias gariepinus.

Materials and methods: Laboratory procedures for fish from both sources to determine metal levels were carried out at Kenya Industrial Research and Development Institute (KIRDI) in Kenya where the concentration of element iron in fish tissue were measured using atomic absorption spectrophotometer (AAS) analyst 800 (Parkin Elmer Instrument, USA). The completely randomized design was used where the main plot was the treatment and the subplots were the fish species obtained from Sagana. ANOVA was performed to compare means and tukey to separate the means having set the significance levels at $p<0.05$. Gen stat version 12, SPSS version 21 and excel 2010 were used in data analysis.

Results: The results showed that iron availability was lower after treatment with aflatoxin compared to controls and fish obtained from River Nyando with a mean of 3.66± 0.84 mg/kg in fish bred at Sagana. The treatment had a significant influence in fish bred in Sagana.

Conclusions: Therefore toxicants affect the nutritional value, quantities and composition of food and therefore all relevant agencies to conduct food quality tests from farms before processing and distribution to wider markets for human consumption.

Keywords: Abberation,fish, diet,aflatoxin,iron,nutritional

ELECTRO-MAGNETIC FIELD TECHNOLOGY AS PROFILER FOR CANCER DIAGNOSIS AND TREATMENT MONITORING

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The WHO report of 2012 observed that the worldwide annual death rate from cancer was about 7.6 million in the year 2008 alone, and that 70% were from the low and middle income countries. These figures were projected to rise to about 13.1 million and 80%, respectively, by 2030. In a nutshell, it says we are tending towards100%. What is it that others do, that the low and the middle income countries are not seen to be doing? The dilemma is that there are still uncertainties about the causes of cancer, symptoms, methods of diagnosis and prevention. Health facilities with the capacity and resources required for early detection and treatment are already overstretched, therefore, calling for versatile interventions and alternative indicators with corresponding mechanisms for detection. Also, there is desire to make diagnosis procedures be non-invasive; much of the diagnostic methods like blood tests for biomarkers are still invasive and, single handedly, not conclusive. This research project is undertaken to explore the ability of electro-magnetic field based technology in detecting Sodium (Na)/Potassium (K) anomalies, as “biomarker” for cancer susceptibility. This is based on the fact that the extracellular Na+ and intracellular K+ are key in setting appropriate membrane potential for body cells. The cancer causing substances (carcinogenic) have been reported to interfere with their order and concentrations. The detection of their anomalies would serve in diagnosis of cancer susceptibility. This project designed and conducted experimental simulation tests for the ability of electro-magnetic induction in detecting Na+ and K+ concentration anomalies. The results for the simulated normal cells/tissues, cancerous cells/tissues, hypothetical cases and intelligence tests for single and multiple sample diagnosis are positive and confirm the potential for application, especially in the frequency range 20-100 kHz. An easy to interpret model scale, for real time detection of cancer susceptibility, is proposed.

Key words: Cancer diagnosis, electro-magnetic field, sodium/potassium ions.

THE IMPACT OF MINIMUM WAGE LEGISLATION ON EARNINGS AND WELL BEING OF DOMESTIC WORKERS IN LANGATA SUB-COUNTY

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Background : The purpose of the study was to investigate the impact of minimum wage legislation on the earnings of domestic helpers and their wellbeing.

Materials and Methods: Descriptive research design was used. Both primary and secondary data was gathered. The Primary data was collected from respondents across 100 households. The sample size was identified using Multi stage sampling method from the population. Interviewer-administered questionnaires were distributed to respondents to obtain relevant information from the respondents sampled from Langata Sub-County.

Results: The findings indicate that 85 percent of domestic workers earn below the minimum wage, are not aware of the minimum legislation and are deprived of their dignity and live under poor sanitary conditions despite the regulation. Employers are aware of the minimum legislation but do not abide by the law. None of the respondents had National Hospital Insurance Cover and National Social Security Fund initiated by their employers .Domestic workers have no housing cover and no house allowance paid to them, This forces them to retrieve to slums like 'Kibera ' where they can hire low cost shanties with no latrines among other basic needs.

Conclusion: There is no significant correlation between minimum wage legislation and the earnings of house helpers. With low pay, their wellbeing is compromised. If Kenya has to eradicate poverty, provide good health and ensure wellbeing, and descent work and economic development of all citizens as outlined in the Sustainable Development Goals, the plight of all citizens must be improved. Kenya national development plans are anchored on the Big Four Agenda. The Health and wellbeing of Kenyans is achievable only if the plight of the low income earners is not addressed

SOCIALLY CONSTRUCTED MEANINGS OF HEALTHY FOODS AND PHYSICAL ACTIVITY AND THEIR IMPLICATIONS FOR NCD PREVENTION

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Kenya is experiencing a rapid nutritional and physical activity transition with the risk of exacerbating the development of non-communicable diseases (NCDs). Scientific evidence suggests that healthy nutrition and physical activity are protective factors in NCDs. An understanding of the social meanings of healthy foods and physical activity is necessary for nations to successfully incorporate them in NCD prevention interventions. However, people's definitions of healthy foods and physical activity are not well documented. In this paper, we present socially constructed definitions of healthy foods and physical activity in Kayole and Langata sub-counties of Nairobi County, Kenya. Qualitative methodology was used to collect data from 12 focus group discussions, 30 in-depth interviews and 15 key informants. Findings show that healthy foods were defined in terms of their perceived benefits, their nutritive value and whether they are traditional foods and fresh. Physical activity was constructed in terms of benefits to the body and its contribution to promotion of health in its entirety. Physical activity was also seen as a preserve for the rich, or for those who were broke or stressed/confused. Overall, the findings imply that people associate both healthy foods and physical activity with improved health care, reduced susceptibility to contracting illness and general wellbeing. This makes awareness creation and interventions directed at positive behaviour change viable. Consequently, government should invest in multisectoral programmes to increase uptake of physical activity and promote healthy nutrition.

Keywords: social construction, healthy foods, physical activity, benefits of physical activity, qualitative research, focus group discussions (FGDs).

MATERNAL, FETAL AND PLACENTAL CONDITIONS ASSOCIATED WITH PRETERM BIRTHS USING BARROS' CLINICAL PHENOTYPES CLASSIFICATIONS IN A TERTIARY HOSPITAL IN KISUMU COUNTY, KENYA.

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Importance: Preterm birth is the leading cause of child and neonatal mortality globally including Kenya. Methods: This study was conducted among 178 participants who were purposively selected at the maternity department of JOOTRH, in Kisumu County, Kenya. Data analysis was done by use of SPSS version 23 that utilized descriptive statistics and inferential statistics (chi squire and Fisher's Exact test). Results: Clinical phenotypes based on maternal, fetal and placental conditions; preeclampsia/eclampsia (p=0.016), extrauterine infections which includes malaria, UTI and HIV (p=0.030), severe maternal conditions that includes DM, anaemia, cardiac disease, hypertension prior to pregnancy and TB (p=0.001), multiple gestations (p=0.013), fetal anomaly (p=0.048), IUGR (p=0.049), antepartum stillbirth (p=0.046) and APH/early bleeding that include placenta previa and placenta abruption (p=0.025) were all significantly associated with preterm births. Conclusions: All clinical phenotypes (maternal, fetal and placental conditions) were significantly associated with preterm births. Hence, advancement of knowledge on Barro's clinical phenotyping of preterm births among clinicians, program managers and policy makers is key. Early identification and prevention of maternal, fetal and placental conditions identified in this study to be associated with preterm births by strengthening the existing or developing new strategies to help prevent the occurrence of PTBs and will eventually help reduce neonatal deaths and under-five mortality.

Keywords: Clinical phenotype, preterm birth, JOOTRH, child mortality and neonatal mortality

SOCIO-DEMOGRAPHIC AND WORK-RELATED FACTORS ASSOCIATED WITH SELF-REPORTED INJURIES AMONG WELDERS IN NAIROBI

Nicholas Odhiambo Onguto, Isaac Mwanzo, Peterson Warutere

Background: The sprawling of small and medium-sized enterprises (SMEs) in the developing world provides several challenges to ensuring health and safety practices among workers in the urban poor. Materials and Methods: This study sought to determine the socio-demographic and work-related factors associated with self-reported injuries among welders in the selected welding workplace in Embakasi, Nairobi. This was a cross-sectional descriptive study involving interviews and focus group discussions with 214 welders. Data were analyzed using SPSS version 22; both descriptive statistics and inferential statistics were conducted to explain the association between the study variables.

Results: Arc welding accounted for 58.9% of the type of welding followed by the practice of both arc welding and gas metal arc welding (34.6%). Bright light, excessive heat, projectiles, and sharps were the most common hazards (reported by more than 90% of the respondents). Eye-related symptoms, cuts and burns to the hands and feet were the most prevalent self-reported health conditions in the present study. Welders' knowledge of physical hazards at their workplace was significantly associated with experience (Fishers Exact Test =45.025, $p<0.05$), number of hours worked per day (Fishers Exact Test = 9.322, $p<0.05$), and PPE use ($\alpha 2 = 3.884$, $df = 1$, $p < 0.05$).

Conclusion: Safety among welders can be ensured through the creation of hazard awareness and prevention and adherence to safety policies at the workplace.

Keywords: Physical hazards, SMEs, PPE, injuries, welding, safety

PHENOTYPIC AND GENOTYPIC DETERMINATION OF ACINETOBACTER BAUMANNII FROM PATIENTS WITH PROLONGED HOSPITAL STAYS IN THREE TERTIARY HOSPITALS OF KANO METROPOLIS, NORTHWEST NIGERIA

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Acinetobacter baumannii is one of the most important opportunistic pathogens that cause serious outbreaks in hospitals and health care associated complications in hospitalized patients. The study aimed to isolate and identify A. baumannii using phenotypic and genotypic methods among patients with prolonged hospital stays in some selected hospitals of Kano metropolis. A total of 138 Gram positive and negative bacterial isolates obtained using standard bacteriological procedure. A. baumannii were primary identified using morphological characters, biochemical test and API 20NE. it was further confirmed by PCR used 16S rRNA gene. Fourteen A. baumannii was obtained using phenotypic method of which 9 (6.5%) isolates were bind 16S specific rRNA specific gene PCR. The isolated A. baumannii in the study shows high resistance to Ampicillin/salbactam and Perfloxacin and least resistance to Ciprofloxacin and Amikacin. The result of this finding shows the emerged of A. baumannii as nosocomial infection among hospitalized patients at this study site is of concern, which indicate need of improved sanitary working condition and proper patient management that can reduce the spread of nosocomial infection.

Key Words: Phenotypic, Genotypic, Acinetobacter baumannii, 16S rRNA gene, nosocomial infection.

ANTIPROLIFERATIVE POTENTIAL OF SELECTED KENYAN AROMATIC PLANTS AGAINST BREAST AND PROSTATE CANCER

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Cancer is among the leading causes of morbidity and mortality worldwide and accounts for up to 32,000 deaths annually in Kenya. Surgery, radiation and chemotherapy are the current treatment techniques for cancer; however, these methods are expensive, have high failure rates and have been associated with detrimental side effects. Essential oils have been shown to target cancer cells and are able to increase the efficacy of commonly used chemotherapy drugs. The present paper reports the in vitro antiproliferative potential of twenty nine essential oils against breast (HCC 1395) and prostate (DU145) cancer cell lines. Cytotoxicity of these essential oils was also evaluated on normal (Vero E6) cells. MTT dye was used in the determination of the antiproliferative activity. The selective inhibitory activity was also determined and expressed as selectivity index (SI). On breast cancer cells, E8 and E21 exhibited the most inhibition with IC50 values of 2.12 µg/ml and 4.96 µg/ml respectively. A number of oils including E5, E6, E7, E10 and E17 showed high antiproliferative potential with IC50< 20 µg/ml. On prostate cancer cells, most of the essential oils exhibited very high antiproliferative activities. E3, E4, E7, E8, E10, E11, E12, E15, E16, E17, E19, E20, E23 and E25 had IC50< 5 µg/ml showing their very effective antiproliferative properties. From the results obtained, the essential oils exhibited selective inhibition to cancer cells while sparing the normal cells (SI ≥ 3). However, cytotoxicity to the normal cells was observed in some essential oils (SI ≤ 3). In conclusion, this study confirms potential application of these essential oils in cancer management and act as a lead to cancer drug development.

Kewords: breast cancer, prostate cancer, aromatic plants, essential oils, cancer cell lines

SUB - THEME: FOOD SECURITY AND SUSTAINABLE AGRICULTURE

TRACK 1: AGRONOMY

OPTIMIZING WATER AND LAND RESOURCES USE THROUGH INTEGRATED RICE-FISH FARMING IN BUNYALA IRRIGATION SCHEME, BUSIA COUNTY

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Background: Optimizing water and land resources use through integrated rice-fish farming was investigated in Bunyala Irrigation Scheme.

Material and methods: Rice varieties, Basmati 370 (B) and IR 2397 (IR) were grown on separate plots of the same size each with and without fish (F). The plots with fish were modified to provide refugia for the fish. Each treatment was replicated twice in each of the 2 blocks in a complete random block design. No fertilizers and chemicals were used in Rice–Fish plots. The growth of fish was monitored by measuring body length and weight monthly. Incidence of stem–borers was determined from dead tillers. Water parameters were determined weekly at 0900 and 1600hrs. After harvest, rice plots were irrigated and only Basmati plots produced ratoon as a second crop. Total yield and economic returns from rice and fish in all plots were determined and data analyzed using ANOVA.

Results: Total paddy yield was slightly higher in rice monoculture than in rice-fish though not significantly different (P<0.05). Rice yields were IR 4.616±0.24, IR +F 4.136±0.14, B 3.94±0.25 and B+F 3.464±0.17 tons/ha. Fish yield in IR and Basmati were 148.1±24.21 and 151.07±21.85 kg/ha respectively. Basmati cultures gave significantly (P<0.05) higher net economic income returns of Ksh/ha.25,8032.40±7,352.66 (B+F) and 21, 7592.30± 4,287.06 (B) than 17, 9195.10± 8,882.88 (IR+F) and 12, 2160±8,500.20 in (IR). Incidence of stem–borers was significantly higher (P>0.05) in rice monocultures than in rice-fish.

Conclusions: Integrated rice-fish farming improves nutritional, enhances food and income security, reduces negative environmental impacts and promotes sustainable integrated agriculture aquaculture.

Keywords: Optimizing, natural resources, integrated, rice-fish farming, food security

THE INFLUENCE OF SUPPLEMENTAL IRRIGATION ON FRUIT YIELDAND QUALITY IN RELATION TO SOIL TYPES, MAKUENI COUNTY

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Influence of supplemental irrigation on Apple mango production on fruit yield and quality in relation to soil types in Makueni County was investigated.

Eighteen mature Apple mango variety, 16 experimental and 2 (no irrigation) were selected in three farms each with a different soil type and subjected to eight irrigation rates (2 trees per rate) subdivided into full and partial irrigation with one dripper on each side and two drippers on one side of the mango tree respectively. The rates were based on a percentage of potential tree evapotranspiration ranging from no irrigation to 100%. The experimental design was Randomized Block Design. After harvest, the number of fruit drop per treatment was recorded. The number of fruits harvested in each treatment was quantified and classified into weight classes' according to the Horticultural Crops Development Authority. Data was analysed using ANOVA. Means that were significantly (P≤0.05) different were separated by Tukey's test.

In all soil types, the highest fruit drop was under no irrigation. The highest number of export quality mango (sizes 8 and 9) was recorded under both 100% full and partial irrigation except in sandy clay loam soil which recorded low numbers irrespective of the treatment. The number of export quality mango fruits were not significantly (p≥0.05) different between 100% and 75% irrigation rates, thus farmers can save water by using lower rate without significant yield and quality loss.

Supplemental irrigation improves yields and quality if applied at the start of flowering to the end of fruit maturation period.

Keywords: Supplemental irrigation, mango, soil types, fruit drop, export quality .

INFLUENCE OF URBAN AND PERI URBAN AGRICULTURAL SYSTEMS ON CROP PRODUCTION IN SELECTED AREAS, KENYA

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Urban and peri-urban (UPA) areas in Kenya are facing an upsurge in population due to rural – urban migration leading to increased demand for housing and food. Agriculture in these areas is of great potential to food security and economic development thus necessitating this study. Three hundred households were interviewed using a structured questionnaire to obtain data on crops grown, livestock kept, farming practices, source of farm inputs, land size, technologies used, seed types and fertilizer application. Econometric analysis was done to assess the contribution of UPA on selected household outcome indicators. In the study areas (Juja-Ruiru, Njiru-Ruai, Athi -river and Ngong-Kiserian), it was found that 100% of the respondents engaged in agriculture. Of the respondents, 18.9% grew maize, 16.1% cultivated vegetables and 14.8% planted sukuma wiki. Majority of the respondents reared chicken (44%). At least, 69% used borehole water for crop production. Only 0.8% used closed irrigation systems. About 57% of the respondents intercropped while 43% used mono-cropping. Nearly, 41.4% of the farmers owned <1 acre of land. Almost 97% of the respondents used technology for farming. Most of the respondents purchased crop hybrids (52.1%). Approximately, 39.2% of the respondents used Di-Ammonium Phosphate (DAP) fertilizer at planting followed by manure (29.38%) with the few who used UREA. Results indicated that 44.3% of the farmers grew crops without fertilizer while 22.4% applied CAN. Intercropping increased yields up to 65% compared to only 35% under mono-cropping. It was observed that UPA was mainly practiced for household food, nutrition sustainability and income.

Keywords: Food security, income, nutrition, systems, technologies, yields

INCREASING YELLOW PASSION YIELDS BY MANAGING WATER STRESS USING HYDROGEL, POLYTHENE AND GRASS MULCHES IN EMBU AND KIAMBU COUNTIES, KENYA.

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Yellow passion fruit production is constrained by low available soil water conserving practices, especially in areas where rainfall is a major limiting factor. The present study was carried out to evaluate the effect of different water conserving techniques on the production of yellow passion fruit. Trials were carried out in two sites: Kenyatta University research farm in Kiambu county and Ugweri in Embu county. The trial consisted of six treatments (Hydrogel_10g + Plastic mulch, Hydrogel_10g + Grass mulch, Plastic mulch, Grass mulch and a control), arranged in a randomized complete block design. Yield data (fruit weight) was collected during five harvests at intervals of one week starting from 44 weeks after transplanting (44WAT). Results showed that at both sites, the treatment with Hydrogel_10g + Plastic mulch provided higher average yields (1.20 t/ha at Ugweri and 1.10 t/ha at Kenyatta University during 44WAT) than other treatments. The same trend was observed during 46, 48, 50 and 52WAT. Based on these findings, the treatment with Hydrogel_10g + Plastic mulch performed better than other treatments and is therefore recommended for adoption by farmers in Kiambu and Embu.

Keywords: grass mulch, plastic mulch, hydrogel

OPTIMIZING THE USE OF BRADYRHIZOBIUM INOCULANTS TO PROMOTE SOYBEAN PRODUCTION IN ORGANIC AND CONVENTIONAL FARMING SYSTEMS

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Declining soil fertility and food scarcity pose a major challenge to most of the Kenyan populace. To address this, soybeans production using soil microorganisms as biofertilizers and organic farming are gaining popularity. Soybean is an important legume with high protein and oil content. Organic farming can alleviate declining soil fertility levels while maintaining environmental quality. This study sought to determine the effect of bradyrhizobia on soybean growth and soil fertility in different farm management practices. Bradyrhizobia were inoculated on three soybean varieties (SC squire, SB 19 and Gazelle) to assess their ability to promote nodulation, nitrogen fixation and growth under organic and conventional farming systems. Field experiments were laid out in randomized complete block design, with three replicates for two seasons. Interestingly, Bradyrhizobium inoculation showed significantly higher soybean nodule dry weight, shoot dry weight and seed dry weight (P=0.001) compared to un-inoculated control. Farm management practices had significant variations on shoot dry weight, nodule dry weight and seed dry

weight (P=0.001) where organic farms performed better than conventional in all parameters tested. The three soybean varieties differed significantly on shoot dry weight, nodule dry weight and seed dry weight (P=0.001) where SC had better response while Gazelle soybean recorded the lowest values. Therefore, our results demonstrate that incorporation of effective Bradyrhizobium inoculants could sustainably enhance soybean production under limited externalities, a key characteristic of organic farming systems.

Keywords: Soybean, nitrogen fixation, Bradyrhizobia, organic farming, conventional farming, Kenya.

EVALUATION OF PRODUCTION LEVELS OF NETHERLAND, SOUTH AFRICA AND PERULIMA VARIETIES OF GOOSEBERRY

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Gooseberries form one of the underutilized fruits with little research on its production and management though they have a number of health benefits (help control blood sugar, have anticancer effects, rich in antioxidants and low in calories and fat). Therefore, a trial to evaluate the production levels of three gooseberry varieties (Netherland, South Africa and Perulima), was laid out at KALRO, HRI, Kibos. The place receives annual rainfall of 1100mm -1350mm with relatively fertile soils. Complete Randomized Design (CRD) was adopted with each variety laid out on plots measuring 18m by 10m and planting holes made at a spacing of 2m by 2 m. 70 seedlings were transplanted per plot on 1st August 2019. Production level assessments were made for a sample of randomly tagged 10 plants per plot. For all trials, observations were made on each plant on the following; number of fruits, weight of fruit with peels and weight of fruit without peels. Data was collected three times at an interval of two weeks. The data was then run on ANOVA and bar graphs. The results show a significant difference in means of the number of fruits, weights of fruits with peels and without peels among the varieties in relevance to harvest interval. Netherlands variety showed the highest number of fruits, highest weight of fruits with and without peels then Perulima variety and South Africa variety the least. The weights reduce with harvests. Netherlands is the highest yielding variety both in number of fruits and weights.

Key Words: Gooseberry, variety, production level, CRD, ANOVA, bar graphs

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GOOD AGRICULTURAL PRACTICES IN MUSHROOM CULTIVATION VALUE CHAIN IN KENYA: THE ROLE OF AGRONOMIC INPUTS

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Agriculture is the mainstay of the Kenyan economy with the highest contribution coming from the small scale holders. To strengthen this industry committed effort to diversify Kenya's agriculture is emerging. Mushroom cultivation is one such great opportunity that is widely accepted as an important crop by all gender at literacy levels. In recent years, the cultivation of mushroom for food and income generation has increased tremendously but its full potential is yet to be exploited especially its agronomic practices. The aim of this work is to qualitatively analyze the agronomic practices of mushroom cultivation, since mushrooms value chain is known to be affected adversely by various constrains. Among the challenges is the lack of quality spawn and production skills, and Post-harvest storage. The study was evaluated through the use of desktop reviews of existing literatures; Reports from the ministry of agriculture in the county were reviewed. Also Published, unpublished articles, case studies and students theses were also relevant for the study. From the findings, successful cultivation of mushroom either on small scale or large scale and achieve high profitable levels is possible if agronomic practices are instituted.

Key words: Food, Income, Mushroom cultivation, Agronomic practices

COMPARISON ON PERFORMANCE OF BULB ONIONS GROWN UNDER GREENHOUSE AND OPEN-FIELD ENVIRONMENTS IN KISUMU COUNTY, KENYA

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The size of single-center bulbs and weight of bulb onions have become important in meeting demands of both processing and fresh market buyers. Size and weight of bulbs determine onion productivity. Onion productivity in Kenya is threatened by harsh and unpredictable environmental factors. Greenhouse is a technology that enhances quality, production and can significantly increase yields compared to open field cultivation. Mature and ripe onion (Allium cepa) transplants were evaluated for effects on yield (weight and bulb size) when grown in greenhouse and open field conditions. The onion trials were laid out at KALRO, HRI Kibos in a RCBD design with the two treatments, greenhouse and open field, replicated four times using onion cultivar 'Red Pinnoy F1'. Onion seedlings were transplanted in soil within and between row distances of 0.15 m and 0.50 m, respectively in both the greenhouse and open field plots. Data was collected on plants within a harvestable area of 1m by 1m and subjected to analysis of variance (ANOVA). The results established that there were significant differences on mean weight and diameter between bulb onions grown in the greenhouse and open field plots. The weight and bulb size of onions in green house production was significantly higher than in open field. Therefore, greenhouse technology performed better than traditional open field farming in sustainable production of onions as bigger and heavier bulbs are harvested. The higher output in greenhouse onion production promotes food security through its use as a sustainable agriculture technology.

Keywords: Onions, yield, bulb-size, greenhouse, open-field, ANOVA

DESIGN AND DEVELOPMENT OF SOLAR POWERED HYBRID VEGETABLE DRYER

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Background: In African Developing country, approximately 60 % of the total population hang on agriculture as the source of income. There exist noteworthy post-harvest losses of agricultural products due to deficiency of good preservation system in Kenya. Solar thermal energy can be used for drying vegetables, fish and fruits. This can be an effective solution to mitigate losses and waste.

Material and methods: Solar drying technology is sun's free energy and low-priced when harvested effectively. The design and construction of a hybrid solar drier is presented. It uses a standalone PV modules and heaters for night drying. An indirect drier is employed at daytime when exposed to direct solar radiation to reduce the limitations of the natural sun drying.

Results: Experiments were conducted to dry vegetables. The results obtained revealed that the temperatures inside the dryer were much higher than the ambient temperature. The rapid rate of drying proves its ability to dry food and keep in safe moisture level in a hygienic environment. Tests with the hybrid solar dryers have shown that it is possible to lessen the drying time, cost and improve the quality significantly compared to the traditional methods.

Conclusions: The quality of dried products produced by the hybrid dryer are superior when compared to open sun drying. Therefore, solar powered hybrid vegetable dryer is more suitable for economical high quality dried agricultural products.

Keywords: Solar dryer, Post-harvest loss, indirect dryer, PV module

TRACK 2: PLANT NUTRITION

IMPACT OF NITROGEN FERTILIZATION ON PLANT GROWTH AND SELECTED SECONDARY METABOLITE CONCENTRATIONS IN THREE VEGETABLE AMARANTH VARIETIES IN KENYA

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Amaranthus are among the most preferred indigenous vegetables in Africa not only for their nutritive and therapeutic benefits but also for their economic value. Nitrogen (N) is an important mineral component for crop production and its availability is a significant aspect for plant growth and nutritive value. The experiment was carried out to investigate the impacts of N forms on phytochemical components accumulation and antioxidant activity in leafy amaranth. The experiment was laid in a split plot arrangement in a randomized complete block design (RCBD) with leafy amaranth (AB5, AB6 and AB7 varieties) as main plots and N forms NH4+, NO3- and NH4NO3 {NO3- and NH4NO3 were stabilized with Piadin® as nitrification inhibitor} and control (no N was added) subplots. The treatments were replicated three times. Nitrate treatment significantly ($p \leq 0.05$) enhanced plant growth unlike ammonium which was associated with poor plant growth. Shoot dry weight of nitrate-treated plants was 8 fold higher while ammonium-fed plants were 3 fold higher in relation to the control. Compared to control, root dry weight increased by 72.3% under nitrate provision and 36% under ammonium treatment. Sole ammonium and the control enhanced accumulation of both TFC and TPC, compared to the nitrate and ammonium nitrate mixture. Under ammonium treatment, TFC increased by 13.8% in AB5, 17.4% in AB6 and 14.7% in AB7 while TPC increased by about 19.5% in AB5, 23% in AB6 and 20% in AB7 in greenhouse. Similar trends were observed from the field experiment. Correspondingly, NH4+ - N form resulted to superior antioxidant DPPH scavenging activity indicated by high scavenging activity and lower IC50 value (concentration which scavenged 50% of the DPPH radicals). Dry weight displayed a significant negative correlation with TFC and TPC accumulation of = - 0.68 and r= -0.73 respectively. It was observed that secondary metabolites accumulation was favoured by N deficiency and ammonium-N provision in vegetable amaranth.

Key words: Nitrate, Ammonium, Flavonoids, Phenolics and Amaranth varieties

EFFECT OF DIFFERENT MICRO-NUTRIENTS (ZN, FE, CU AND MN) ON SORGHUM YIELDS IN THE SEMI-ARID AREAS OF KENYA.

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The effect soil micronutrients on sorghum yields in the semi-arid areas of Kenya has not been well studied. A study was carried out using soils and sorghum yields collecte1d from different locations in western, Eastern and coastal regions of Kenya to evaluate the relationship between sorghum yield and soil concentration levels of four micro-nutrients (Mn, Fe, Cu, and Zn). The soils were analyzed to determine the concentration of each micronutrient obtained from each region. The concentration of Mn, Fe, Cu and Zn in the top 30cm of the soil ranged between 161-197, 22-213, 0.6-2.8 and 4.2-19.2ppm, respectively. Sorghum yields in the areas where soil samples were obtained ranged between 0.1 and 4.6 tons ha-1. The data of sorghum yield and micronutrient concentration was subjected to regression analysis using excel version. Results indicated significant regression between sorghum yields and Mn (P=.004, R2= 82), Fe (P=.015, R=72%), Cu (P=0.0007, R2= 92) and Zn (P=0.0105, R2=76%) in soils obtained from Kilifi County. Similarly, significant regression was shown for Mn (P=0.003, R2=85) in Kwale and Fe (P=0.02, R2= 69%) in Marsarbit Counties. Significant regressions are indicative of the fact that sorghum yields will respond to the micronutrients that were significant. It is recommended that studies should be conducted to investigate the effect of micronutrients to sorghum yields.

Key words: micronutrients, semi arid, soil concentration levels, yields

EFFECTIVENESS OF DIFFERENT NITROGEN FERTILIZER RATES ON MAIZE GRAIN YIELD AND NITROGEN USE EFFICIENCY IN WESTERN KENYA

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Background: Nitrogen (N) is an essential nutrient for crop production yet, it is deficient in most Kenyan soils. Low soil fertility and insufficient use of N fertilizers have caused decrease in maize yields in Western Kenyan farms. This study aimed at determining the effect of N fertilizer on maize yield and N use efficiency (NUE) in Rongo, Western Kenya.

Materials and methods: Nitrogen fertilizer was applied at: 0, 25, 50 and 75 kg N ha-1, which were all combined with a blanket phosphorus rate of 10 kg P ha-1. The control treatment consisted of plots with no fertilizer inputs. Nitrogen uptake at heading stage, nitrogen use efficiency and maize yield were determined during experiment.

Results: Our results indicated that application of 50 kg N ha-1 produced the highest maize grain yields at Kambija (4.34 t ha-1) and Koderobara (3.41 t ha-1); which were 62 and 74% higher than the control respectively. The same treatment (50 kg N ha-1) exhibited the highest NUE (22.61) and increased tissue N content by 48.43% compared to the control at Koderobara site. In comparison however, the highest NUE (23.84) was obtained at 25 kg N ha-1 for Kambija site while, treatment 75 kg N ha-1 had the highest tissue N content that was 49% higher than the control.

Conclusion: Therefore, in order to get higher maize yields, a rate of 50 kg N ha-1 combined with 10 kg P ha-1 is recommended for application by maize farmers in Rongo. This study contributes to improved maize yields.

Key words: Nitrogen, Nitrogen use efficiency, Maize yield, Western Kenya

INTERACTIVE EFFECTS OF NITROGEN LEVELS AND ACCESSIONS ON GROWTH OF SPIDER PLANT IN JUJA DISTRICT, KENYA

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Spider plant (Cleome gynandra L.) is an important African leafy vegetable (ALV) that has been used by local African communities as a source of nutrition in their diets for many years. The plant has recently attracted an increasing demand for its highly nutritive and health promoting bioactive compounds important in combating malnutrition and reducing human degenerative diseases. Despite the great value of spider plant, its supply and cultivation remain low, a factor attributed to unavailability of superior genotypes. This study carried out at Ruiru sub county, Kiambu county of Kenya sought to establish the influence of genotypic variation on spider plant phenotypic diversity for future breeding and conservations. Experimental plots were set up in the field in Ruiru using split plot design with three replications. Analysis of variance (ANOVA) was used to assess the significance of variables. Results indicated that genotypes MLSF3, UGSF36, UGSF14 and MLSF17 produced the highest number of flowers, large petioles, big stem sizes and large leaf area respectively. The seeds were sourced from World Vegetable Centre (WVC) in Arusha, Tanzania. In conclusion, the study recommends adoption of genotypes MLSF17, UGSF14, UGSF36 and MLSF3 by farmers considering their outstanding positive effect on phenotypic traits.

Key words: Phenotypic diversity, African leafy vegetable, Cleome gynandra, genotypes,

EVALUATION OF DHARANI GROOMER HERBAL POWDER (FOLIAR SPRAY) FOR ENHANCING MATURE TEA SHOOT ATTRIBUTES AND NUTRIENTS UPTAKE IN KERICHO

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Organic and inorganic fertilizers are essential for plant growth because they supply plants with nutrients required for optimum productivity. Dharani Groomer Herbal Powder (Foliar spray) (DGHP) is 100% organic certified herbal product for organic farming and has been reported to enhance shoot attributes and nutrients uptake. The product was submitted for evaluation of its efficacy and potential use in tea. A field study was carried out at KALRO - Tea Research Institute, Timbilil Estate, Kericho to evaluate the effect of DGHP on shoot attributes and nutrient uptake in mature tea. The trial was laid in RCBD with three factors (2 fertilizer types, 3 N-rates and DGHP) replicated three times. Tea shoot attributes were monitored after two years. Mature leaf samples were collected for analysis after two years. The results showed that the tea shoot attributes and leaf nutrients content were not significantly ($p \leq 0.05$) influenced by the fertilizer type, nitrogen rates and DGHP. This study has shown that supplementing the soil applied phymix and NPK fertilizers with DGHP spray did not affect shoot attributes and nutrients uptake. These results are important for academic purposes, environmental policy formulations and tea production advisory services

KUBRIC 2019

UNLOCKING THE POTENTIAL OF CONTROLLED RELEASE UREA ON NITROGEN MINERALIZATION AND MAIZE YIELD IN A MAIZE-SOYBEAN CROPPING SYSTEM IN WESTERN KENYA

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Nitrogen (N) is a major limiting plant nutrient in most soils of sub-Saharan Africa, and it is often lost before it is used up by crops. This is primarily due to its transformations in the soil, leading to losses through volatilization and leaching. This usually leads not only to reduction in crop yield but causes environmental pollution by contaminating underground water resources through leaching. Besides, N lost in form of nitrous oxide (N2O) contributes grossly to global warming since N2O has a global warming potential of 298 times more than carbon dioxide over 100 years. Appropriate management of soil fertility is key in realizing increased food productivity in Kenya while minimizing environmental pollution. Controlled release urea fertilizers are one such strategy, but their potential has not been largely tested on Kenyan soils. This study investigated the N mineralization and yield of maize when using normal urea (NU) or controlled release urea (CRU) under conservation agriculture systems (CA) or conventional tillage (CT) in Siaya County in the western region of Kenya. The experiment was superimposed on a long term trial with tillage system as the main plot and urea type as the split plot. Results showed significantly (p=0.05) lower nitrate concentrations with CT+CRU and CA+NU in the early stages of the season. Maize yields were not significantly influenced by the urea type. The study concludes that the effect of CRU on N mineralization is dependent on soil management, but needs further investigation as it did not seem to influence maize yields.

Key words: controlled release urea, conservation agriculture, nitrogen mineralization

RESPONSE OF PHOSPHATE ROCK FERTILIZER ON MAIZE YIELDS IN ACIDIC SOILS OF THARAKA-NITHI COUNTY

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Low crop yields experienced by farmers in Tharaka-Nithi county results from decline in soil fertility associated with phosphorus (P) deficiency. Intensive land use without adequate replenishment P as fertilizers are applied at rates far much below the recommended rates due to high costs. Hence there is need to explore ways of enhancing P availability without increasing the cost of production. Based on this, an experiment was conducted to evaluate the response of Phosphate Rock fertilizer on maize yield and soil chemical composition in Tharaka-Nithi County. The experimental design was Randomized Complete Block Design (RCBD) with plot sizes of 6m by 4.5 m replicated three times and treatments used include: Phosphate Rock,manure, Tithonia ,manure + Phosphate Rock ,Tithonia + Phosphate Rock, Triple Super Phosphate + Calcium ammonium Nitrate and a control. Grain and stover yields was determined at harvest in each season. Data was subjected to Analysis of Variance (ANOVA) using the general linear model (GLM) in SAS version 9.4 software and mean separation done using Duncan's Multiple Range Test at P ≤ 0.05. Results indicated that there was a significant (p=0.0049, p=0.0002) difference in grain yield between different treatments during the SR 2017 and LR2018 seasons respectively. When applied alone or in combination with organic inputs Phosphate Rock significantly improved maize yields compared to the control. Comparison of changes in soil phosphorous levels before and after the different treatments was done using a T-Test for comparison of means. The results indicated that Phosphate Rock when applied alone did not have any significant (p=0.185) improvement on the soil phosphorous levels. While manure (p=0.01) and Tithonia (p=0.04) had significant increase in the soil phosphorous levels. When Phosphate rock was used in combination with manure there was a significant (p=0.042) increase in the phosphorous levels with a mean difference of +91.76fft) as compared to manure alone (+25) and Phosphate Rock (+60) alone. Rock phosphate and Tithonia treatment had an increase in the phosphorus level (+161.7) (p=0.075). The best combinations option which is Manure + Phosphate Rock will be presented to researchers and stakeholders and the local extension officers and organic farmers for use in their farms.

Key words: Phosphate Rock, manure, Tithonia, yields,

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TRACK 3. BREEDING AND MOLECULAR TECHNIQUES

KEY PATHOLOGICAL BIOMARKERS REVEAL POTENTIAL EFFECTS OF POLLUTION ON COMMERCIAL FISH SPECIES IN LAKE VICTORIA

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Lake Victoria receives huge quantities of effluent from domestic, agricultural, industrial and pharmaceutical sources. Hitherto the present study, pollution related studies in the lake ecosystems focused on assessment of contaminant levels in catchment wetlands, water, sediments and fish tissue. We used fish condition factor (K), vitellogenin (VTG) production and liver lesions as biomarkers to assess lake pollution. Commercial fishes of the lake, Oreochromis niloticus (n = 230), Lates niloticus (n = 99) and Protopterus aethiopicus (n =37) were used. K was lower in densely populated compared to remote catchment areas of the lake ($p < 0.001$). VTG induction was high in all fishes, O. niloticus (0.77 ± 0.08 µg/L), L. niloticus (0.73 ± 0.09 µg/L) and P. aethiopicus (0.55 ± 0.06µg/L). Liver tissue showed lesions like microvesicular and macrovesicular vacuolations, cellular degeneration, sinusoidal dilation, focal necrosis, increased Küpffer cells and congestion of sinusoids. The prevalence of liver tissue alteration showed normal lesion (19.9%, n = 73), slight (8.2%, n = 30), moderate (41.5%, n = 152), severe (18.6%, n = 68) alterations and irreparable damage (11.8%, n = 43). Prevalence of severe liver alterations in O. niloticus was higher compared to L. niloticus and P. aethiopicus ($F (2, 365) = 4.199$, $p = 0.016$). Severe liver alterations were higher among urban and industrial (Ggaba, Jinja Port Bell, and Kasenyi) sites compared to agricultural (Kasensero, Baale and Bukakkata), ($F (6, 359) = 5.94$, $p < 0.001$). Chemical environmental contaminations induced liver lesions in fishes studied and possibly adversely affect their populations.

Keywords: Environmental pollution, Lake Victoria, Lates niloticus, Liver lesions, Oreochromis niloticus, Protopterus aethiopicus, Vitellogenin.

PHENOTYPIC AND MOLECULAR CHARACTERIZATION OF VIGNA RADIATA (L) WILCKZEK (MUNG BEAN) IN MACHAKOS, EMBU AND THARAKA NITHI COUNTIES IN EASTERN KENYA.

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Vigna radiata (L) Wilckzeck which is commonly known as mung bean or green gram is a leguminous crop grown for its seeds and also used as fodder. It's thought to have originated in India but it's also grown in Africa and Latin America. It's an annual crops which take a short duration to mature and it does well in semi-arid areas which receive less rainfall thus of great importance. It also helps in maintaining soil fertility through nitrogen fixation which is useful in crop rotation. As a pulse crop it is easily digestible and hence doesn't cause flatulence. It is consumed as dry seeds, leaves or fresh green pods and its highly rich in proteins, minerals and vitamins hence an important food and feed. Despite this its production is low since the average yield worldwide is 384kg ha^-1 according to Jawal and Gulati which is so low and hence the need for yield improvement. This low productivity as compared to other cereals can be attributed to stresses like high temperature, insects, disease, drought, heavy metals and salinity. Plant breeders have put effort but with limited success because of insufficient genetic diversity for the traits that are desired in germplasm. This indicates the need to determine genetic diversity so as to ensure better use of these genetic resources to improve the yield. This study aimed at determining the genetic diversity of mung beans grown in Eastern Kenya where green grams are mainly grown and the results of this study will be of great use in breeding programs so as to improve its productivity. Green grams were collected using stratified random sampling and their morphology studied. The seeds were planted in Kenyatta University plant transformation lab where the morphological features were observed. Morphological differences were analyzed using ANOVA by the GLM procedure and correlation coefficient used to determine the degree of diversity. Twelve phenotypic traits were used to establish the genetic divergence among the genotypes 11 of which showed significant variation. Molecular characterization of the seven genotypes was done using SSR markers where 8 of the 10 markers were polymorphic. The SSR profiles coded in binary form were analyzed using gen ALEx software version 6.1 to establish genetic diversity of green grams. The relationship between the populations of cultivars and wild type was produced and a dendrogram drawn based on Neis regular and unbiased genetic distance using MEGA software. The findings will be used in plant breeding to improve the germplasm hence develop plants using marker assisted selection.

Key words: Mung beans, Genetic Diversity, Plant breeding

GENETIC RESPONSE OF SELECTED MAIZE GERMPLAM SCREENING FOR MLND RESISTANCE IN KENYA

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Maize is the most staple food among many people in Sub-saharan region. Maize production in these region has been affected by the outbreak of Maize Lethal Necrosis threatening food security among many households in East African countries characterized by loss of 50%-90%. This disease results from synergistic interaction between viruses from the Potyviridae family example Sugarcane Mosaic Virus (SCMV) and Maize Chlorotic Mottle Virus (MCMV). This study outline the results after screening several in breds lines for resistance to MLN toward identification of resistance lines for introgression in breeding programme in Kenya. 30 In breds lines were inoculated artificially using virus inoculum collected from Bomet and Nyandarua County in Kenya at 3-4 leaf stage. Data on Flowering, disease severity, ELISA analysis and respective incidences and AUDP score were collected at Kenyatta University Screening Greenhouse. In breds lines showed high significant differences for MLN. Eight Inbreds lines showed acceptable level of resistance to MLN but many genotypes were susceptible and resulted to necrotic and finally death. This study also validates the presence of Tolerant varieties among Farmers cultivars (Landraces). These tolerant genotypes will serve as donors toward introgression of resistant to Kenyan Genotypes hence food sustainability to small scale farmers who constitute 75% of maize producers in Kenya.

Keywords: Maize Lethal Necrosis, Resistance and Food security

ADVANCING CROP PRODUCTIVITY THROUGH MODERN BIOTECHNOLOGY

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Crop production constraints including drought, weeds, pests and diseases, exacerbated by climate change, adversely affect crop productivity especially in the sub-Saharan Africa thereby resulting in endless famine and malnutrition. This trend is bound to continue considering that the United Nations has projected the global population growth to reach nearly 9.6 billion by 2050. Moreover, a greater percentage of this population increase is expected to occur in the developing countries where three of every four people live in rural areas and depend directly or indirectly on agriculture for their livelihoods. In line with the first aspiration of Agenda 2063 regarding inclusive growth and sustainable development, Africa's capacity to feed itself now and in the future requires intensified investments in climate change research, biotechnology and development, and innovation. Countries in the sub-Saharan Africa need to enhance food security by embracing comprehensive food production strategies that combine both conventional and modern biotechnology approaches while unlocking limitations along the entire food production value chain. Modern biotechnology including genetic modification (GM), has been used to increase agricultural production in many parts of the world by targeting plant production traits, improving nutritional content, and to reduce loses through adoption of improved crop varieties. This paper reveals that genetic

engineering is nolonger a foreign technology, and highlights efforts made by local scientists based at the Plant Transformation Laboratory, Kenyatta University through government funding to improve local germplasm including maize, sweetpotato and cassava to overcome drought, cyanide, Striga, aflatoxin and diseases. The paper further underscores that Kenya has the requisite enablers for the adoption of crops improved through modern biotechnology. Deliberate efforts towards advancing the transgenic crops to confined field trials are currently ongoing.

Key words: Genetic engineering, plant transformation, drought, striga, food security

EVALUATION OF LAMBDA - CYHALOTHRIN BEHAVIOURAL RESPONSES AND HEPATO - NEPHRO BIOMARKER ENZYMES EFFECTS IN CLARIAS GARIEPINUS

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Evaluation of lambda-cyhalothrin(LCT) effects on hepato-nephro biomarker enzymes and behavioural responses in Clarias gariepinus was the focus of this study. A total of 300 C. gariepinus, standard length 16 to 40 cm (80 to 250 g weight) were used while LCT (600 gl-1) was purchased from agrochemical dealer at Nsukka. The behavioural responses of C. gariepinusup on exposure to LCT were observed. The sub lethal exposure lasted 28 days. At days 1, 7, 14, 21 and 28 of treatment and 7 days after treatment, fishes were sampled from each treatment (A-D). Blood samples were collected for liver and kidney marker enzymes test. Behavioural abnormalities increased as the LCT concentration increased. Alanine aminotransferase (ALP), aspertate aminotransferase (AST), alkaline phosphate (ALT), creatinine and urea levels showed concentration and duration significant increases ($p < 0.05$) while total protein significantly decreased ($p < 0.05$) compared with controls. This study has demonstrated that LCT caused hepato-nephrotoxicity to C. gariepinus.

Keywords: Lambda-Cyhalothrin, Median Lethal Concentration, Hepato-Nephrotoxicity, Behavioural Responses, Clarias Gariepinus

TRACK 4. CROP PROTECTION I

SEED BORNE FUNGAL PATHOGENS ASSOCIATED WITH FARMER - SAVED SORGHUM (SORGHUM BICOLOR L.) SEEDS IN KENYA

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Sorghum (Sorghum bicolor (L.) Moench) is an important cereal crop in Kenya. Access to good quality seeds is one of the constraints facing the small scale farmers in key areas growing sorghum. Good quality seeds is an important factor for maintaining plant population and increasing crop yield to attain food security. An experiment was carried out in Kenyattta University Agricultural Laboratory in August-November, 2018 to identify fungal pathogens associated with farmer-saved sorghum seeds. The seeds were obtained from farmers' fields in Nyanza, Coast and Eastern regions. The seeds were washed with sterile distilled water and sterilized in 1% Sodium hypochloride for 5 minutes, rinsed with sterile distilled water and dried using a blotting paper. The dried seeds were placed onto prepared Potato Dxtrose Agar (PDA) on Petri dishes and incubated at 23±20C for 7 days. The growing pathogens were sub-cultured on new PDA medium to make pure cultures. A segment of mycelia from the sporulating colonies in each pure culture was examined under a compound microscope and identified based on their morphology and mycelial growth charateristics. Seven fungal pathogens were identified to be growing on the sorghum seed samples. These were Pythium aphanidermatum, Aspergilus niger, Fusarium ventrichosum, Fusarium solani, Fusarium moniliforme, Biploris cookie and Collectotrichum graminicola. Results showed that all the seed samples were contaminated with various fungal pathogens. This study highlights the need for farmers to treat their seeds after harvest before storage as a strategy for managing seed-borne pathogens especially on long term basis.

Key words: farmer-saved seeds, seed-borne pathogens, sorghum.

INFLUENCE OF POTATO PRODUCTION PRACTICES OF THE OCCURRENCE OF POTATO LATE BLIGHT

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Potato is the second to maize in Kenya in terms of consumption, due to its rich nutritious value and short maturity period. Potato late blight, caused by Phytophthora infestans (Mont.) de Bary is the major threat to potato production causing severe loses of 30 to 60% in Kenya, but can cause up to 100% yield loss if left uncontrolled. Several production practices have been associated with the prevalence of late blight and the current study sought to assess the influence of the production practices on its occurrence. Solvin's formula was used to calculate the desired sample size from the total households in Kinangop Sub-County, Nyandarua County. Random small scale potato farmers at least 1km apart were self-administered with open-ended questionnaires. Practices found to majorly influence the occurrence of late blight include: Choice of variety, Shangi (97.1%); source of seeds, previous harvest (61.9%); cropping systems, mono-cropping (33.3%) and crop rotation (27.6%); irrigation (32.4%); fungicide application regimes, wet season, once a week (42.9%) and dry season, twice a month (26.7%); plant debris management, animal feed (61%), and potato storage, in-house storage (54.3%). These practises serve as a potential source of inoculum, could lead to build-up and spread inoculum to the subsequent planting seasons and since potato production is practised year round in Nyandarua County and the pathogen being polycyclic, it becomes difficult to manage. It is recommended that small scale potato producers adhere to the good agricultural practices (GAPs) in order to maximise production of safe food for human consumption.

Keywords: Potato, Phytophthora infestans, inoculum, yield loss, GAPs.

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BIOCONTROL POTENTIAL OF ANTAGONISTIC BACTERIA AGAINST AGROBACTERIUM TUMEFACIENS ON ROSES IN KIAMBU COUNTY, KENYA

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The flower industry in Kenya is expanding rapidly, with roses dominating the export market. The main cut flowers grown in Kenya are roses, carnations, Gypsophila and hypericum. However, rose production is heavily constrained by pests and diseases which necessitate frequent use of synthetic pesticides. Among the diseases, crown gall (Agrobacterium tumefaciens) has severely infected rose farms. Increased environmental pollution due to overuse of synthetic pesticides has led to increased interest in finding biocontrol products that are safer and more affordable. Local environments can be a rich source of microorganisms for use in biocontrol. Forty seven (47) bacterial organisms were isolated from soil obtained from 17 various rose growing farms in Kiambu, Laikipia and Nakuru counties. Primary screening was conducted by agar disc method to determine their effectiveness against Agrobacterium tumefaciens. Fifteen (15) isolates showed antibacterial activity and were further screened against the same bacterial pathogen. In addition, the selected isolates were identified using biochemical and physiological tests; they were too sent for molecular analysis. They include Lactobacillus brevis 2.28.11, Micrococcus luteus 2, Micrococcus luteus 1 and Arthrobacter spp. The largest inhibition zone was by Arthrobacter spp, (7.8mm) followed by Lactobacillus brevis 2.28.11 (7.1mm), Micrococcus luteus 1 (5.4mm) and Micrococcus luteus 2 (5.1 mm). The results demonstrate that local environment is a potential source of effective antagonistic bacteria that can be further developed for formulation and commercialization as biocontrol agents. The effective isolates were recommended for further evaluation under field conditions and to determine their modes of action.

Keywords: Roses, Agrobacterium tumefaciens, antagonists, biocontrol

EFFICACY OF MICROBIAL ANTAGONISTS IN MANAGEMENT OF BACTERIAL WILT OF TOMATOES UNDER FIELD CONDITIONS

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Bacterial wilt (Ralstonia solanacearum) is a disease with broad geographical distribution infecting more than 200 plant species and can cause up to 91% yield losses. This disease has no effective control method and hence requires more intensive research for functional management strategies. The study was conducted to evaluate efficacy of microbial antagonist in managing bacterial wilt under field conditions in Mwea, Kirinyaga County. The experiment was laid in RCBD in naturally infested farmer's field in two cropping cycles. Three antagonistic fungi namely, Trichoderma hamatum, T. atroviride, T. harzianum and 3 bacteria including Bacillus subtulis, Serratia spp., Acinobacter spp., were used in this study. A commercial Trichoderma (Bio-Cure F), Pseudomonas (Bio-Cure B) served as standard checks and the untreated served as the control. The treatments were applied as drench every two week commencing at transplanting until the tenth week. Data on disease incidence, severity, distribution and crop mortality was collected every two weeks while biomass and yield data were collected at the end of the experiments. There was significantly ($P \leq 0.05$) variation in the activity of antagonists. Among the fungi, T. hamatum was the most efficacious with a reduction in mortality (200%,161%), incidence (49.3%,42.6%), index (18.6%,21.9%) while increased biomass (21.7%,51.3%) and yield (196%,208%) in first and second cropping cycles, respectively. Bacillus subtilis was superior compared to other bacterial antagonists. It reduced incidence by up to 42.4% and 51.5%, index (21.3%,28.1%), mortality (174.6%,160%) but increased biomass (42.7%,56%) and yield (159.3%,206%) in first and second cropping cycles respectively. These findings illustrate that local microbial antagonists possess compounds with antibacterial activity and can be exploited for disease management under field conditions.

Key words: Biocontrol, Microbial pesticides, Botanical pesticides, Bacterial wilt.

INVITRO AND INVIVO STUDIES OF WARBURGIA UGANDENSIS LYOPHILIZED CRUDE EXTRACT WITH TRICHODERMA ASPERELLUM ON PHYTOPHTHORA INFESTANS AND ALTERNARIA SOLANI

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Alternaria solani and Phytophthora infestans are causative agents of early and late blight of tomatoes respectively both of which greatly reduces the tomatoes yield. Warburgia ugandensis extracts have wide prophylactic and curative use against pathogens. Warburgia Stem bark samples were air dried then ground. The powdered material was weighed and soaked in distilled water and left to stand on an orbital shaker for 24 hrs. The soaked material was filtered and filtrate put into freeze drying plates in deep freezer for 24 hrs until frozen. The frozen material was lyophilized for 28 hrs. The lyophilized crude extract was screened against A. solani and P. infestans both invitro and invivo. All assays were performed in triplicate. Preliminary phytochemical analysis of the extract was carried and minimum inhibitory concentration (MIC) determined. Data on inhibition was analysed using ANOVA and the differences between means separated by Tukey's test ($p<0.05$). Warburgia ugandensis extract in diffusion wells showed significant inhibition ($P= 0.001$) of the pathogens. The MIC for A. solani was 1.25mg/ml while for P. infestans was 2.5mg/ml. Invivo results showed disease reduction by Warburgia extract to be 53.62% for A. solani and 59.04% for P. infestans respectively. This was closely comparable with the commercial fungicide which reduced disease severity in A. solani by 55.07% and P. infestans by 57.83% respectively. Further research is needed to analyze the active antimicrobials in Warburgia extract. The current study suggests that Warburgia ugandensis lyophilized crude extract has prophylactic properties against P. infestans and A. solani.

Keywords: Warburgia ugandensis, Phytophthora infestans, Alternaria solani, inhibition zone, invitro, invivo.

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BIOLOGICAL CONTROL OF FUSARIUM WILT DISEASE IN FRENCH BEANS USING PSEUDOMONAS FLUORESCENS

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Fusarium wilt is a major disease affecting French beans, causing yield loss of up to 100%. Synthetic pesticides have been used but they have posed high health risks to humans and environment. The study evaluated the effectiveness of Pseudomonas fluorescens isolates against Fusarium oxysporum on French bean as an alternative to synthetic pesticides. Twelve Pseudomonas fluorescens were isolated from soil samples collected from Mwea. Four isolates scored above 50% inhibition against F. oxysporum and were further mass multiplied and evaluated. Greenhouse experiment was conducted in Kenyatta University between September-October 2018. The treatments included; P. fluorescens Pf1, Pf2, Pf3, Pf4, Bio cure-B (commercial product), Neem, Pf1+Neem and control. Each treatment comprised of six pots replicated thrice and arranged in complete randomized design. Treatments were applied in the soil before planting. Three French bean seeds var. Vanilla were planted in each pot. The plants were inoculated at two-leaf stages by drenching five milliliters of F. oxysporum near the roots. Efficacy of P. fluorescens isolates was assessed on a 14 days interval after inoculation. Data on disease incidence was recorded based on number of infected plant while severity was scored on a scale of 0-4. Data on incidence and severity was subjected to analysis of variance using SAS software and Least significant difference used for mean separation at 5% level of significance. All Pseudomonas isolates significantly (P=0.001) reduced the disease incidence and severity compared to the control. The lowest disease incidence and severity was recorded by P. fluorescens–Pf1 (43.6, 40.7%) followed by Pf3 (46.9, 45.9%), Bio cure–B (48.7, 43.3%), Pf2 (50.3, 44.8%) and Pf4 (58.8, 49.6%). The results showed that P. fluorescens is a potential biocontrol agent for Fusarium wilt management in French beans. The effective isolates were recommended for further evaluation under field condition.

Key words: Biological control, Fusarium wilt, French bean, Inoculation, Incidence, Severity

ASSESSMENT AND DETECTION OF MAIZE CHLOROTIC MOTTLE VIRUS STABILITY IN MAIZE SEEDS IN KENYA

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Viral diseases are a major obstacle in maize production and attaining of food security in Africa. Maize chlorotic mottle virus (MCMV) combines synergistically with other potyviruses causing maize lethal necrosis disease (MLND) that threatens food security and poses challenges in trade. The MCMV virus is vectored by thrips. Maize is the main staple food in Kenya and therefore, with the advent of the MLND, there is need to establish mechanisms for combating the spread of the disease. Huge losses have been incurred by seed farmers and seed companies especially where their final products have been denied access to the market because of the presence of the MCMV in the seed. The Kenya Plant Health Inspectorate Service (KEPHIS), tests all locally produced and imported maize seeds to ascertain the presence or absence of the MLND causing viruses. Infected seeds are not allowed into the Kenyan market hence a big loss to both seed growers and seed marketing companies.

The main objective of this work was to ascertain if infected seed lots can be salvaged by either thermal inactivation of the MCMV in the seed or by storing seeds for a specified period of time during which the MCMV can naturally be inactivated. Furthermore, sensitivity and cost of the current testing methods used in detecting MCMV in maize seeds among them; Loop mediated Isothermal Amplification (LAMP), real time PCR, and immune strip (ELISA) was evaluated. A sample size of twenty five lots of infected maize seeds was used in the experiments. Results show that the viral load did not change significantly with both time and storage temperature. Furthermore, it was established that Lamp as a method of diagnosis of MLN was slightly more sensitive compared to rtPCR which in turn was more sensitive compared to lateral flow kits. The lateral flow kits can be recommended for use in the field by inspectors for quick decision making during inspection but not for conclusive laboratory analysis. The cost of testing was lower for kit followed by rt PCR and LAMP which was the most expensive. It was also noted that the viability and vigour of stored maize seed deteriorated fast and hence is not ideal as a management plant for MLND.

Keywords: LAMP, Maize, MLND, MCMV, potyvirus, resistance, screening, seed testing, virus stability

INVITRO EVALUATION OF ORGANIC AND INORGANIC AMENDMENTS AGAINST DIFFERENT STRAINS OF RALSTONIA SOLANACEARUM

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Ralstonia solanacearum is the causal agent of bacterial wilt in many plant species. Many vegetables are host of this pathogen, especially members of the family Solanaceae. The objective of the study was to investigate the effect of organic and inorganic amendments on growth of R. solanacearum under in vitro conditions. Sixty-nine bacteria isolates were obtained from wilting tomato, capsicum and potato plants from 11 different sites in Nyeri, Nyahururu, Kirinyaga, Kiambu, Nakuru, Murang'a and Embu and subjected to SMSA-E media for purification and CPG for testing effect of the media based treatments on colony forming units of pure R. solanacearum at concentrations of 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1%. There was significant difference ($P<0.05$) between control and all the treatments in CPG media in terms of bacterial colonies. All the treatments showed some suppressive effect on the bacteria as they recorded less R. solanacearum colonies. The best invitro treatments for R. solanacearum were seen in ChalimTMand orange peels, ChalimTM and hydro-grow polymer where there was no growth of bacteria colonies in the petridish. ChalimTMand orange peels and ChalimTM and hydro-grow polymer had a synergetic effect in eliminating R. solanacearum as opposed to ChalimTM, orange peels and Super-hydro-grow polymer individually.

Through this study, it was realized that all the organic and inorganic invitro amendments tested had

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suppressive effect against R. solanacearum. However, treatments that were most effective in the order of activity were ChalimTM and orange peels, ChalimTM and hydro-grow polymer, Brassica tissue, orange peels, Brassica tissue and orange peels, Super-hydro-grow polymer, Brassica tissue and Super-hydro-grow polymer and ChalimTM. Brassica tissue is the sole best alternative amendment hence the study recommends farmers to use it since it is cheap, readily available and environment friendly.

Keywords: Bacterial wilt, Colony forming units, Amendments, In vitro

BIO-CONTROL AGENTS FOR MANAGEMENT OF ROOT KNOT NEMATODES ON TOMATO IN KENYA

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Root knot nematodes (Meloidogyne spp.) are a serious problem in smallholder farms causing 90-100% yield loss in tomato in Kenya. Effective management of nematodes has primarily depended on the application of chemical nematicides, which are expensive, a health hazard and can pollute the environment. A greenhouse experiment was set up in Kenyatta University (January-April 2019) to evaluate the efficacy of local fungal isolates against Root Knot Nematodes (RKN) on tomato. The treatments; Trichoderma harzianum, T. afroharzianum and Purpureocillium lilacinum, Bionematon (Positive control) and untreated control were arranged in Completely Randomized Design with four replicates. RKN inoculum was obtained from galled tomato roots using root maceration technique. Three weeks old tomato seedlings were transplanted in pots. Data on mean number of galls, galling index, j2 in soil and yield was recorded. The data was subjected to analysis of variance using SAS software and means separated using Fisher's Least Significance Difference at 95% confidence level. Results showed significant effects of treatments on all measured parameters. All the treatments had a lower mean galling index and higher mean gall reduction % which was significantly different from the control. The percentage increase in yield recorded in T. harzianum (69.31%) was not statistically different from that recorded in Bionematon and P. lilacinum but significantly different from control. Overall, T. harzianum, P. lilacinum and T. afroharzianum performance was similar to that of the commercial Bionematon. The results of this study show that indigenous fungal bio-control agents are effective for managing RKN on tomato, therefore, recommended for use in integrated nematodes management.

Keywords: Meloidogyne spp., fungi, T. harzianum, P. lilacinum.

OCCURRENCE AND ABUNDANCE OF PLANT PARASITIC NEMATODES ON TREE TOMATO (SOLANUM BETACEUM CAV.) IN KIAMBU AND EMBU COUNTIES, KENYA

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Tree tomato (Solanum betaceum Cav.) is one of the most important fruits in Kenya which contributes to the economy of local farmers and has the potential of contributing to the country's GDP through exports and therefore important in food security. Despite this importance, production faces serious threats from plant parasitic nematode (PPN) infestations and especially the root knot nematodes (RKN). A nematological survey was conducted in five agro-ecological areas of Kiambu and Embu counties to determine the occurrence and abundance of PPNs associated with tree tomatoes. A total of 60 soil and 60 root samples were collected between January and March 2019 were processed and analyzed. Nematodes were isolated from 200cc of rhizosphere soil and 5g of roots using modified Baermann technique. Nematodes were enumerated and identified to genera level. Fourteen genera of PPNs belonging to eight families of the Order Tylenchida, Triplonchida and Dorylaimida were isolated. Sixty four percent (64%) of nematode genera identified belonged to order Tylenchida, 14% Triplonchida and 21% Dorylaimida. Meloidogyne spp. was detected in all soil and root samples with the highest absolute frequencies of occurrence (100%) followed by Helicotylenchus and Pratylenchus (98% each), Longidorus (85%), Trichodorus (81%), Xiphinema (80%) and Hemicycliophora (63%). The nematode population densities differed significantly ($P<0.05$) between AEZs with Githunguri recording the highest nematode densities while Kiambu had the lowest. Meloidogyne spp. was the most dominant PPN followed by Helicotylenchus spp. and Pratylenchus. Soil physical-chemical properties and farming practices may have significantly influenced occurrence and population densities of various PPNs.

Key words: Abundance, Agro-ecological zones, Baermann technique, Meloidogyne spp, Plant parasitic nematodes, Solanum betaceum.olanum Betaceum Cav.) in Kiambu and Embu Counties, Kenya

POTENTIAL OF LOCAL FUNGI IN MANAGEMENT OF POTATO CYST NEMATODES ON POTATO IN KENYA

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Potato cyst nematodes (PCN) (Globodera spp) are serious nematodes threatening potato production in Kenya. Potato is the second most important food crop in Kenya. Management of nematodes is mainly by synthetic nematicides which are associated with environmental pollution and human health threats. Thus alternative measures such as biological control are needed. A trial was done at Kwa Haraka, Nyandarua County between June and September 2018 to evaluate the effectiveness of five fungi in managing PCN using susceptible Shangi potato variety. The treatments comprised of Trichoderma atroviride, T. tomentosum 1, T. tomentosum 2, T. atrobrunneum, Purpureocillium lillacinum, Bionematon- Commercial P. lilacinum and untreated control. Experiment was laid in a Randomized Complete Block Design with four replicates in 3m by 4m plots. Treatments were applied at a rate of 6 kg/ha through soil drenching at planting, 30 and 60 days after planting. Nematode reproductive potential was assessed based on reduction of juvenile populations and reproduction factor (RF), calculated using initial and final juvenile and cyst populations respectively. Data was subjected to Analysis of Variance and means separated using least significant difference at $P\leq0.05$. The fungal agents and Bionematon significantly ($P < 0.0001$) reduced juvenile populations by 11 to 59% compared to untreated control which increased populations by 45%. Untreated control recorded the highest mean RF (1.94) while T. atroviride and T. tomentosum 2 the least mean RF (0.68, 0.49, respectively).The results of this study indicate that T. atroviride and T. tomentosum 2 can be incorporated in integrated management of potato cyst nematodes.

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Key words: Bionematon, Globodera spp, Juvenile, reproduction factor, shangi, soil drenching

TRACK 5. CROP PROTECTION II

USE OF PHEROMONE TRAPS IN THE MANAGEMENT OF FRUIT FLIES (DIPTERA: TEPHRITIDAE) ON MANGOES MANGIFERA INDICA IN CENTRAL KENYA.

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Mango Mangifera indica is a fruit crop of economic and nutritional importance grown in different parts of Kenya where it generates income for many large and small scale farmers. Tephritid fruit flies are the major insect pests of mangoes causing up to 40-80% losses. Farmers' mostly use pesticides to control the pests but this has proven to be ineffective since the destructive stage is found inside the fruit and many species have developed resistance. New, effective and affordable methods of control have been developed but most farmers are not aware of them. This study aimed at determining the effectiveness of pheromone traps in the management of fruit flies in Murang'a, Kirinyaga and Embu counties. Three types of pheromone traps, i.e. Bactrolure®, Ceralure® and Torula® track lure were installed in mango orchards from November 2018 to April 2019. The number of traps installed in each county were Murang'a (40), Kirinyaga (24) and Embu (50). Data collection begun two weeks after trap installation and continued fortnightly for 5 months. Data on the abundance of fruit flies was expressed as a percentage of the total number recorded. A total of 117,135 fruit flies were trapped from all regions; Embu County had the highest proportion (57.75%) followed by Murang'a (24.6%) and Kirinyaga (17.7%). Five fruit fly species were trapped that included Bactrocera dorsalis, B. curcubitae, C. capitata, C. cosyra and C. fasciventris. B. dorsalis (98.98%) was the most abundant species while B. curcubitae (0.004%) was least abundant. Bactrolure (91.28%) was the most effective pheromone trap followed by Ceralure (8.15%) and Torula track lure (0.62). The results showed that pheromone traps are effective against fruit flies. However, farmers should be advised on the correct type of trap to ensure they are effectively utilized. This will reduce use of pesticides in control of fruit flies on mangoes and other host crops.

Keywords: Fruit flies; pheromone traps; management, Mangoes.

PESTICIDE USE PRACTICES IN HORTICULTURAL CROPS PRODUCTION IN CENTRAL KENYA.

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Agriculture is the mainstream of Kenya's economy contributing to about 24% of Kenya's Gross Domestic product (GDP). The horticultural crops sub-sector contributes 33% to the Kenyan GDP. The main crops comprise of vegetables (44.6%), flowers (20.3%), fruits (29.6%), nuts, medicinal and aromatic plants (5.8%). Arthropod pests and diseases are a major constraint to the horticulture industry in Kenya. To reduce damage and losses, farmers heavily rely on synthetic pesticides, which leave residues on produce, and poses a risk to health of farmers, consumers, beneficial non-target organisms and the environment.

Therefore, this study aimed to document the major horticultural crops, their pests and diseases, and the management measures in selected counties in Central Kenya. A survey was conducted in between October and November 2018 in Murang'a, Kirinyaga, Embu and Meru counties targeting farms producing vegetables and fruits. A total of 100 farmers volunteered to participate in the study, of which 80.2% were males and 19.80% females, aged 21-60 years. A large diversity of crops (Solanum lycopersicum, Phaseolus vulgaris, Capsicum annuum) pests (Tuta absoluta, Frankliniella spp., Aphis sp., Bemisia tabaci) and diseases (Phytophthora infestans, Ralstonia solanacearum, Erysiphe spp., Colletotrichum spp) were reported depending on types of crops cultivated. On Solanum lycopersicum, the most destructive pest and disease was Tuta absoluta (38.61%) and blight (33.66%).
The results showed that pesticides are readily available and widely used by farmers. The most widely used pest control measures were pesticides (86.2%), pheromone traps (6.9%), bio-pesticides (3.4%) and botanicals (3.4%). The most frequently used insecticides were Proof® (Cold-Pressed Neem Oil) (23.76%), cyclone® (Citric acid and Lactic acid) (16.83%) and Dynamic® (1.8g/L Abamectin) (10.89%) while common fungicides were Ridomil® (Metalaxyl-M40g/Kg, Mancozeb 640g/Kg) (18.81%) and Funguran® (Copper Hydroxide 770g/kg) (8.91%). About 48.2% of the respondents reported pesticides to be highly effective while (51.7%) indicated they are moderately effect.

This study shows that pesticides are widely used to control pests and diseases on horticultural crops in the survey area. It is recommended that farmers should be educated on other safe and eco-friendly management methods for the major crop pests and diseases.

Keywords: Pests, diseases, horticultural crops, pesticides.

MANAGEMENT OF INSECT PESTS OF TOMATO USING INDIGENOUS ANTAGONISTIC FUNGI IN MANAGEMENT OF INSECT PESTS OF TOMATO USING INDIGENOUS ANTAGONISTIC FUNGI IN KENYA

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Tomato Solanum lycopersicum L. is an important crop in Kenya. Its production is constrained by arthropod pests and diseases. Farmers use synthetic pesticides which lead to contamination of the produce, pest resistance to pesticides and pollution of the environment. Thus, need to identify safer alternatives. This study was carried out to determine the effectiveness of indigenous antagonistic fungi in managing tomato pests. Field trials were conducted in farmers' field at Bukonoi in Bungoma County between March and November, 2018. Treatments included fungal isolates selected after in vitro screening. These were Gliocladium virens, Trichoderma virens, Trichoderma afroharzianum, Fusarium solani and Fusarium oxysporum compared to commercial Beauveria basssiana, synthetic imidacloprid and a control applied weekly as foliar sprays.

Treatments were replicated four times arranged in a randomized complete block design. Data collected on population of Frankliniella.occidentalis, Bemisia tabaci and yield of tomatoes was subjected to Analysis of Variance using SAS version 9.4. Means were separated using Student Newman-Keuls test at P≤0.05. Fusarium oxysporum recorded the lowest mean of 38.1 and 18.2 F. occidentalis compared to the control which had 96.1 and 35.5 for the long and short rainy season, respectively. Trichoderma afroharzianum recorded the least mean of 1.4 and 13.7 B. tabaci during the long and short rainy season, respectively. Trichoderma afroharzianum gave the highest yield of 3.7 t/ha and 27.2 t/ha during the long and short rainy season, respectively. Results demonstrated that F. oxysporum and T. afroharzaianum are potential isolates for development as fungal-based bio-pesticides for management of tomato pests.

Keywords: Bemisia tabaci, Frankliniella occidentalis, Fusarium oxysporum, pesticides, tomato.

A DECADE OF FREE PARASITIC NEMATODE OF HADEJIA'S CULTIVATED RICE: A MIRACLE FROM THE PLANT OR THE FIELD?

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Rice is the most important human food in the world, directly feeding more people than any other crop. Rice is one of the leading crops in the world and the most consumed staple food in Nigeria. Rice is a major source of carbohydrates, minerals, and vitamins which provides energy and good health for the body. However, over one hundred and fifty species of nematodes parasitize rice. Some have restricted geographic distributions, while others occur throughout the rice-growing regions of the world. Nematodes parasites on rice may be divided into foliar parasites and root parasites. The common species of plant parasitic nematodes infesting rice among others include Ditylenchus angustus, Aphenchoides besseyi, and Meloidogyne. Hadejia town, in Jigawa State Nigeria, is one of the largest rice producers in Nigeria and the type of rice cultivated in the area is Oryza sativum. During the period of this observation, no nematocide has ever been used and no single species of parasitic nematode is witnessed while it is witnessing in the neighboring towns. This could be of great importance and should attract rice farmers worldwide to invest in cultivation of rice in the area. And a comprehensive research is recommended to find out why.

Keywords: Decade, Hadejia, Nematode, Parasites, Rice

OCCURRENCE, ABUNDANCE AND DISTRIBUTION OF PLANT PARASITIC NEMATODES ASSOCIATED WITH BANANAS (MUSA SPP.) AT DIFFERENT ALTITUDES IN KENYA

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Bananas (Musa spp.) are considered the most important fruit crop in Kenya and are grown mostly by small-holder farmers. However, in the past two decades, production has declined and this has been attributed to plant pathogens, among which are the plant parasitic nematodes (PPN). A nationwide survey was therefore conducted in Kenya to assess farmers' awareness about nematodes, determine incidence, abundance and distribution of PPN across different altitudes on different banana cultivars and to compare pathogenicity of Pratylenchus spp. on different banana cultivars. One hundred and eighty (180) farms from 12 major banana producing areas with varying altitudes of 1100-2000 m were surveyed. A structured questionnaire was used to collect qualitative data on nematode. In each farm, soil and root samples were collected from both dessert and cooking banana cultivars. Nematodes were extracted from both roots and soil following the Baermann technique and identified to genus level. In addition, two pot experiments were set up to assess the differential ability of Pratylenchus spp. derived from diverse altitudinal gradients to infect banana. Results showed that only 2.3% of the farmers were aware of nematode damage and symptoms, none of whom had applied any management measures. The highest abundance of PPN was recorded at altitude range of 1600-2000 m with Pratylenchus, Meloidogyne and Helicotylenchus spp. as the predominant genera.

Across all altitudes, cooking banana showed prevalently higher numbers of nematodes than dessert bananas. Screening tests on Pratylenchus spp. revealed that populations from high altitude areas (Embu) had higher plant infectivity as they recorded the highest reproduction rates when compared to low altitude populations (Oyugis). Cooking banana showed higher infectivity than dessert banana in both trials. Nematode damage is more prevalent at higher altitude areas, and on cooking banana cultivars. The findings from our study can be used by extension officers to advice farmers on nematode management techniques that are suitable for different altitude areas.

Key words: altitude, banana cultivar, pathogenicity, Pratylenchus spp., sampling, survey, Nematode damage.

TRACK 6. FEEDS AND ANIMAL PRODUCTION

PERFORMANCE OF THE AFRICAN CATFISH (CLARIAS GARIEPINUS) FED ON DIETS CONTAINING BLACK SOLDIER FLY (HERMETIA ILLUCENS) LARVAE MEAL

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This study aimed at evaluating the growth rate, feed utilization and survivability of the African catfish

(Clarias gariepinus) when fed on diets containing Black Soldier Fly larvae (BSFL) meal as a replacement for fishmeal (FM). Treatment diets were formulated to contain BSFL meal at the rate of 0% (C), 25% (D1), 50% (D2), 75% (D3) and 100% (D4. The diets were formulated to meet the nutrient requirements of catfish. The experimental catfish were housed in harper nets each measuring 2 by 2 by 2 meters and the net had one millimeter perforations to allow proper circulation of water and also prevent escape of the catfish. Each harper net held 20 pieces of catfish. The experiment was laid out in a completely randomized design with each treatment being replicated three times. The performance of the catfish was determined by recording the weights, lengths and mortality in each cage. Data collection was done twice monthly for six months. Analysis of variance was carried to determine the different effects of the treatment diets. Water quality parameters measured were within the optimum levels. Catfish consuming D2 and D3 diets had the highest weight gain and length gain. The performance of the catfish consuming the control diet (C) and diets D1 and D4 was comparable and with no significant (P>0.05) differences. A 5% mortality was only noted in the catfish consuming diets C and D1. There was no mortality for the other treatment groups. These findings suggest that BSFL meal can be utilized or used to replace FM in diet formulations for rearing African catfish for improved growth and production.

Our findings revealed that the combination of fishmeal and BSFL meal significantly enhanced the growth performance and carcass nutrient status of the African catfish.

DIETARY PROBIOTICS MODULATES NON-SPECIFIC IMMUNITY AND GUT MICROBIOTA OF NILE TILAPIA (OREOCHROMIS NILOTICUS) CULTURED IN LOW INPUT PONDS

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The use of antimicrobials has become rampant to control diseases and infections in farmed fish worldwide. However, cases of antimicrobial resistance have been reported in aquaculture as a result of uncontrolled usage. To reduce these negative effects, probiotics has been widely used as immunostimulants in fish because of their multiple benefits. However, no studies have been conducted on fish cultured in low input ponds despite high susceptibility to infectious pathogens in these environments. We studied the effects of commercial probiotics, Saccharomyces cerevisiae and Bacillus subtilis supplementation on non-specific immunity, gut microbiota and microbiological quality of Nile tilapia (Oreochromis niloticus) cultured in low input ponds. O. niloticus fingerlings of an average size of 40 g were stocked at 50 fish m-3in cages in low input ponds and were fed diets supplemented with S. cerevisiae, at 2g kg-1 (Diet 1); 4g kg-1(Diet 2) and 6g kg-1(Diet 3); and B. subtilis, at 5g kg-1 (Diet 4); 10g kg-1 (Diet 5) and 15g kg-1 (Diet 6) and Control (Diet 0) for a period of 180 days. Results indicated that hemato-immunological parameters (hemoglobin (Hb), red blood cells (RBC), white blood cells (WBC) serum protein, albumin, globulin and lysozyme activity) were significantly ($P < 0.05$) higher in probiotic treated groups than the control group. However, fish fed on Diet 6 presented significantly similar values to the control ($P > 0.05$) for Hb and globulin. Additionally, fish fed on probiotic treated diets retained the probiotics in their gut and lower microbial load not important in food safety was realized in their muscle ($P < 0.05$). Therefore, S. cerevisiae at dietary levels of 4g kg-1 and B. subtilis at 10g kg-1 use in low input ponds is important in improving immunity, manipulation gut microbiota and flesh quality for Nile tilapia.

Key words: Bacillus subtilis, immunity, Nile tilapia, probiotics, Saccharomyces cerevisiae.

QUANTIFICATION OF OCHRATOXIN-A IN POULTRY FEEDS AND CHICKEN PRODUCTS, AND SCREENING OF ESSENTIAL OILS OF SELECTED PLANTS FOR INHIBITING FUNGAL GROWTH

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Poultry farming in Kenya has become one of the most profitable businesses due to increased demand for chicken by hospitality industry and households. Poultry farming is an important sector in the agricultural industry that creates employment and forms a business platform for entrepreneurs. However, there is increased risk that poultry feeds may contain potential toxicological contaminants such as Ochratoxin A (OTA) that may compromise the safety of poultry products. This study sought to quantify the levels of OTA in poultry feeds and chicken products from various agro-ecological zones in Kenya using the LCMS technique. Essential oils of selected ethnobotanical plants were screened, individually and in different blends as potential inhibitors of OTA producing fungi by measuring the mycelial diameter. Maximum OTA contamination level was 10.14 µg/kg and 202 µg/kg in chicken products and poultry feed respectively. The mycelial diameter of A. niger decreased with increase in concentration of each of the three-essential oil, Lippia javanica, Ocimum gratissimum and Toddalia asiatica; oils of T. asiatica were the most effective. A blend of O. gratissimum and T. asiatica had the best inhibition activity while a blend of O. gratissimum and L. javanica had the least inhibition activity among the blends of two oils. A blend of the three essential oils demonstrated antifungal activities against A. niger due to synergistic effects of various compounds within the oil. Inhibition of A. niger leads to decrease in OTA production thus increasing food security in Kenya and globally.

Key words: Mycotoxins, Ochratoxin-A, Essential-oils.

LENGTH WEIGHT RELATIONSHIP AND RELATIVE CONDITION FACTOR OF THE NATIVE MOUNTAIN CATFISH (AMPHILIUS URANOSCOPUS PFEFFER, 1889) IN A TROPICAL STREAM (THEGO), MOUNT KENYA.

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A study on Length-weight relationship (LWR) and relative condition factor (Kn) of the mountain catfish, Amphilius uranoscopus Pfeffer 1889 (Silurifomes: Amphiliidae), was carried out for fisheries management in Thego stream on the slopes of Mount Kenya from June 2016 to May 2017. A total of 369 individuals of A. uranoscopus were sampled from the stream by electro fishing, measured and weighed. The relationship between the fork length (FL) and weight (W) was analyzed using the formula W= a Lb which was further transformed into Log W = a+b logL. Fork length and weight ranged from 2.6 to 19.0 cm and 1.4 to 92.1g, respectively. Average fork length and weight was 9.07±0.25 (±SE) cm and 12.69 ± 1.10 (±SE) g, respectively. The equation obtained for males was; log W = -1.62 + 2.69 logFL; for females: logW = -1.47 + 2.56 logFL; The regression coefficients between males and females did not show any significant difference ($p > 0.05$). The exponent b values of LWR ranged between 0.48 and 3.08 with a mean of 2.56 ± 0.14 (±SE) for females and 2.18 and 3.79 with a mean of 2.67 ± 0.11 (±SE) for males. However, the obtained b value for LWR on pooled data was 2.75 exhibiting an isometric growth. Relative condition factor (Kn) ranged from 1.00 to 1.22 with a peak in November (1.22) though relatively stable for the rest of the months.

The Kn factor reported in this study indicates that A. uranoscopus were in good condition for human consumption.

Key words: Amphilius uranoscopus; Length-weight relationship; Relative condition factor; Isometric growth,

TRACK 7. SOIL FERTILITY AND PRODUCTIVITY

IMPACT OF FEEDSTOCK C/N RATIO ON BLACK SOLDIER FLY LARVAL YIELD AND ORGANIC FERTILIZER QUALITY

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Background: Efforts to recycle organic wastes using black soldier fly (BSF) *Hermetia illucens* into high-quality alternative protein ingredients in animal feeds and fertilizer have gained momentum worldwide. There is little information on waste manipulation for enhanced larval productivity and residue quality. This study seeks to evaluate the effects of feedstock C/N ratio on BSF larval growth performance and nitrogen conservation in residual waste as well as duration to compost maturity.

Materials and methods: Brewer's waste, was amended with sawdust to C/N ratios: 15, 20, 25 and 30. The control treatment consisted of an un-amended feedstock. BSF larvae were subjected to the five treatments and developmental time, larval yields, residue nutrient contents and compost maturity were determined.

Results: Adjustment of feedstock's C/N ratio did not significantly affect larval developmental time. There was a significant reduction in larval yields across the different feedstocks. Feedstock with C/N ratio of 15 had the least negative effect on BSF larval yield compared to other treatments. The feedstock with C/N of 15 produced compost with significantly higher nitrogen (2.5%), phosphorus (2.02g/kg) and potassium (1.28g/kg) contents compared to the other amended feedstocks. The composting process of BSF residues took four weeks to maturity for use as organic fertilizer.

Conclusion: Amendment of feedstock with sawdust to C/N ratio of 15 significantly enhanced residue quality and shortened compositing duration without negatively affecting BSF larval yield. This study contributes to the production of high-quality and affordable insect-based protein as ingredients in animal feeds and enhanced fertilizer for improved soil health and crop productivity.

Keywords: Black soldier fly, feedstock C/N ratio, larval yield, organic fertilizer, nitrogen loss, sawdust.

USING LIGNOCELLULOLYTIC BACTERIA TO BIOCONVERT ORGANIC RESIDUE TO BIOORGANIC FERTILIZER FOR SUSTAINABLE CROP PRODUCTIVITY

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Presently, the need to boost sustainable food production is on the increase globally due to burgeoning population coupled with finite non-renewable resources. With a high food demand and limited land availability, farmers regularly use harmful synthetic farm inputs to increase crop productivity. Bioorganic farm inputs are the option in order to curb the problems associated with synthetic inputs. Bioconversion of recalcitrant and abundant rice straw in Mwea, Kenya was thus done in this study.

The objective of this study was to identify and develop a consortium of microorganisms that can accelerate biodegradation of organic materials into fertilizer for soil conditioning to enhance crop growth and yields. Lignocellulolytic bacteria were obtained by isolating from partly decomposed rice straw. Lignocellulolytic abilities of the isolates were established using different tests that reflect the enzymatic capacities of a microorganism. Among the bacteria isolated, those with the best ability to degrade rice straw were identified and formulated into a starter culture for composting experiments. Rice straw was then composted using the formulated microbial consortium alongside commercial effective microorganisms (EM).

Results from the composting experiment showed a significant difference in both electrical conductivity and pH readings among the treatments ($P = 0.001$). Nitrogen content in the resultant bioorganic fertilizer prepared using the formulated microbial starter culture was significantly higher than in the other treatment and in the control ($P = 0.001$). Plant growth index of the bioorganic fertilizer from the treatment with selected microbial consortium was also significantly higher than in the other treatments at $P< 0.05$. The results indicate that addition of the selected lignocellulolytic microorganisms significantly improved the composting process and the quality of the resultant compost. It is thus recommended that lignocelluloytic microorganisms be used to compost crop residue and other organic wastes for improved soil fertility and increased crop productivity.

Key words: Bioorganic fertilizer, composting, **c**rop residue, food security, lignocellulolytic microorganisms, soil quality

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BIODIVERSITY AND ABUNDANCE OF ARBUSCULAR MYCORRHIZAL FUNGI IN LOWER EASTERN KENYA.

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Arbuscular mycorrhizal fungi (AMF) are important in ecological systems because they have wide plant symbiosis and improve plant resistance to nutrient stress, diseases and pests. They provide essential nutrients to the partner plant influencing its growth and development. The distribution, composition and richness of AMF communities is greatly influenced by environmental conditions. This study aimed at determining the effect of soil characteristics on AMF infective propagule abundance and AMF biodiversity in smallholder farms in Embu and Kitui Counties. Soil samples were collected from five farms with no history of rhizobia and AMF inoculation from each county. This was charted by determination of the soil chemical properties. AMF abundance was determined using the most probable number technique (MPN) using bermuda grass as trap host. The experiments were set in a complete randomized block design, replicated four times and maintained for 35 days. AM fungi spore isolation was done using sucrose flotation technique followed by observation and identification of the spores under compound microscope. Mycorrhizal root colonization was determined after harvesting by staining the roots with tryphan blue stain and observing for vesicles or arbuscules under sterio microscope. Mycorrhizal infective propagules had insignificant ($P > 0.05$) positive correlation with available phosphates, potassium, zinc and manganese ions, but negative insignificant ($P > 0.05$) correlation with soil pH, total carbon, soil organic matter, total nitrogen calcium ions and magnesium ions. Notably there was a similar trend in AMF biodiversity with free AMF spore numbers, Shannon's diversity index and Simpson's dominance index positively correlating significantly ($p < 0.05$) with soil pH, available phosphates, potassium and zinc ions and negatively with soil organic matter, carbon and total nitrogen. These results provide strong evidence that core geochemical characteristics influence mycorrhizal development.

Key words: Arbuscular mycorrhizal fungi (AMF), Biodiversity, Abundance, Soil properties.

INFLUENCE OF INSECT-BASED ORGANIC FERTILIZER SOIL AMENDMENTS ON THE GROWTH AND YIELD OF *PHASEOLUS VULGARIS, SOLANUM LYCOPERSICUM AND BRASSICA OLERACEA VAR. ACEPHALA* IN KENYA

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In Kenya, several hectares of acidic with low nitrogen content soils are scattered over the Central region that can potentially be cultivated. However, this type of soil is not immediately suitable for crop production unless improved by applying some amendments. Thus, the current study was carried out to investigate the effects of various types of soil amendments on the growth and yield of French beans (*Phaseolus vulgaris* L.), Tomato (*Solanum lycopersicum* L.) and Kales **(***Brassica oleracea* L. *var. acephala*) using 1 ton/acre black soldier fly (BSF) residue only; 1.4tons/acre brewer's spent grain (BSG); 3.45tons/acre commercial organic fertilizer (Evergrow); 150kg/acre NPK (23:23:0); 0.5 tons/acre (BSF) residue+75kg NPK; 0.7tons/acre BSG + 75kg/acre NPK and control (no fertilizer) under greenhouse and field conditions. The manures were applied as per recommendations to provide 34.5kg of nitrogen per acre. The experiments were conducted for two cropping seasons between 2018 and 2019. Results revealed significantly fast growth performance when compared to control ($p<0.05$). Highest yields were recorded in 0.5 tons/acre BSF compost +75kg NPK with 4.5, 2.4 and 5.4 times more production compared to the control for Tomatoes, Kales and French beans, respectively. This study provides important information demonstrating evidence that the integration of BSF composted manure and NPK fertilizer provides the best plant growth performance. Therefore 1tons/acre BSF manure or 0.5tones/acre BSF residue compost +75kg/acre NPK is recommended for improving the production of vegetables. In conclusion, amendment of soil with BSF residue compost has the potential to improve soil conditions for vegetable production.

Keywords: Black soldier fly composted manure, Acidic and low nitrogen soils, Improve soil health, crop yield, Tomatoes, Kales, French beans

EFFECTS OF SOIL FERTILITY-CLIMATE INTERACTIONS ON PERFORMANCE OF SPIDER PLANT IN THE LAKE VICTORIA REGION

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Spider plant is an indigenous African leafy vegetable (ALV) that is grown in the Lake Victoria Region because of its high nutritive and economic value. Its productivity is significantly affected by climatic conditions and soil fertility. There is scanty information that establishes the interactions between fertility options and climatic conditions in Kenya. Field experiments were conducted in Kisumu, Siaya and Busia counties to determine the effect of different fertilizer options on yields of spider plant in three agro-ecological zones (AEZs) - LM2, LM3 and LM4. Four fertility options - control (T1), farmyard manure (T2), mavuno (T3), and a combination of farmyard manure and mavuno (T4) were tested in Siaya (LM2), Kombewa (LM3), and Port Victoria (LM4). Ten farmers were selected per AEZ and the treatments laid out in a Randomized Complete Block Design (RCBD) in an area of 15m by 4.5m with each treatment in a block of 4m by 4.5m. Three scores of Fresh Leaf Weight (FLW) data were collected at an interval of two weeks. GenStat was used for ANOVA analysis of the data obtained and presented in box and whiskers. In the results, T4 and T3 alternated at the top followed by T2 then T1. Highest yields were obtained in LM3 followed by LM4 then LM2 across the treatments except for T1 where LM4 was the leading with a mean of 317g. This showed a significant interaction between soil fertility and climate because the treatments gave better results in moderately drier areas.

Keywords: Spider plant, soil fertility, RCBD, agro ecological zones, FLW

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RESPONSE OF SOIL ORGANIC CARBON AND ACID PHOSPHATASE ENZYME ACTIVITY TO PHOSPHATE ROCK AND ORGANIC INPUTS ON ACIDIC SOILS OF CENTRAL HIGHLANDS OF KENYA

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Soil organic carbon depletion is a major soil degradation process in a tropical environment. Soil enzymes is a promising soil quality indicator because of its relationship to soil biology, ease of measurement and rapid response to changes. The mechanisms controlling organic carbon and enzyme activities as influenced by phosphate rock and organic inputs on acidic *humic nitisols*, however, remain largely unresolved. We conducted a multi-season field experiment in Tharaka-Nithi County, Kenya to investigate the effects of phosphate rock and organic input in acidic *humic nitisols*. We laid the experiment in a Randomized Complete Block Design with seven treatments replicated thrice. The treatments were *Tithonia diversifolia*, Phosphate rock, manure, *Tithonia diversifolia* plus Phosphate rock, manure plus Phosphate rock, Triple Super Phosphate plus Calcium Ammonium Nitrate and a Control (no external inputs). Soil Organic Carbon and Phosphatase enzyme activities were determined using standard laboratory procedures. The data were subjected to Analysis of Variance (ANOVA) in SAS 9.4 and mean separation done using Duncan's Multiple Range Test at P ≤ 0.05. Soil organic carbon was significantly (0.0001) influenced differently by the treatments. A highest of three-fold increase in soil organic carbon content under *Tithonia diversifolia* plus PR treatment in SR17 was observed. Use of *Tithonia diversifolia*, manure and PR noticeably increased the soil organic carbon with respect to the controls. No remarkable variations were observed in phosphatase enzyme activities during SR17 in the present study. In contrast, manure in either sole application or combined with PR reasonably increased the phosphatase activities with decreases under CAN plus TSP treatment. Overall our results indicate that manure and or combinations with PR remarkably enhanced soil organic carbon and acid phosphatase activities thus could be recommended for higher soil productivity in humic nitisols and similar agro-ecological zones.

Keywords; acid phosphatase activity, Phosphate rock, inorganic input, *Tithonia diversifolia*, agro-ecological zones

TRACK 8. TOXICITY AND PRODUCTION BIOSAFETY

ANTI-SALMONELLA, CYTOTOXICITY AND GC-MS ANALYSIS OF LEAVES EXTRACTS OF CARICA PAPAYA

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Shed dried matured leaves of Carica papaya were extracted with water, ethanol and chloroform solvents via percolation method. The composition of bioactive compounds in the leaves extracts of Carica papaya was determined by Gas Chromatography Mass Spectrophotometry. The toxicity statuses of the extracts were tested using Brine Shrimp Lethality Assay and bioactivity test was carried out on the bioactive TLC fractions. From the GC-MS study eighteen compounds were identified, with oleic acid (36.65%), palmitic acid (16.68%), stearic acid (9.78%) and 9-octadecenal (7.44%) being the major components. The toxicity study revealed that chloroform extracts of C. papaya was not toxic with LC50 value of (11,641µg/ml). While water extracts have LC50 values of (57.450µg/mL) and ethanolic extracts presents LC50 values of (179.505 µg/mL) respectively. Lastly results of antibacterial activity using contact bio-autography showed that the only bioactive fractions (Rf2 and Rf3 of chloroform extracts) were active against Salmonella Typhi and Salmonella Paratyphi B only.

Key words: Carica papaya, GCMS, Toxicity, Brine shrimp, Bioactivity.

COMPARATIVE EVALUATION OF BIOCHEMICAL RESPONSES OF *BUFO REGULARIS* (REUSS, 1833) TADPOLE EXPOSED TO BUTAFORCE AND TERMEX PESTICIDES

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The urge to ensure food security for the growing population in developing countries has resulted to new technology in Agriculture especially in the area of pesticides for the improvement of agricultural production. The misuse of pesticides has environmental adverse effect on health and physiology of non – targeted organisms like tadpoles. This study was designed to determine the biochemical responses of *Bufo regularis* tadpoles exposed to butaforce and termex pesticides. Three sublethal concentrations each for the test chemicals were determined and used for the study. The biochemical parameters, Alanine amino Transferase (ALT), Aspertate aminotransferase (AST), Alkaine phosphatase (ALP) and total protein concentrations in homogenized muscle sample of *Bufo regularis* tadpole were determined using standard procedures. The results showed significant increase (($p < 0.05$) in ALT, AST, ALP *in Bufo regularis* tadpoles exposed to butaforce and termex pesticides when compared with the control group. the concentration of ALT, AST and ALP increased as the duration of exposure and concentrations of both pesticides increased. The study indicated that butaforce and termex are toxic to *B. regularis* tadpoles and these pesticides induced biochemical changes indicating muscle damage and decrease of protein synthesis. We therefore advise that these pesticides should be used with carefulness to ensure the sustainability of the ecosystem and reduce toxicity of non- targeted organisms.

Keywords: Pesticides, Biochemical, Bufo Regularis, Tadpole, Butaforce and Termex

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EXTENT AND INTENT OF FARMERS FOR THE USE OF AGROCHEMICAL SUBSTANCES AND IMPLICATION FOR FOOD SECURITY.

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Traditional methods of farming in Nigeria have lost the potentials to provide sustainable food security. In an attempt to meet up with the food security requirements: sufficient, safe and nutritious food to all people at all times, farmers have been propelled to introduce various types of agro-chemical substances that improve agricultural output. Thus, this study was conducted to verify types of agrochemicals commonly used, extent and intent of farmers for the use of the agrochemical substances in the area. Five (5) agrarian communities and fifty one commercial farmers were selected from the study area Eha-Amufu in Enugu State, Nigeria through random sampling. A self made structured interview and questionnaires were used for data collection. The data collected were analyzed using Statistical Packages for Social Sciences (SPSS). The study discovered that, the agrochemical substances commonly used were herbicide, insecticide, fungicides, soil fumigants and natural pesticide. The substances were mostly used in the months of June (27.2%) and July (52.5%). The result also shows that farmers use agrochemical mainly to improve farming outputs for sustainable food security, not on the intent to destroy or cause harm to other organisms and environment. Suggestions were put forward that, companies producing agrochemicals should clearly explain the procedures for appropriate use of the agrochemicals in improving crop production. It was concluded that agrochemicals were used as a vehicle for improved crop production technology in the area and to boost food security for the teeming population.

Key words: Farmers, Agrochemical, food security.

CONTAMINATION OF MEAT WITH HEAVY METAL IN BUTCHERIES IN SELECTED OUTLETS IN NAIROBI COUNTY, KENYA

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Background: Metal contamination through processing and cooking of food has is of growing health concern, with suspected link to cancer and Alzheimer's disease attracting increasing research focus. Unregulated meat processing procedures in butcheries may introduce metal shreds which is a health hazard.

Objective: The study objective was to assess contamination of meat with heavy metal through processing in selected outlets/butcheries in Nairobi County, Kenya.

Methods: Random and paired sampling procedures were used to select 5 meat outlets and to pick large intact cut and small pieces cuts samples from each outlet. Two sets specimens were extracted using clean razor blade; the inner part of the large cuts, and the edge parts of the small pieces. The samples were digested and tested for Calcium (Ca), Chromium (Cr), Copper (Cu), Iron (Fe), Magnesium (Mg), Manganese (Mn), Nickel (Ni), Lead (Pb), Strontium (Sr) and Zinc (Zn), using Atomic Absorption Spectrophotometer.

Results: Concentration [mg/kg] of the Inner part specimen was Ca; 15.423±2.175, Cr; 21.129±28.937, Cu; 16.334±.477, Fe; 11.111±1.762, Mg; 632.793±51.615, Mn; 0.6453±.645, Ni; 0.175±.313, Pb; 185.283±21.228, Sr; 1.057±.739, Zn; 1749.390±352.755, while that of the Edge part specimen was Ca; 27.154±11.420, Cr; 10.695±19.529, Cu; 16.120±.144, Fe; 12.526±2.098, Mg; 639.376±40.180, Mn; 1.407±1.045, Ni; 0.487±.804, Pb; 183.723±20.436, Sr; 1.303±.804, Zn; 1788.450±862.329 (Mean±SD). Comparison of the two set of specimens using paired *t*-test recorded significant difference in Fe (*t*=-3.742, *p*=.020).

Conclusion: Meet processing especially cutting devices and related procedures can introduce significant metal contamination. More stringent regulation and education is needed among meat handlers in the studied population.

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TRACK 9. SOCIO-ECONOMIC /POLICY I

MEASURING THE VULNERABILITY OF PADDY FARMERS TO CLIMATE CHANGE VARIABILITY IN PENINSULAR MALAYSIA

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Climate changes greatly affect agricultural crop production and the associated farming community. The magnitude of the climatic stressor, the sensitivity and capacity of the affected communities to adapt with such stressors affect farmer vulnerability. This study assessed the vulnerability of paddy farmers to climate change variability in Peninsular Malaysia. The study employed an integrated vulnerability assessment approach using three component of vulnerability i.e. exposure, sensitivity and adaptive capacity. Household survey was conducted using multi- stage systematic random sampling on 450 sampled respondents to measure their adaptive capacity. 22.9% of respondents were found to be less vulnerable, 32% were vulnerable and45.1% were highly vulnerable. Based on granaries, MADA has the highest vulnerability followed by KADA with IADA as the least vulnerable. Ordinal logistic regression revealed that 17 factors have significant influence on the vulnerability outcome of the respondents. Conclusively, the respondents in the study areas are vulnerable to the effects of climate change variability. Therefore, decision makers should tailor policies to address local specific conditions by placing climate change vulnerability issues within the broader developmental context.

Keywords: Vulnerability, Climate change, Variability, Paddy Farmers, Peninsular, Malaysia

CHALLENGES OF FOOD SECURITY IN NIGERIA

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Following the discovery of the oil industry, Nigeria has grown in to a major food importing nation because the government has neglected the agricultural sector as petroleum has taken the number one position as a more stable income earner for economic development. The situation has divided Nigeria into high and low income groups. Unfortunately, only a very small percentage of the population have benefited from the oil wealth. A greater percentage of the population has suffered the misfortune of food insecurity as they can hardly afford three square meals a day. This is, in spite of the fact that a large percentage of the population is engaged in the agricultural sector, operating mainly at subsistence level. This paper brings into focus the menace of food insecurity, highlight the different challenges of food security and enunciate the strategies for coping with the problems.

Key words: Food security, Government, Undernourishment, Hunger.

SUSTAINABLE AGRICULTURE: A PANACEA FOR ACHIEVING SUSTAINABLE DEVELOPMENT GOALS IN NIGERIA.

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The role of sustainable agriculture in achieving sustainable development goals cannot be overemphasised. It is an all-inclusive conscious efforts through which farming and development could be achieved without jeopardising the future of this planet earth. This paper sought to examine the importance of sustainable agriculture in achieving sustainable development goals by 2030 as targeted by the United Nations especially in Africa, focusing on Nigeria with a view to ensuring food security. Nigeria as a nation-state which over 70% of her population is employed by agriculture is experiencing some form of deforestation and other environmental depletions due to unfriendly farming of crops in which trees are cut down indiscriminately thereby depleting the environment. This situation is worrisome to many concerned Nigerians. This paper has emphasised the importance of being environmental friendly in the course of carrying out agricultural activities in Nigeria in order to achieve sustainable development goals. It relied on secondary data as source of information as qualitative as it may be. The paper revealed that carrying out agricultural activities without conscious efforts towards environmental friendliness has impacted negatively, resulting to deforestation, low agricultural productivity, etc thereby causing climate change and hunger, thus delaying the process of achieving sustainable development goals in Nigeria. The paper concluded that for sustainable development goals to be achieved in Nigeria, sustainable agricultural practices must be embraced. It recommended amongst others that government at all levels should legislate, enforce and ensure sustainable agricultural practices.

Key words: Sustainable Agriculture; Panacea; Sustainable Development goals; Nigeria

MIGRANT FARMING BY FULANI HERDSMEN: IMPLICATIONS ON NIGERIA'S FOOD SECURITY

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It is worrisome that rural crop farmers and livestock breeders, who are the primary source of food for the populations of Nigeria have of recent engaged themselves in serious warfare that is threatening the food security and stability of the country, if it continues unabated. The aim of this work is to examine the concepts of migrant farming and food security, undertake a review of the activities of Fulani herdsmen and its implications on Nigeria's food security. The research is qualitative in nature and relied heavily on secondary data, such as journal publications, newspapers and published textbooks as sources of information. The study unearths summarily that, the activities of the Fulani herdsmen are largely responsible for the many deaths and abandonment of farms by farmers in the central and southern parts of Nigeria, giving rise to a shortfall in food production and supply, it holds further that, the nomadic system of raising cattle was appropriate only when human and animal populations were small and land was huge, just as the system of shifting cultivation was appropriate. It concludes that there is an urgent need to resolve the conflict so as to avoid the eminent crisis of food insecurity and recommends the rearing of cattle in ranches as a panacea to the crisis.

Keywords: Migrant Farming, Fulani Herdsmen and Food Security.

THE IMPACT OF AFRICAN INDIGENOUS VEGETABLES IN PROMOTING EDUCATION AMONG STUDENTS AND IMPROVING LIVELIHOODS OF YOUNG SMALLHOLDER FARMERS IN BUSIA COUNTY, WESTERN KENYA

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The African indigenous vegetables (AIVs) are a major source of essential nutrients critical in providing a balanced diet. They are rich in micronutrients such as iron, zinc, vitamin A, and contain bioactive phytochemicals, which provide protection to the body against disease. Incorporation of African indigenous vegetables into mainstream diets has remained a common practice for meeting cultural, medicinal and nutritional needs. This study assessed the impact of cultivation and incorporation of a wide range

of African indigenous vegetables by smallholder farmers to improve diets and nutrition among school going age groups within Busia County through a farmer business school (FBS) model. Sensitization in households and schools was carried out to promote the importance of cultivation and consumption of AIVs for improved nutrition and health. Smallholder farmers were trained on improved cooking methods, entrepreneurship and linkages to the markets. Schools and communities were made aware on good agricultural practices, seed production and developing different recipes for incorporation in school meals. Nutrient composition data was used in sensitization activities to raise awareness of their values compared to imported vegetables, cabbages and kales in school feeding programs. In addition, capacity building of farmers and linkage to schools has increased production and consumption of AIVs in households and schools. These have led to increased income at household level from sale of AIVs and improved health in the community and school children. As a result, of this training and use of the FBS model, 18 groups have been linked to 25 schools for the supply of African indigenous under a mutually agreed memorandum of understanding. In addition, in one school, 450 students are feeding on AIVs for lunch 4 times a week one up from none before BFN project intervention.

Keywords: African indigenous vegetables, farmer business model, livelihoods, biodiversity, nutrition and health.

PERCEIVED BENEFITS OF ORGANIC-BASED INPUTS FOR SOIL FERTILITY IMPROVEMENT IN THE CENTRAL HIGHLANDS OF KENYA

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Declining soil fertility in sub-Saharan Africa is a major constraint towards increasing agricultural productivity. Coupled with rapid population increase, low soil fertility has threatened the lives of the population that live in the rural area and rely on rain-fed agriculture for survival. The study uses data from a sample of 237 randomly selected households in the Central Highlands of Kenya to determine farmer perceptions based on four variables; potential to improve soil fertility; potential to improve yields, profitability and labour requirement of organic based inputs. To analyse perceptions by farmers, an ordered logit regression model was fitted into the data. Household size, external labour, cattle ownership, herd size positively influenced the perception of the potential of organic-based inputs to improve soil fertility while cattle ownership had a significant negative influence. Cattle ownership had a negative significant influence while herd size and group membership had a positive significant influence on the perception on organic-based inputs potential to increase yields. External labour and herd size had a significant positive influence while training and cultivated land had a significant negative influence on the profitability of the organic-based inputs. Gender of the household had a significant negative influence while the age of the household, cultivated land and credit access had a positive influence on the perception of high labour requirement of using organic and organic based technologies. This study recommends the use of organic-based inputs because they have been perceived to have the potential to crease crop yield as well as improve soil fertility.

Keywords: ordered logit, smallholder farmers, survey.

FOOD SECURITY AND SUSTAINABLE AGRICULTURE FEASIBILITY IN KENYA

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Food security and sustainable agriculture are inseparable. Food accessibility has been a problem in the recent past due to the ever-increasing population in Kenya. Sustainable agriculture is a concept that intends to meet the needs of the present generation without compromising the ability of the future generation. When the needs of the present generation that is food and nutrition are met and can all access the food then food security is achieved. From the studies undertaken by various organizations such UNICEF and FEWSNET it is clear that a large population of Kenyans have been hard struck by hunger. According to a research conducted by UNICEF showed that the Kenyans facing food insecurity have doubled to 2.6 million in 2017 from 1.6 million in the previous year and that 23 out of the 47 counties have been affected. Climate Smart Agriculture, is one such strategy that aims to transform agricultural systems to improve on the resilience and sustainability. In other areas, non-governmental organizations such as the Maasai Integrated Development Initiatives, are teaching the local communities about conservation agriculture, intercropping and crop rotation. All this culminated will steer the achievement of the Big Four Agenda and the Sustainable Development goals. Kenya is a productive country and if sustainable agriculture is upheld, food will be sufficient and accessible this will mean that individuals will meet nutritional needs.

Keywords: Food security, Sustainable agriculture, Nutrition, Big four agenda, Hunger, Conservation, Organization.

AN EMPIRICAL ASSESSMENT OF ENGENDERED DETERMINANTS AND INDICATORS FOR MONITORING, EVALUATION AND IMPACT ASSESSMENT OF SUSTAINABLE AGRICULTURE AND FOOD SECURITY IN KENYA

Dr. Robert Kagiri

Background: Sustainable Agriculture forms an integral part of the Kenya's national priorities such as the "Big "Big Four Agenda" (Food Security, Affordable Housing, Manufacturing and Affordable Healthcare for all), Kenya Vision 2030 guided by the Constitution of Kenya, 2010, Medium-Term Plan (MTP) III (2018 – 2022), the 5th EAC Development Strategy, EAC Vision 2050, Sustainable Development Goals, and. African Union (AU) Agenda 2063 among other relevant policy documents. In order to achieve food security through sustainable agriculture, a governance structure underpinned and informed by evidence-based, engendered determinants and Indicators in essential.

Material and Methods: Data is to be derived from state and non-state top-management individuals and teams in Kenya's the agricultural sector. Samples from various sectors drawn from stratified clusters, identified using snowballing as the primary sampling technique, will be analysed using Nvivo software.

Expected Results: This study is expected help in developing a food system and agriculture governance index, based on the findings of this exploratory, qualitative, cross-sectional study targeting government and non-state sector to adduce key determinants and indicators that can satisfice key stakeholders' expectations. As a result, the task of monitoring, evaluating and ultimately assessing the impact of agricultural and food security will thereby be buttressed to produce definitive results
Conclusions: The result will be an empirically informed monitoring, evaluation and impact assessment (ME & IA) framework that ensures that Kenya's food security and sustainable agriculture aspirational interventions are met. *(Abstract 236 words)*

Key Words: Governance, Impact Assessment, Monitoring and Evaluation, Engendered Research, Sustainable Development

CULTIVAR DIVERSITY, SMALLHOLDER BANANA PRODUCTION PRACTICES AND AWARENESS OF TISSUE CULTURED TECHNOLOGIES IN KISII, NYAMIRA AND EMBU COUNTIES, KENYA

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Banana is the world most widely known and distributed fruit and is a great contributor to the food security of millions of people in the developing world. In Kenya it is grown by smallholder famers and production of bananas in Kenya does not satisfy local and international market demand. It has been observed that the demand for high-quality, high-yielding, disease-free planting material has increased significantly over the last two decades. Currently the innovation of tissue culture technology is a promising tool in addressing this issue however; it has not been significantly adopted. This study aimed at assessing banana cultivars grown in Kisii, Nyamira and Embu County, their farming practices and the awareness of tissue cultured bananas. A questionnaire was administered to the farmers to capture data on banana production practices (main banana cultivars, source of planting materials, soil fertility management, crop protection and post-harvest handling), market information as well as the awareness of tissue culture bananas. It was established that farmers in the regions grow a diversity of crops and banana was ranked the top earner by 80% of the farmers. These farmers are limited by several factors majorly access to extension services especially in Kisii and Nyamira as well as access to inputs and materials. Most farmers choose varieties according to availability of materials, suitability to the region as well as market demand. The most predominant cultivars in Kisii and Nyamira were Ng'ombe and kienyeji while in Embu the most common cultivars were Israel, Muraru and Kiganda. More than 50 % of farmers cited lack of awareness of tissue cultured bananas. There is very low adoption of tissue cultured banana as well as knowledge of tissue culture technology. This could potentially lead to a decline in production due to the use of low quality diseased planting materials. Creating awareness with the aid of relevant authorities on the potential benefits of utilizing disease free tissue cultured bananas as well as adoption of low cost tissue culture technology will go a long way in boosting banana production in these regions and the country as a whole.

PHYSICOCHEMICAL CHARACTERISTICS OF MANGROVE HONEY FROM KILIFI COUNTY, KENYA

Nancy Kwamboka Omori

The Kenyan mangrove honey from the coastal region is usually priced higher than honey from other areas of the country because consumers prefer its distinctive taste, flavor and medicinal value. Though some physicochemical characteristics of the mangrove honey have been reported, the volatile organic compounds present which are responsible for its characteristic flavor are not known. The objective of this study was to determine the physiochemical properties and volatile organic compounds in Kenyan mangrove honey.

Twenty (20) honey samples, weighing approximately 250g each were collected randomly from farmers in different locations in Kilifi County and packed in 500cm^3 plastic bottles. These samples were transported to the laboratory and stored in a refrigerator at 4° C. Volatile organic compounds were extracted by Ultra-sound-assisted solvent extraction (USE), then determined using Gas chromatography-Mass spectrometry. The physicochemical characterization was done using standard methods recommended by International Honey Commission.

Data was analyzed using the SPSS program version 21. Mangrove honey was analyzed for moisture content, pH, free acidity, electrical conductivity, proline, HMF, invertase, diastase, specific sugars, color and volatile organic compounds. The moisture content means ranged from 23.40±0.00 to 19.23±0.06. The pH means ranged from 4.45±0.05 to 4.00±0.00. The electrical conductivity means ranged from 0.54±0.00 to 0.32±0.00. The acidity means ranged from 30.21±0.15 to 22.20±0.00. The proline means ranged from 734.36±4.23 to 602.24±2.68. The mean HMF range was 2.86±0.14 to 0. The mean invertase range was 9.55±0.10 to 5.54±0.11. The diastase means ranged from 11.48.47±0.06 to 8.11±0.64. Honey volatile organic compounds were extracted, identified and compared with those extracted and identified from the mangrove flower. From the identified VOCs, 35 of these were both in honeys and in mangrove flower. Among the 35 identified volatile organic compounds, 21 were similar in all analysed mangrove honey samples.

These VOCs can be used as markers of mangrove honey, thus help protect consumers fraudulently labeled mangrove honeys.

DOES BIXA OLLERANA VALUE CHAIN GOVERNMENT POLICY INFLUENCE THE RELATIONSHIP BETWEEN PLACE STRATEGY AND SALES PERFORMANCE?

David Kisa Cheruiyota1, Dr. Peter Mwaura and Dr. John Kipkorir Tanui

The main aim of this study was to answer the question whether *Bixa Ollerana* Value Chain Government Policy influence the Relationship between Place Strategy and sales performance?
Bixa is grown by small scale farmers in Kwale, Lamu and Kilifi Counties, Kenya, and further processed by private companies as natural colorant for the food, pharmaceutical and beauty Industry.The study adopted

descriptive and exploratory research design . The target population of the study was 2,419 Bixa farmers registered in Kwale County. A sample size of 106 farmers was drawn using simple random sampling technique. The study used structured questionnaire to collect the required data from the respondents. The study used descriptive and inferential statistics using Regression Analysis. The study established that place strategy did not influence the sales performance of small scale *Bixa* farmers in Kwale County, Kenya. The interaction of the moderating effect of Government policy on *Bixa Ollerana* value chain did not change the relationship between place strategy and sales performance of small scale *Bixa Ollerana* farmers. The findings from the study will be of importance to practice, marketing scholarship and Government on Policy formulation marketing of *Bixa* products. The study recommends that the Government of Kenya puts in place a policy framework to regulate and promote Bixa production, processing and marketing to increase sales performance.

Key words: Marketing Strategy, Marketing Mix Strategy, Place Strategy, and Sales Performance.

TRACK 10. SOCIO-ECONOMIC /POLICY II

A SPATIAL MULTI-CRITERIA EVALUATION FOR SELECTION OF OPTIMAL LOCATIONS FOR THE USE OF ORGANIC RESOURCES IN THE UPPER TANA REGION KENYA

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Low adoption of technologies to improve soil fertility has been the main hindrance to increased agricultural productivity in the Upper Tana region of the Central highlands of Kenya. Proper targeting of locations to scale-out the particular technologies necessary for soil fertility conservation and improvement can be one of the adoption rate determinants. Integration of remote sensing data and geographical information system (GIS) for the spatial evaluation of the most suitable sites for the soil fertility enhancing organic resources technologies can be a breakthrough in the field of integrated soil fertility management (ISFM) research. We delineated suitability zones for the soil fertility ameliorating organic resource technologies out-scaling in the Upper Tana River (UTR) region of Kenya. The necessary datasets were acquired from different online sources and Kenya meteorological department and Kenya survey. The datasets were processed using geographical information systems (GIS). The suitability evaluation was carried out using weighted overlay technique in ArcGIS. The factors were assigned weights based on their importance in determining suitability. The major influencing factors were assigned a weightage of 1.0 while the minor influencing factors were assigned a score of 0.5. The cumulative scores of both major and minor factors was further used to calculate the weights of each of the factors. The factors necessary for the identification of the suitable areas were identified. About 0.002 % of the study area indicated low suitability 4.7 % of was marginal suitability, 38.5 % showed was of moderate suitability; 34.7 % was of medium-high suitability while 0.03% was of very high suitability. The results demonstrate how GIS can be used in suitability analysis and clearly show its potential in providing evidence-based policies for scaling out the organic resources. From the results obtained in the study, it is recommended for scaling out of the organic resources guided by the suitability map developed.

Key words: Agriculture; Geographical Information System (GIS); Suitability map; Soil fertility; Weighted Linear Combination (WLC).

CONTRIBUTION OF THE HOSPITALITY AND TOURISM INDUSTRY TO FOOD SECURITY IN KENYA.

Jackline Imali, Caroline Mwaniki

According to the Global Hunger Index 2018 report, for every three Kenyans, one is facing severe food insecurity and poor nutrition (Acted, 2018). Food security is the access to sufficient, safe, nutritious food which meets people's dietary needs and preferences. Zero hunger is one of the Sustainable Development Goals (SDGs) aimed at ensuring food security globally. In Kenya the government launched the Big 4 Agenda with food security being one of the key pillars in achieving industrialization by the year 2030. The hospitality and tourism industry is one of the major contributors to the gross domestic product (GDP) and the largest consumer of agricultural produce in Kenya. Tourism has direct and indirect multiplier effects in different sectors with agriculture being directly connected to the industry. Food and beverage industry whether stand alone or incorporated with accommodation has shown great growth in recent years driven by entrance of new establishments, increased tourist spending and changing customer preferences. It is assumed that, tourism growth leads to an increase in food demand, consumption and domestic food production yet food security is still a challenge in the country. Agriculture and tourism are key to Kenya's economy. The linkage of how the hospitality and tourism industry contributes to the achievement of this SDG and pillar are yet to be explored. Though, the government has outlined its aspirations and opportunities for achievement of this pillar, their focus has been on research and scientific methods. Therefore, the study shall explore the vital role hospitality and tourism enterprises can play in enhancing food security in the country. Through the review of available literature, the study shall outline the linkage of Hospitality and tourism to agriculture, the challenges in the food value chain, industry standards set by food and beverage enterprises, and highlight opportunities for new hospitality and tourism products and partnerships. The study will provide insight to the hospitality and tourism industry on achievement of this pillar.

FARMER AND RESEARCHER METHODOLOGIES TRADE-OFFS IN PARTICIPATORY LARGE N RESEARCH: THE CASE OF COMMON BEAN ADAPTATION TRIALS IN WESTERN KENYA

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Increased number of farmers in participatory research has enabled researchers to address heterogeneity in smallholder systems. However, data collection is a great challenge because of the different methodologies preferred by farmers and researchers. Researcher data collection methodology is detailed, intensive and time-consuming, while farmers prefer less rigorous methods like rating. This study aimed at comparing the variations and conclusions drawn from data collected using researcher and farmer methodologies. These methodologies were used concurrently to collect data on emergence, pest and diseases, maturity, and grain yield, in common bean adaptation trial. Focused group discussions were conducted to understand farmers' criteria for evaluating bean performance. The sets of variables were correlated to establish the strength of their relationship. Binomial farmer observations were modeled against the researcher observations using logistic regression (glm) to determine the accuracy ranges. The results showed low convergence between individual observations of the methodologies on pest and disease tolerance, maturity and yield (scores vs. metric) with coefficients ranging from |0.39| to |0.60|, and higher convergence on emergence and yield (volumetric vs. metric) with coefficients above |0.80|. However, there was stronger convergence in the conclusions drawn when the results were aggregated (r>|0.80|) for all the variables tested in this study. Farmers hardly gave accurate rating for differences of ±0.44 kg for grain yield, ±10% for disease severity, and ±7% for emerged plants. Therefore, researcher and farmer data seem to be equivalent for average results. However, data may not be equivalent for understanding variations in technology performance, due to lack of precision in the subjective assessments of farmer relative to the objective measurements of the researcher, and farmer and researcher are measuring different things.

Keywords: farmer, researcher, methodology, crowd science, crowdsourcing, participatory research.

ECO-CULTURAL CALENDAR AND MAPPING AS A TOOL FOR ADDRESSING FOOD SECURITY AND CLIMATE CHANGE CHALLENGES: CASE STUDY OF KIVAA LOCATION IN MACHAKOS COUNTY, EASTERN KENYA

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This project was undertaken in Kivaa Location of Machakos County in Eastern Kenya. The objective was to develop eco-cultural maps and calendars to guide in restoring degraded ecosystems and promoting sustainable livelihoods. It focused on two sub-themes namely; Food security...; and .... climate change and Sustainability. It targeted one of Kenyan Government's Big Four Agenda .i.e. food and nutrition security as well as three Sustainable Development Goals namely; **Goal 2. *(...food security),* Goal 13 (....*combat climate change and its impacts)*; and Goal 15 *(promote sustainable use of terrestrial ecosystems)***
Purposefully selected elders, indigenous and local knowledge (ILK) holders and some young people were involved in series of forums (like FGDs) focusing on harnessing and transfer of ILK which can be applied in environmental reconstruction and livelihoods improvement. During the forums, the idea of developing eco-cultural maps and calendars was mooted which together with intergenerational dialogues would promote transfer of ILK from the elderly and knowledgeable members to the youthful members.
Ecocultural maps and calendars of the past and present were developed during the forums. The community members were able to document all resources in the area as they appear currently as well as their past status. They also documented seasons and associated agrobiodiversity as they are currently and in the past (about 50 years ago).
This guided the community in undertaking environmental reconstruction and restoration of threatened ecosystems and indigenous agrobiodiversity thus improving household food security and promoting sustainable development.

Key words: Eco-cultural map, calendar, dialogues

EFFECTS OF SOIL FERTILITY AND OTHER DRIVERS ON LAND USE CHANGES AND HUMAN WELL-BEING IN RUIRU SUB-COUNTY, KIAMBU, KENYA

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While changes in land use can be attributed to a myriad of drivers, the relative contribution of changes in fertility has not received much attention. Together with other drivers, changes in land use can trigger changes in the state of the land resource thus interfering with its ability to deliver expected goods and services. In particular, a decline in provisional ecosystem services like food has direct impact on human well-being components. This study is focusing on the drivers of land use changes in Ruiru Sub-County with special focus on soil fertility management and their ultimate effects on UN-defined human well-being components that is having materially enough for a decent life, having good social relations, enjoying good health, enjoying safety and security of self and property and having the ability to make choices and preferences. A spatial survey was used to track land use changes from 1986 to 2017, while a social survey targeting 240 respondents was used to determine the role of soil fertility management on the same. Results show that agricultural land has been decreasing continuously from 51.99% in 1988 to 30.24% in 2016, this leads to reduction in food production which directly impacts human wellbeing negatively. Most of the residences rely on farming as the main source of income. Decrease in farmland has negative impact on their income. Income level was ranked first as the main driver of land use change by the respondents with 48.5%, followed by family size 33.2%, declining soil fertility contributed 15.8%. On the other hand 63% of the respondents have been growing the same kind of crops continuously for the last 10 years and 36% have attempted diversification. 36.6% of the respondents were using manures only as the main source of nutrients and 25.7% use both manures and fertilizers. Growing same type of crops continuously leads to depletion of nutrients and application of nutrients is necessary to replace those used in production. Most of the farmers were using manures which have less nutrients, this leads to low production and reduced income. To improve food production and farmers' income level, soil fertility management should be embraced. This will also lead to enhanced human wellbeing.

Key words: Land use Changes, Soil Fertility, Human well-being, Ruiru, Kenya

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APPLICATION OF KNOWLEDGE MANAGEMENT PRACTICES FOR SUSTAINABLE FOOD SECURITY IN KENYA

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Food security is achieved when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences. Food Security and nutrition continues to be a major concern, more so in developing countries. According to the Global Hunger Index 2018, Kenya is among the 45 countries worldwide still grappling with food insecurity. This is quite disturbing given the varied efforts put in place to tackle the recurrent food crisis.

This paper examines the knowledge management practices employed by County Governments in Kenya to attain food security. In particular, the study addressed the following objectives: What are the current knowledge management practices employed to achieve food security? What are the constraints faced in applying knowledge management to realize food security? What knowledge management solutions can be implemented to increase food security? Document analysis, survey questionnaires and focus group interviews elicited qualitative and quantitative data.

Results indicated that 76% of the respondents had an understanding of knowledge management, however roles and responsibilities in the knowledge management area were not clearly articulated. There was heavy reliance on manual systems for knowledge identification and storage. Key constraints included inadequate of support from management; lack of policies; funding, technological infrastructure and knowledge management officers in counties. It is proposed that managers in County Governments require sensitization on knowledge management to enable them support knowledge management initiatives. The contribution of knowledge management practices in identification of relevant knowledge, acquisition storage, sharing and utilization to improve food security need to be emphasized. Counties also need to have dedicated officers to take up roles and build the capacity of existing staff to support the knowledge management function. While face-to-face interaction was very significant, there was high usage of mobile phones and social media to share knowledge on agricultural practices. There is need to increase the use of technological solutions including use of mobile technology to support knowledge management practices within County Governments.

This study calls for upscaling of the project to cover all the counties in the country and also engage a larger sample of participants from each county. This will enable a broader view on the subject and also offer recommendations to county governments taking into account their unique settings. It will also be useful to carry out a study that targets the farmers to understand their practices including indigenous knowledge on food security.

THE RELATIONSHIP BETWEEN LEVEL OF EDUCATION, FARMERS VARIETAL PREVALENCE, CONTROL AND DISTRIBUTION OF MAIZE LETHAL NECROSIS IN BOMET COUNTY

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Maize is the most staple food among many people in Sub-saharan region. Maize production in these regions has been affected by the outbreak of Maize Lethal Necrosis threatening food security among many households in East African countries characterized by loss of 50%-90%. This disease results from synergistic interaction between viruses from the Potyviridae family example Sugarcane Mosaic Virus (SCMV) and Maize Chlorotic Mottle Virus (MCMV). The study aimed at determining the level of awareness of Maize Lethal Necrosis Disease in Bomet County. Random sampling method was used to obtain a sample of respondents from a target household population of maize farmers. Structured questionnaire was used in collection of data and was subjected to R statistical software for analysis. The findings indicated that 54.8% of males were involved in decision making while 45.2% were females. Majority of the respondents 50% had attained their highest level of education as primary, 35.8% were secondary schools holders, 8.8% had no formal education, while 5.4% had tertiary education level. most dominant Maize variety in Bomet County was DK777 with 97.5% of the farmers, 67.5% 614, 62.5% 624, 30% Katumani, 27.5% 511, 22.5% pioneer, 20% 621, 7.5% grow 625 and 2.5% grow 627. It was also observed that greater percentage of the farmers 77.5% used crop rotation to control MLND in their farms, 55.0% applied the glow season strategy, 30% preferred clearing the weeds, 27.5% applied intercropping method whereas 22.5% of the farmers in this county applied spraying method to control the disease as a control method. Findings on whether there was a significance difference between maize productions in the sub counties indicate that there was no significance difference in the maize production between the sub counties, p-value 0.071. The correlation between maize yields and Maize Lethal Necrosis Disease indicated a negative relationship. Most of commercial maize were susceptible to MLND, presence of traditional landraces with moderate resistance was observed in some farms. This research recommend MLND awareness to be carried out in the County and further screening of landraces in maize screening programme toward food sustainability in the county.

Key words: Education, food sustainability, preferred varieties, resistance Maize

CURRENT COPING AND ADAPTATION STRATEGIES TO DROUGHT IN THE TAITA HILLS, KENYA

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One of the major consequences of climate variability and change in sub-Saharan Africa is prolonged droughts. This increases the vulnerability of small-holder farmers whose livelihoods are mainly pegged on rain-fed agriculture. The extent of the impacts of climate change on these small-scale producers depends largely on their level of adaptation, adaptive capacity, exposure and vulnerability. The aim of the study was to evaluate the current coping and adaptation strategies to drought in the study area. It emerged from the results that in coping with drought, the most common coping mechanisms employed by farmers in the study area was buying food, reported by 70.9% of the respondents. While 39.7% of the respondents were aware about conservation agriculture, only 3.2% practiced it on their farms. The study established that the coping practices currently employed by farmers are not sustainable and are only likely to make farmers more vulnerable in the long term.

Key words: Climate change and variability, vulnerability, adaptation, conservation agriculture

LAND USE LAND COVER CHANGES AND IMPLICATIONS ON FOOD PRODUCTION PLANNING IN RUIRU SUB-COUNTY, KENYA

Fuchaka Waswa, Ronald Yego, Kennedy Mwetu

Background: Globally, anthropogenic factors have been the main drivers of land use land cover change over the centuries. Population growth exerts pressure on land for both food and settlement. Critical ecosystems and their services are often lost. On this basis, land use land cover changes in Ruiru Sub-County between 1988 and 2016 were assessed in order to stimulate policy changes towards food security.

Materials and Methods: Land use land cover changes were investigated using GIS while land users' and County agriculture officials' responses on emerging trends were assessed using social survey approaches. Food production reports were obtained from the county agriculture department.

Results: Urban land use grew from less than 1% to about 11.34% while agricultural land had a consistent decline from 51.99% to 30.24%. About 88% of respondents felt that there is need for a strategy shift in food production from traditional farming methods to modern techniques for assured food security.

Conclusion: Driven by declining agricultural land, intensification is gaining popularity. This calls for integrating micro-gardening and urban and peri-urban agriculture in town/city physical planning. This study recommends the development of a land use policy that will address how agricultural land is converted to other uses such as real estate. There also need to be enhanced farmer education and support to ensure that modern farming practices are adopted as these have proved to be effective.

RISK ANALYSIS IN FADAMA FARMING; PROSPECTS AND CHALLENGES OF FARMING LIVELIHOOD IN NORTH-EASTERN, NIGERIA

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The paper attempts to investigate the risk types in Fadama farming, as well as the strategies for risk management utilized by Fadama farmers in Jigawa state, Nigeria. Over 75% of the state landmass is considered arable which make it one of the most agriculturally endowed states in Nigeria. However, the area is confronted by multiple natural, ecological, social and economic problems. This research focus mainly on the challenges and prospects of Fadama agricultural production as well as rural livelihood in the area under study. Three null hypotheses were formulated, and tested at 0.05 level of significance. The sample comprised of 150 professional farmers selected from the total population of 350 through simple random sampling procedure. The instrument used in the research was the self-assessment questionnaire (SAQ) developed by the researcher. The data collected were analyzed using rank ordered. The findings revealed that, the major risks encountered by Fadama farmers are market related, natural/social and whether related risks. Market related risk constitutes the major peril to Fadama farming with glut as its major features. The strategies for managing risk by Fadama farmers essentially help to minimize probable losses from current production or to manage the consequences of inevitable losses for sustainable development.

Keywords: Fadama Farming, Food Security, Irrigation, Risk Analysis and Sustainable Development.

EFFECT OF SPACING REGIMES ON PERFORMANCE OF ONIONS

V. O. Moranga, Siso N. O., Omolo P. O., Nderitu A. M., Opiyo G. and Yahuma N.

Onion is a common spice majorly grown in Kenya because of its economic, nutritive, and medicinal values. Spacing significantly affects growth and yields of onions as it influences competition for nutrient and space resulting in different bulb sizes. However, there is little research that has been done in Kenya to validate this crucial agronomical aspect in onion production which determines consumer preferences and pricing of onions. A research trial was laid on-farm at the Kenya Agricultural and Livestock Research organization (KALRO-HRI), Kibos to evaluate the effect of different spacing on yields of red pinoy F1 variety of onion. A Complete Randomized Design (CRD) was adopted. Three spacing regimes of 10cm by 50cm, 15cm by 50cm and 20cm by 50cm were used. The size of the unit plot used was 5m by 7m for each spacing regime with three replicates. 10 bulbs were selected from each harvesting unit of 2m by 2m and measures of diameter and weight of each bulb taken. GenStat was used for ANOVA analysis of the data collected and presented in box and whiskers. The results demonstrated that plant spacing had a significant effect on the growth and yields in terms of bulb size, bulb diameter and bulb weights. The highest yield was obtained in the spacing regime of 10cm by 50cm with an average weight of each bulb being 32.6 g and diameter of 3.978 cm, whereas a spacing regime of 20cm by 50cm had the lowest yield with average weight of 28.9g and bulb diameter of 3.682 cm.

Keywords: Bulb, spacing, Complete Randomized Design, yield, regime

CHALLENGES OF MILLET AND SORGHUM VALUE CHAIN ACTORS IN JIGAWA STATE, NIGERIA

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The study examined the socioeconomic characteristics and challenges faced by millet and sorghum value chain actors in Jigawa State Nigeria. Two LGAs were randomly selected from each of the three senatorial zones in the state and 300 structured questionnaires were administered, 50 per LGA. There was different set of questionnaire for each of the four value chains comprising input dealers (60), producers (120), processors (60) and marketers (60). Key Informant Interview (KII) and Focus Group Discussion (FGD) were also employed to generate additional information from the respondents. Simple descriptive statistics was used for the analysis using Eviews 9. The study discovered that lack of capital was the main challenge across the four value chains. Other problems identified included lack of training, unstable price, lack of fertilizer, drought, lack of equipment and debtors (bad debt). To overcome these challenges the study recommends adequate information on how to access bank loan and management training should be provided to the actors, fertilizer should be made available at official rate, irrigation and water resources should be developed to minimize the impact of drought, and linkages with industries to minimize excessive price fluctuations.

Keywords: Millet, Sorghum, Agricultural Value Chain, Jigawa State

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SUB - THEME:
TRANSFORMATIVE, INCLUSIVE AND EQUITABLE QUALITY EDUCATION

DYNAMICS OF ART & CRAFT CURRICULUM IN ENHANCING THE CHILD GROWTH & DEVELOPMENT

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”All great art is the work of whole living creature body and soul”
By John Ruskin, (1707-1900) English art critic and writer

Last year the government of The Republic of Kenya through the Ministry of Education rolled out the new education system 2-6-3-3-3 dubbed *“Competence Based Curriculum”* with an aim of nurturing every learner’s potential. It received overwhelming appraisal from different stakeholders in both locally and internationally, to the extent of eliciting different excitement debates in our local radios and television talk shows. The established task force reviews of 1992, 1995, 2002, 2009 and 2011, led by Professor Douglas Odhiambo asserted the atrocities of children not developing into their full potential and the negative effect towards the realization of Kenya Vision 2030. The paper intends to disseminate diverse ways in which the curriculum in art and craft is enhancing growth and development of a child’s emotional, physical, cognitive, and creativity. It will employ qualitative analysis to examine art and craft and analyze the artistic stages of growth and development of a child. Furthermore the paper will briefly observe naturalistic child growth and development of Leonardo Da Vinci - (A high renaissance artist of 14th century), and the researcher’s teaching experience in one of pre-school in the city of Nairobi, as the case study and scope. It then will draw its conclusions with intention of strengthening the school curriculums designs.

Key word: Art & craft curriculum designs, child growth and development, Kenya New Education system 2-6-3-3-3

INFLUENCE OF SCHOOL MANAGERS’ COMPLIANCE WITH DISASTER RISK MANAGEMENT POLICY IN PUBLIC SECONDARY SCHOOLS IN NAIROBI CITY COUNTY KENYA

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Disaster risks are very common occurrences within Kenyan secondary schools. Most disasters afflicting public secondary schools in the City County of Nairobi include fire outbreaks, student unrest, terror threats and strikes which have caused harm to humans and property in a number of incidences for a long time.

Nevertheless, the concept of compliance with disaster risk management policy in secondary schools in Nairobi has so far not attracted much attention of researchers in Kenya. The objectives were: to investigate how school managers complied with disaster risk management policy, to investigate the aspects of disaster risk management policy most complied with by school managers, to investigate how compliance with disaster risk management policy influences management of disaster risk. Emergent Norm theory and Risk Management theory were used to give guidance to the study. The study was mixed methodology research employing concurrent triangulation design. The population comprised 282 individuals and a sample size of 167 respondents determined according to Krejcie and Morgan sampling table. Data was collected through questionnaires and observation checklists for principals, HODs, BOM chair persons and interview guides for sub QASOs. Tools were pre-tested among 10% of the target sample, not part of the actual study. Pearson Product Moment Correlation was used to establish instrument consistency and a correlation coefficient of 0.75 was considered acceptable. Expert judgment by supervisors and peer reviewers was used to test the instruments for validity. Instrument dependability was established by employing overlapping procedures including telephone and face to face interviews during field work. Concurrent triangulation was employed for data credibility. Instrument reliability was calculated using Chronbach's Alpha. Quantifiable statistics was descriptively analyzed and results presented in tables and figures. Significance of confidence at 95% level was tested using inferential statistics. Qualitative data was analysed thematically and results presented in tables. Conclusions are anticipated to benefit School managers, Teachers' Service commission, Parents, the Ministry of Education and Nairobi City County. All ethical issues pertaining to research were observed. The researcher found out that there was no policy on Disaster risk management available to guide school managers. Alternatively, the school managers were guided by the School Safety policy. However, through observation checklist, the researcher found that in some schools, classes were overcrowded; in others, windows had grills while in a number of other schools, doors opened to the inside. The recommendations are that: The Government of Kenya should develop a Policy on disaster risk management for school managers. The Government should beef up security in schools by providing well trained security personnel. Provide adequate funding and other requisite resources for management of disaster risk in schools throughout the country. T S C should re look into their selection criteria on appointment of school managers to focus more on merit.

Key Words: School Safety, Compliance, Aspects of Safety, Disaster, Risk, Management.

UNDERSTANDING THE ROLE OF TAX EDUCATION ON TAX COMPLIANCE IN KENYA

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An efficient tax system in any country endeavours to carry features including simplicity, neutrality, equity, adequacy; where its citizenry expect the state tax system to fulfil among other purposes, collection and pooling revenues so as to render public services as well as undertake government projects. Due to dynamism in the Kenya operating environment, the government continues to conduct tax reforms with the expectation that revenue obtained is sustainable for efficient and effective service delivery. Tax reforms have yielded fruits in the recent past including provision of funds for devolution of counties, free maternity health care, free primary and secondary education and improved infrastructure just to mention a few. Past studies have indicated mixed results, where tax reforms in some states had led to tax compliance by tax payers while in some studies it had led to tax evasion and avoidance by tax payers. This study sought to establish the role of tax education on tax compliance in Kenya. Specifically, the role of individualised learning and online education on tax compliance. The theory applied in the study included Purchasing theory and Insurance theory. Research methodology entailed descriptive research design where the researchers conducted secondary literature review of institutions in Kenya. The study found out that tax education is a significant issue and may plays a major role in the long term in ensuring tax compliance to the government. The study concludes with a conceptual model for empirical review.

Key words: Tax reforms, tax education, tax compliance, Kenya tax system, tax collection.

BODY SHAPE AND APPAREL FIT USING PERSONAL MEASUREMENTS OF KENYAN UNIVERSITY FEMALE STUDENTS

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Background: The body size and shape of the Kenyan female population is undocumented. Kenya utilizes size charts from UK and USA for teaching and clothing manufacture. The purpose of this study was to use students' personal measurements to categorize their body shapes and analyze fit of trial garments (toiles) from patterns using the Aldrich apparel pattern making technique.

Material and methods: The study population was all female third year students enrolled for Pattern Drafting unit in 2018 (n=30) and 2019 (n=40). Microsoft Excel was used for comparison of personal measurements with UK size charts and body shapes classification using bust, waist and hip girths. Drafted patterns were developed and toiles stitched. Three Fashion Design lecturers assessed photographs of students wearing the toiles for fit using human subjects' evaluation test.

Results: Body sizes ranged from 8 to 24, with majority (81%) being of the bottom hourglass body shape. Two thirds of respondents had waist girths larger than the standard and 72% had hip girths larger than the standard measurement. The patterns produced well fitting toiles for women with the perfect hourglass figure (11%). The bust fit for all body shapes was satisfactory. The front shoulder to waist fit of dress bodice tended to be short, but was longer from nape to waist.

Conclusions: This study is beneficial to fashion design instructors, students and the Kenyan population. The Aldrich technique does not fully cater for African female body shapes. A limitation of the study was the small sample size and similar study on a larger population is therefore recommended.

Keywords: Apparel pattern making, apparel fit, female body shape, personal measurements, human subjects' evaluation test.

ASSESSMENT OF THE LEVEL OF TRAINING AND AWARENESS REGARDING FOOD HYGIENE REQUIREMENTS AMONG EMPLOYEES IN AFRICAN INDIGENOUS RESTAURANTS IN NAIROBI CITY COUNTY, KENYA.

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Background: Dining is a common phenomenon in major cities and towns, especially in modern lifestyle where people have limited time due to work and other related engagements. Indigenous restaurants have become a preference for most consumers although their patronage varies, attributed to various push factors such as health, curiosity and variety. Although hygiene is an important aspect in choosing where to dine, most customers are not keen to observe it. This study explored food handlers' hygiene practices as determinants of customers' choice of selected African indigenous restaurants' in Nairobi City County, Kenya.

Objective: The objective of this study was to assess food handlers and supervisors' level of training and awareness regarding food hygiene requirements in African indigenous restaurants.

Methods: The study adopted a cross-sectional descriptive survey targeting 15 selected African indigenous restaurants. Purposive sampling was used in selecting all supervisors in the 15 African indigenous restaurants. Using Yamane formula, a sample size of three hundred and forty (340) food handlers was obtained from a population of 2250. Proportionate sampling was used in selecting food handlers as their population had different numbers in each of the selected restaurant. Data collection instruments were a questionnaire, an interview guide and an observation checklist. Qualitative data was ordered, coded and summarized in compilation sheets for easier analysis in addition to inferential statistics. Quantitative data was analyzed using statistical packages for social sciences with levels of significance established using paired tests with a cut-off point of $P \leq 0.05$, (95%) confidence and significance levels. Chi square Pearson's correlation coefficient tests were calculated to identify the correlation between food handlers' hygiene practices and customers' choice of restaurants.

Results: The findings showed that most restaurant supervisors were well aware of HACCP system although not all of them implemented it. Further, the restaurants do not observe adequate precautions in the entire food production and therefore programs related to HACCP training needed to be implemented in a practical and realistic manner. The study further identified that the general hygiene standards of the restaurants were relatively high although during the time of the visits, some were not clean. The study recommended the public health authorities in the urban centers to educate all restaurant stakeholders on food hygiene requirements and regulations in order for them to adhere as required. The study further recommended that similar studies to be done in other localities, in rural restaurants, and to incorporate more restaurants.

Keywords: Requirements, Regulations , Training, Awareness, Restaurants.

IMPACT OF A SOCIAL MEDIA TEACHING TOOL ON THE LEARNING OF EDUCATIONAL STATISTICS AT THE KENYATTA UNIVERSITY

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Educational Statistics (EPS 400) is a core compulsory unit that prepares student teachers for the conduct of educational assessment and analysis of test data. Despite its importance, the unit has a high failure rate. Given the urgent imperative to improve performance in this unit, social media was incepted as a means to keep learners engaged in learning activities. The media was tried out as a teaching tool in the 2017/2018 academic year in a class of 421 students pursuing Arts-based courses. The Whatsapp social media application was used share reference material, provide practice quizzes, make announcements, respond to student queries and obtain feedback on learning progress. A descriptive survey design provided a framework for the study of the impact of this innovation. At the end of the semester, 66 students were conveniently sampled to respond to questions concerning their perception on the usefulness of the social media tool. Results indicated that most (41%) of the students accessed the media more than once a day. This was however more for social purposes (40%) than for academic purposes (34.2%). The most appreciated aspect of social media was the opportunity for interaction (34.8%) and only 15.2% appreciated the availability of the lecturer in those interactions. The students suggested the scaling up of social media, improving awareness and adoption in other course units. To go with this, they emphasized the need for strict supervision of the media to improve its effectiveness as a learning tool.

Key words: educational assessment, social media, information and communication technology, impact evaluation

IMPLEMENTATION ISSUES IN COMPETENCY BASED CURRICULUM IN SCHOOLS IN KENYA: A REVIEW OF LITERATURE

Ongek Margaret, Benedicta Tabot

In a bid to accelerate the realization of Vision 2030 and the Big Four Agenda as key drivers of economic development in Kenya, the government has had to respond to the challenge of providing both relevant and quality education to its populace by rolling out the Competency Based Curriculum in the year 2019 beginning from elementary levels of education upward. The implementation process of this new curriculum has however not been smooth as it is bedeviled by several systemic issues or their lack thereof leading to an outcry among various education stakeholders. Some of the requisites of effective curriculum

implementation such as public and resource mobilization; capacity building among teachers and other education personnel; involvement of authors, publishers among others are issues that cannot be merely glossed over as they underpin effective curriculum implementation globally. This paper therefore sets out to examine the concept, essence and prospects of curriculum implementation in light of Competency Based Curriculum in Kenya. Thereafter, recommendations and way forward are provided in hope that they would make partial contribution to fast and effective implementation of Competency Based Curriculum in Kenya and in the long run have a positive impact on development in the country and beyond.

Key Words: Implementation, Competency Based Curriculum, Requisites of Curriculum Implementation, Kenya

STRATEGIES IN HIGHER EDUCATION FOR BUILDING AN ENHANCED, DIVERSIFIED AND TRANSFORMATIVE WORKFORCE FOR THE 21ST CENTURY JOB MARKET

Dr. Daniel W. Muthee, Dr. Salome Nyambura, Kenneth Njoroge Kiambuthi, Robert Kahiga, Mercy Mwaniki

The changing nature of careers and the workplace in this 21st century is being significantly influenced by the 4th Industrial revolution which has disrupted the traditional workplace in terms of expertise, duration, rewards (Bersin, 2017). This is coupled by the new demands not only for knowledge, basic skills and competencies but also the need for soft skills for the modern day graduate in their bid to navigate the changing trends of the 21st century workplace. In a recent study on skills gap, 83% of Human resources managers observed that 30% of the candidates lacked requisite soft skills for the workplace (SHRM, 2019). This paper aims at finding out, the job search experiences of our recent graduates in relation to the soft skills gap, and secondly to explore the opinions of the Human resource officers and University faculty on the skills needed by a diversified workforce. Through a case study of Kenyatta University's Directorate of career development and mentoring programmes, whose mandate is to provide career education to students and also liaise with the industry inorder to provide placements, the study will purposively sample for 50 KU alumni, 20 Human resource Officers and 20 University Faculty members. Data collection will be undertaken using interviews and questionnaires, while data analysis will be done thematically. This study will be able to inform on the gaps which need to be addressed at the University and the workplace, in order to meet the demands of the future workplace. This paper will come up with recommendations that will guide the thinking in Higher Education in their bid to building an enhanced, diversified and transformative Workforce for the 21st century.

Key words: Diversified, Soft skills, Changing nature of careers, 21st century workplace

DISABILITY AND CO-CURRICULUM PARTICIPATION: ANALYSIS OF SUITABILITY OF CO - CURRICULUM RESOURCES FOR LEARNERS WITH DISABILITIES IN PUBLIC INCLUSIVE SETTINGS.

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Inclusive practices breeds' healthy minds that house skills for food productions, house building, innovation and manufacturing. Hence, it should be accessible to pupils with disabilities and those without. Reports shown that learners with disabilities are quitting inclusive schools due to unavailability of appropriate co – curriculum resources. Co- curriculum activities earns individual survival skills. Such reports invite a study. This study investigates the extent to which the co - curriculum resources in public inclusive schools in Kenya are suitable to support learners with disabilities participation in co- curriculum activities. The study will use the Social Model of Disability theory within a descriptive research design to explore the essence of effective participation in co- curriculum activities by learners with disabilities. Through interview, questionnaires, schedules and observation the study will take a comparative perspective to analyze data. Quantitative data will be analyzed using descriptive statistics such as frequency counts, means, tables and graphs. Quantitative data will be analyzed using narration. The findings of the study should help teachers, students, parents and other stakeholders in education to examine the barriers and find solutions to curb the vice. In order to achieve national development and sustainable goals, schools should observe and adhere to inclusive practices. This breeds a health disability stress free brains capable of housing skills in; food production, house building, innovation and manufacturing.

Key words; Suitability Co- Curriculum, Inclusive, Breeds, Innovation, Houses

LINKING INCLUSSIVE PRACTICES, ADAPTATION, AND PARTICIPATORY EDUCATION WITH ATTAINMENT OF SUSTAINABLE DEVELOPMENT GOALS

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Valuable co-curriculum skills that are inline with competence based curriculum and achievement of sustainable development goals are achievable by learners with disabilities when inclusive practices are adhered to .Inclusion calls for adaptation of environments and learning resources. Such adaptations make their participation effective. Hence all schools must adhere to inclusive practices. Pupils with disabilities have been quitting inclusive schools due to barriers in their participation. This invites a study. This study investigates the barriers hindering learners with disabilities from participating in co – curriculum activities in selected public inclusive schools of Lugari Sub- County, Kakamega County of Kenya. The study uses the Social Model of Disability theory within a descriptive research design to explore the essence of effective participation in co-curriculum activities by learners with disabilities. Through interviews, questionnaires, schedules and observations the study will take a comparative perspective to analyze data. Quantitative data will be analyzed using descriptive statistics such as frequency counts, means, tables and graphs. Quantitative data will be analyzed using narration. The findings of study should help teachers, students, parents and other stake holders in education to examine the barriers and find solutions to remove them. All inclusive schools should adhere to inclusive practices by adapting their environment and learning resources. This enables all participate in co- curriculum activities. Gains from such participations will house participant, create a healthy stress free mind; provide food and innovative brains for manufacturing.

Key words: Inclusive, Co- curriculum, accessible, skills, setting, disability.

BARRIERS TO PARTICIPATION OF PUPILS WITH DISABILITIES IN CO-CURRICULUM ACTIVITIES IN SELECTED INCLUSISSIVE PUBLIC PRIMARY SCHOOLS OF LUGARI SUB-COUNTY, KAKAMEGA COUNTY

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Competence Based Education System is a participatory learning for all. Hence should be accessible to pupils with disabilities and those without disabilities. It is heathy, houses all learners and initiates creative skills for survival. Recent reports have revealed that pupils with disabilities are quitting inclusive schools due to accommodative barriers. This calls for a study. This study is to investigate the extent to which barriers dictates participation of learners with disabilities in co-curriculum activities in selected settings in Kenya. The study will use the Social Model of Disability theory within a descriptive research design to explore the essence of effective participation in co-curriculum activities by learners with disabilities. Through interviews, questionnaires, schedules and observations the study will take a comparative perspective to analyze data. Quantitative data will be analyzed using descriptive statistics such as frequency counts, means, tables and graphs. Qualitative data will be analyzed using narration. The findings of the study should help teachers, students, parents and other stake holders in education to examine the barriers and find solutions to curb the vice. All-inclusive schools should adhere to inclusive practices in general and provision of appropriate resources for all learners in particular. Inclusive practices are heathy and will give all learners an equal opportunity to achieve skills for food production, house building and initiates skills for innovation and manufacturing.

Key words; Inclusive, Co-curriculum, accessible, skills, settings, disability.

OPPORTUNITIES AND CHALLENGES IN DEVELOPING THE 21ST CENTURY TEACHER: A CASE STUDY OF KENYATTA UNIVERSITY MENTORSHIP PROGRAMME IN MATUNGULU SUB COUNTY, MACHAKOS COUNTY-KENYA.

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Teacher mentoring programmes are increasingly getting perceived as an effective form of development for training teachers (koko 1995) . Various researchers have come to believe that teacher mentoring can be a valuable process in educational reforms for beginning teachers and at times for veteran teachers (ganser 1996). In the 21st century, there is need to transform the development of the teacher by shifting emphasis from training to preparing the teacher to be an educator of the 21st century learner. The main purpose of this study is to identify the Opportunities and Challenges arising from Kenyatta University innovative Mentorship programme in developing the 21st century teacher based on 2019 Practicum in Matungulu Sub County, Machakos county.. The study will be guided by three objectives: To identify teacher preparation opportunities arising from mentorship programme, To identify challenges associated with teacher mentorship programme. To establish and propose a strategy for the future teacher. The study will adopt a descriptive survey design .The data will be generated using opinions from Kenyatta University Student Teachers who are undertaking their teaching practice in Matungulu Sub County and their Teacher mentors. They will be chosen using purposive sampling .12 Student teachers will be chosen for the study which will constitute 30%of the target population alternatively 5 teacher mentors will be interviewed . Test-re-test method will be used to test reliability and this will be done during piloting stage which will be carried in one school.The Data will be collected using self-designed Questionnaires and interview guide for the teacher mentors which will be administered by the researcher. Data will be analyzed using descriptive Statistics that will be generated by Statistical Package for social sciences (SPSS)Results will be presented inform of percentages,frequencies,tables and other graphical presentations.

Key words: 21st century Teacher , Opportunities,Challenges ,Mentorship,Practicum

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SUB - THEME: GENDER AND DEVELOPMENT

GENDER ANALYSIS OF LIVELIHOODS ADAPTIVE CAPACITY TO DROUGHT IN SEMI ARID MAKUENI COUNTY IN KENYA.

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The article presents the results on gendered analysis of adaptive capacity to drought by rural agricultural households in Makueni county of Semi-arid Eastern Kenya. In spite of Makueni county being semi-arid and over-reliant of rain-fed agriculture livelihoods are more sensitive and hence more vulnerable to recurrent droughts. Drought conditions potentially affect men and women differently and exacerbate further gender divisions. Likewise gender dynamics have the potential to influence how people prepare and respond to climate impacts by influencing gender roles, decision making capacity and control of livelihood resources. The aim of this study was therefore to generate knowledge of how gender inequality affects the way women and men perceive, prepare, or respond to the impacts of droughts. The study involved 420 households that were stratified into male-headed households and female-headed households, 12 focus group discussions and 60 key informant interviews. Results of the study showed that women were less equipped to adapt or cope to drought compared to men. Adaptation strategies taken up by respondents were found to be directly related to adaptive capacities. The capacities were lower for women since they lacked a lot of entitlements that enhance their ability to cope or adapt. Women's capacities were limited by low levels of education (α^2=17.494, p<0.001), lack of adequate weather information and extension services (α^2=82.259, p<0.001), limited of involvement in key decision making processes and low control of major assets (land, α^2=17.494, p<0.001; livestock, α^2=109.817, p<0.001; crops α^2=16.249, p=0.003). Compared to their male counterparts women had low access to formal sources of credits (α^2=3.822, p=0.032). They were also burdened by reproductive and domestic roles (t=41.132, p<0.001) that took most of their time limiting their capacity to take up some adaptive approaches. It was therefore concluded that due to limited adaptive capacity women were more vulnerable to the impacts of climate variability than men.

Key words: Climate variability, vulnerability, Adaptive capacity, agricultural livelihoods, gender analysis.

IMPACT OF GENDER SHIFT IN FLOODPLAIN FARMING ON LOCAL LIVELIHOOD AND FOOD SECURITY IN KIAMBU COUNTY

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Traditionally, floodplain farming is gendered. On the one hand, women in Central Kenya cultivated food crops for household consumption in floodplains. Men, on the other hand, have dominated agricultural activities in the elevated lands. However, in recent past, there has been gender shift in the cultivation of food crops along floodplains. Men, especially in the peri-urban regions of Kiambu County, have taken over cultivation in floodplains from women. The reasons and implications of this shift are not fully understood.

Therefore, the purpose of this study was to explore factors contributing to the gender shift in cultivation of food crops along floodplains and the socio-economic implications and impact on household food security in Kiambu County.

The study was carried out between September 2017 and October 2018 and the key objectives were to: Explore the extent of gender shift in cultivation of the flood plains in the peri-urban regions of Kiambu County; Explore the factors that contribute to this gender shift in the cultivation of floodplain; Establish the effects of such shift on household food security in the area; Find out how the shift has affected socio-economic status of the households and to establish gender specific challenges facing men and women in flood plain cultivation . The theoretical framework is derived from Sarah Logwe's (1990) who has expounded on women's empowerment. A sample size of 71 persons (31 men and 40 women) were purposively sampled.

The key finding of the research were: (i) there is not only gender shift in the cultivation of floodplains from women to men dominated, but also on the type of crops grown (ii) the demise of the original owners and the patriarchal nature of the community where only sons but not daughters inherit the land as well as shift from food crop production which is female dominated to production of commercial crops which is male dominated were the main causes of the gender shift in the cultivation of flood plains; (iii) gender shift in cultivation of floodplain and of crops has by far affected social economic status and food security at household level with women who are wives of the men flood plain farmers cannot make decision on family finances and nutrition, lacking finances to meet their personal needs and lack health diet among other important findings. The findings gave insight on gender shift and give bases for policy formulation and implementation.

These outcomes will impact directly on achievement of the Kenya Vision 2030 as well as Sustainable Development Goals, particularly Numbers 1, 2, 3, 5, 8 10 and 13.

IMPACTS OF INSECURE LIVELIHOODS ON MEN'S PARTICIPATION IN DEVELOPMENT: A CASE OF MUKURU INFORMAL SETTLEMENT IN NAIROBI COUNTY, KENYA

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Male identities play an important role not only in the development of men themselves, but also in the overall wellbeing of their households and communities. While there have been efforts to improve overall living standards in Kenya, poverty and livelihood insecurities associated with residing in informal settlements have affected men and women in different ways (World Bank, 2015). In many patriarchal African communities, men are perceived as superior to women, and are heads of their households, where they provide for them, while women tend for the families (Balan, 2010). Patriarchy is practiced by many households in Kenya's informal settlements. Such patriarchal practices entrench breadwinning and provisioning as some of the qualities associated with masculinities. It is however, noted that women in these settlements indeed hustle and provide for their children. This paper focuses on men living in these informal settlements, where poverty and insecure livelihoods are likely to dent their abilities to provide for their households, hence their abilities to live up to societal expectations for men. Some of the issues it responds to include; how are men's relations with women and other men in these communities affected by poverty and insecure livelihoods? And, when men's self- esteem and gender identities are impacted negatively, how does this affect their active engagement in development? Based on primary and secondary data, this paper argues that livelihoods play a significant role in the definition of men and attainment of masculine status. It also argues that failure to attain desired masculine status affect's men's involvement in development, and identifies alternative traits that men in informal settlement prescribe to attain masculinities, and the implications that the acquired traits pose on development. In furtherance, the paper proposes the need to focus on both men and women in efforts geared towards socio-economic empowerment of those that live in the margins of society.

WOMEN, CARE GIVING AND RECOGNITION: A CASE OF DOMESTIC WORKERS' ROLE IN DEVELOPMENT IN KENYA

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The domestic services sector is a major contributor of wage employment in Kenya. While diverse figures and descriptions have been given in regard to the number and the services they offer, domestic workers have become part and parcel of households (Kudheiha ,2011). This is due to the high demand for their services as most of their employers work outside the home and require someone to care for the children and the home (IDAY-K, 2015). The sector, however, remains highly invisible, undervalued and informal. There have been concerted efforts to regulate the sector, more so after the ratification of ILO C189, however, due to the context and nature of domestic work it is important to underline their role in development. In furtherance, aspects such as their well-being ought to be given prominence since domestic workers' participation in development to a large extent depends on it. This paper addresses the issue of care for the care giver, that is the domestic worker an issue that is hardly given due attention. Based on both primary and secondary data, the paper argues that, domestic workers hardly have anyone to care for them within their work places even when they face health challenges that emanate from their workplace environment. It therefore, identifies work related occupational hazards, care needs and provision as well as implications for their welfare and development.

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GENDER MAINSTREAMING OF THE DEAF – THE CASE OF UASIN GISHU

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This is part of a concluded PhD thesis and is based on a study that was done in Uasin Gishu County. The main objective of the study was to evaluate spaces for inclusivity of male and female deaf in Uasin Gishu County.
This paper argues that the deaf are a specialised group that has been marginalised. The paper also argues that in order to mainstream the deaf the understanding of deaf culture is imperative. Deaf Culture is described by Kenya National Association for the Deaf (KNAD) as those who use the Kenya Sign Language. Those who embrace Deaf Culture, promote an environment that supports Kenya Sign Language as the main communication, value children who are deaf and do not discriminate against them in any money. In addition they encourage the learning of another language to enable the deaf to be more accessible. They also promote inclusivity and affirmative action for those who are deaf.

The research was conducted in Uasin Gishu and used both qualitative and quantitative methods. The objective of the study was to evaluate measures that have been initiated by the county government to enable mainstreaming of the deaf in Uasin Gishu County.

It was found that the deaf women face challenges related to, Communication, Resources to start business, Negative perception of the society/stigma, Unemployment and Access of education.

The study recommends that county governments should ensure that education is available for the deaf. Deaf women in particular women who are deaf and who bear the brunt of gender violence be protected by laws that are available. Deaf studies should also be introduced as a course in universities to create awareness on the needs of deaf woman.

WOMEN SCIENTISTS AS ROLE MODELS: FORGING FORWARD WITH THE GIRL-CHILD EDUCATION AGENDA IN AFRICA

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Education has long been considered as a fundamental human right that is key to sustainable development, peace and stability within and among countries and thus an indispensable means for effective participation in the societies and economies of the world. Committed to this perspective, the UN launched a Declaration for Human Rights in 1948, which states that everyone has the right to education which should be free and compulsory, at least in the elementary and fundamental stages. This paper explores what marginalized communities and other stakeholders can do to ensure the girl child enrolls, stays in school and completes her period of study. Among the chief challenges to be addressed include;

cultural practices, poverty, and emerging distress situations. Thrown in this mix are unsafe educational environments. While affirmative action has addressed the situation to some extent, deep-rooted stigma against girls' education, conjoined with culture and gender inequality, translates to what is commonly perceived as unbreakable barriers to girls' education. It is unfortunate that even in the 21st century girls' education is not a priority to many African parents. Professional Women should act as vibrant role models seek to address these challenges by working with other partners who are passionate about these issues that seek to give the girl child an equal chance to compete and lead a fulfilled life.

POVERTY AND GENDER INEQUALITY IN NIGERIA: IMPLICATIONS FOR SUSTAINABLE DEVELOPMENT

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Poverty is a global problem of economic development affecting over a billion people worldwide. There has been growing inequality not only between rich and poor countries, but also between men and women. Despite their crucial roles to the world economy, women constitute 80% of the world's poorest group. This has brought about serious gender inequality which has become a critical part of the development process and an important target of socio-economic policy. In Nigeria, there has been a proliferation of policies, programmes and projects that are derived from different macro-level economic, and social policy approaches to third world development. So far these models have not guaranteed sustainable development and hence the quest for viable alternatives. This paper therefore attempts to provide an alternative empowerment framework for poverty alleviation amongst women in Nigeria. Five different frameworks have been identified in the paper and the paper has adopted the empowerment framework as the most viable. The paper concludes that if the empowerment framework, can be used, it would go a long way in alleviating women's poverty in Nigeria. The paper further recommends that poor women must be allowed to define their own ends and means of development. They should therefore be allowed to participate in project formulation and implementation by allowing them to make inputs, giving them the authority to execute and building confidence in women in order to have optimal results.

THE TWO-THIRDS GENDER PRINCIPLE: A CONSTITUTIONAL ILLUSION FOR WOMEN'S LEADERSHIP IN KENYA

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The Road to Gender Equality in Kenya has been a rough terrain since 1963. Local and international laws and conventions, strategies and gender agendas have not yet yielded much. The Kenya Constitution 2010, spelt a new dawn with the Constitutional provision in Article 81 (b): "Not More Than Two Thirds of the Members of Elective or Appointive Bodies Shall Be of the Same Gender", hence government institutions

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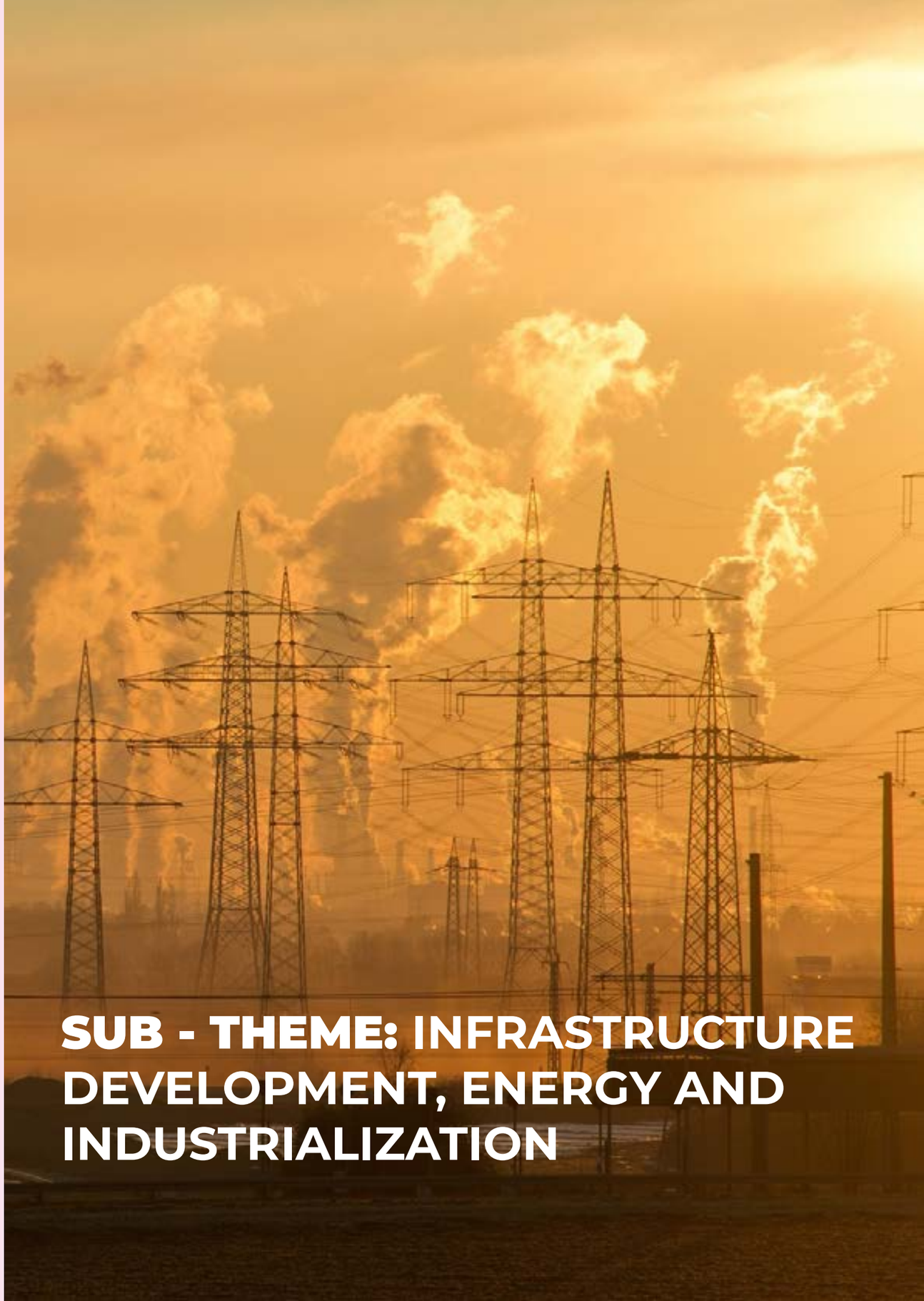
not adhering are subsequently illegally constituted, parliament being a good example. An attempt to rectify the discrepancy has been through the Amendment of the Gender Bill. The Bill was supposed to be enacted within 5 Years from – 2015. The incumbent 11th Parliament sought extension and quietly post-poned it. Attempts to have the Bill passed by the subsequent Parliament has been short down every time it appears, for flimsy reasons such as poor quorum, lobbying, free ride for women, huge wage Bill on tax payers etc. Meaningful development requires a de-link between the Gender Bill as one about and for women and a deliberate shift to perceive gender responsive leadership, where both men and women equitably contribute. The government's continued claim to support the Gender Bill, and at the same time do nothing tangible in its enactment, makes the Big Four Agenda an illusion. To achieve meaningful development, gender bias road blocks that inhibit women's competitive access to leadership must be willingly demolished. Consequently, more innovative ways to demystify gender responsive leadership and paradoxically attain a shift in paradigm for both men and women to see its link to development are mandatory.

Key words: 1. Gender Bill; 2. Gender Equity; 3. Gender Equality; 4. Development 5. Leadership; 6.Gender responsive



SUB - THEME: INFRASTRUCTURE DEVELOPMENT, ENERGY AND INDUSTRIALIZATION

NANO SATELLITE SYSTEM AND PROTOCOL APPLICATIONS IN MARINE COMMUNICATION AND NETWORKS INTEROPERABILITY.

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The blue economy is the next frontier for achievement of a number of sustainable development goals. For sustainable exploitation of marine resources effective and more efficient monitoring and communication networks need to be in place. The marine environment is unique in terms of the physical, geographical and other conditions hence most of communication standards and specifications available may not be applied directly. Effort has been made to develop and implement networks that fit these conditions; however a lot more needs to be done to enhance interoperability of various systems. In this paper a proposal is made in which the effectiveness of such a network can be enhanced by inclusion of a nano satellite to extend the range of coverage and provide better interoperability of various sub networks with different standards and specifications. Some of these include acoustic marine networks for monitoring and protection of offshore platforms and energy plants, wireless networks for marine life monitoring ship to shore networks, unmanned aerial and submarine data nodes. Various technologies to achieve this are explored and analysis and testing carried out to assess the suitability of each. Criteria used in this assessment include reliability, performance, availability and cost and complexity .Typical network architectures are discussed and the suitability of each in various scenarios analyzed. Results show that deployment of a nano satellite system for marine monitoring and network interoperability is desirable since a nano satellite can offer sufficient foot print, resolution and signal processing capability .A nano satellite is also affordable in terms of construction, launching and operation

Key words: Marine network, Nano-satellite, Interoperability, Marine sensors, Foot print, blue economy, unmanned vehicles

EFFECT OF SUPPLIER COLLABORATION ON PERFORMANCE OF RETAIL STORES IN KENYA. A SURVEY OF SUPERMARKETS IN NAIROBI CITY COUNTY

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In Kenya, retail chains are facing high competition, increase in globalization and high level advancement in technologies posing a threat to profitability earnings. To improve on performance, retail stores are instituting supplier collaboration. However, Kenya's leading supermarket, Nakumatt and Uchumi are losing on market share, loss of customer base and low profitability earnings. This motivated implementation of suppliers relationship management with emphasize given to supplier collaborations in supermarkets. However, the extent to which supplier collaboration contribute to performance in supermarkets in Nairobi, Kenya remain contested. The general objective for this study was to determine influence of supplier collaboration on performance in retail stores in Kenya focusing on supermarkets in Nairobi City County. The study was anchored on transaction cost theory. The study used cross-sectional descriptive survey research design. The target population was 32 supermarkets in Nairobi City County. The study respondents were 160 staff working in the retail stores. The study used primary data collected using questionnaires. Descriptive analysis mean and standard deviation was carried out. Correlation and regression analysis was done to examine the relationship between variables. The findings indicated that there was a strong, significant and positive correlation between supplier collaboration and performance on supermarkets. Further regression results revealed that supplier collaboration had a statistically significant and positive effect on performance of supermarkets. The study recommends that supplier collaboration should be deployed in supplier relationship management as it contributed to performance on retail stores in Kenya .

Key Words: Supplier Relationship Management, Supplier Collaboration and Performance on Retail Stores

END-USER INVOLVEMENT AND PERFORMANCE OF GOVERNMENT SPONSORED HOUSING PROJECTS, IN LANGATA CONSTITUENCY

Nyangau, Jacinta & Dr. Tumuti, Joshua

Housing in any nation is considered an important human and social need. Global statistics show that at least 30% of all public housing are sponsored and constructed by government authorities'. Equally, the government of Kenya under Vision 2030 and the Big 4 agenda launched a government sponsored housing project with a focus of delivering over 500,000 affordable houses across the 47 counties by 2022. A key facet of successful public projects is extensive end-user involvement. This study considered the influence of end-user involvement and performance of government sponsored housing projects in Langata Constituency, Nairobi County, Kenya. The theories underpinning this study included Freemans' Stakeholder Involvement Theory and Maslow's Theory of Motivation. Literature reviewed encompassed different components of end-user involvement and their influence on project performance. Descriptive survey research design was adopted for the study. The target population was all residents of Langata, Madaraka, Nairobi West, Highrise and Kibera housing projects. Random sampling technique was used where 144 residents made up respondents of the study. The main data collection instrument was a questionnaire. Data collected was analyzed using both descriptive and inferential statistics. The findings indicated that end-user involvement had a 73.4% variation in the performance of housing projects. Conversely 26.6% of respondents felt that they were not adequately involved as stakeholders of the housing projects. As a result, low intended beneficiary occupancy rates was recorded where up to 25% of the original project beneficiaries were found to either have sold or rented out housing units allocated to them. This suggested some level of rejection of the government housing projects by end-users. It was concluded that lack of end-user involvement led to some end-users rejecting government housing projects because their needs were not matched. The study therefore recommended that all government housing projects should include end-users involvement with specific focus on their needs in terms of size of housing, the number of occupants and their economic level to ensure that there's sustainable development in housing projects and achievement of the Big 4 Agenda.

Keywords: End-user Involvement, Performance, Government Housing Projects, Occupancy Rates, Beneficiaries, Sustainable development.

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PHYSICO-CHEMICAL AND FUEL PROPERTIES OF FATTY ACID ETHYL ESTERS FROM *JATROPHA CURCAS* OIL TRANSESTERIFIED USING *RHIZOCLONIUM GRANDE* AND *CITRUS SENENSIS* BIOETHANOL

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Transesterification of vegetable oils from various plants using methanol have been evaluated seeking to find sustainable biofuels. In this work physico-chemical and fuel properties of fatty acid ethyl esters from *Jatropha curcas* oil using bioethanol from *Rhizoclonium grande* and *Citrus senensis* biomass were assessed. *Jatropha curcas* seeds from contracted farmers of Energy Africa in Shimba hills, Kwale were solvent extracted using *n*-hexane to obtain oil. Algae from Shimoni in Kwale, Shelly beach in Mombasa, Jamvi la Wageni in Likoni, English point in Mombasa was dried and processed to obtain bioethanol. *Citrus senensis* from Shimba Hills, Muheza and Malindi was used to obtain peelings biomass. A*spergilus niger* was used for hydrolysis of the biomass and *Saccharomyces cerevisiae* for fermentation. Transesterification of *J. curcas* oil was carried out using bioethanol from the algae and citrus peelings biomass. Characterisation of the bioethanol and ethyl esters was done using GC-MS. Physicochemical and fuel properties of the biofuel were investigated at TUM, Government Chemist and Kenya Pipeline Laboratories in Mombasa. *J. curcas* produced 53±0.135 $\%^{v}/_{w}$ of oil. From *R. grande* and *C. senensis* biomass was obtained 5.36±0.355 $\%^{v}/_{w}$ and 14.13±1.548 $\%^{v}/_{w}$ of bioethanol respectively. The yield of FAEE from *J. curcas* oil was 65.80±2.774%. There was no significant difference in physicochemical and fuel properties observed between JO FAEE samples and standard biodiesel B100 according to statistical analysis of data using STATA/SE 13.0 and Xlstat at 95% confidence level ($P<0.05$) two -tailed. The bioethanol can therefore produce a more sustainable biofuel with similar properties to standard biodiesel B100.

Keywords: *J. curcas*, *R. grande*, *C. senensis,* Ethyl esters, Physico-chemical and Fuel properties.

APPLICATIONS OF NUCLEAR SCIENCE TECHNOLOGY IN KENYA

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Kenya is a member state of the International Atomic Energy Agency (IAEA) and also a member of the Africa Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA). The country has benefitted from the IAEA and AFRA through technical cooperation projects and human capacity development programs. Over the last 40 years, the country has built capacity for peaceful uses of nuclear science technology in diverse areas of research and development. Currently there are National Nuclear Institutions (NNIs) in Kenya that are actively engaged in training and research in nuclear science and technology. They include research institutions as well as institutions for higher learning. This paper focusses on the progress made in the applications of nuclear science and technology in Kenya in the following areas: agriculture, medicine and health care, industry and research. The progress made towards the country's nuclear power program will also be highlighted. The applications of nuclear science and technology make direct contribution towards achieving the country's big four agenda and the goals of the Vision 2030.

EXPERIMENTAL MODEL INVESTIGATING POTENTIAL OF GEOTHERMAL FLUID VELOCITY IN RECYCLING POLYETHYLENE TEREPHTHALATE: CASE STUDY OF OLKARIA

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Geothermal energy is one of the clean, sustainable and renewable resources which provide heat energy that is derived from radioactive decay elements within the earth's crust. The non-electric utilization (direct use) of geothermal heat has been reported in various domains that have a need for sustainable supply of heat energy. Adoption and direct use of geothermal energy in Kenya is one way which can enable waste control to enhance environmental protection and optimize the use of energy. In this research, heat energy from the geothermal well was simulated using an experimental model in which polyethylene terephthalate (PET) pieces were melted and moulded into usable products under suitable pressure conditions. The objective of this study was to investigate the potential of using geothermal fluid velocity, in recycling PET plastics through an experimental model. The ground plastic waste material was exposed to heat and the resulting molten medium was subjected to selected polymer processing techniques to obtain desired products. The suitability of geothermal conditions in recycling PET was investigated through numerical analysis. In the design, the study performed experiments on three controlled factors temperature, velocity and pressure. The data collected was analyzed by use of MATLAB. This study established through experimental model that geothermal fluid velocity conditions in Olkaria are viable in recycling PET plastics. These findings, will enhance control of environmental pollution and create job opportunities in the recycling process. The study recommends that KenGen should explore the utilization of geothermal energy in the recycling of PET plastics.

Key words: experimental model, geothermal fluid velocity, recycling and polyethylene terephthalate

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FOREIGN DIRECT INVESTMENT MODEL OF ECONOMIC INFRASTRUCTURE AND TRADE OPENNESS

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In this paper, I construct a theoretical model of foreign direct investment (this will be called FDI hereafter) and examine if trade openness and the development level of economic infrastructure in a country interact insofar as the attraction of FDI is concerned. The model predicts positive relationships between FDI inflows and the degree of trade openness of the host country and also between FDI and the level of infrastructural development in that country. The model interestingly also predicts an unambiguous negative interaction effect of the degree of trade openness and economic infrastructure on FDI. This paper tests the predictions of the theoretical model and an empirical analysis details the effects of openness and infrastructural developments on FDI. Using a panel data set for 95 developing economies from 1994 to 2016, the study concludes that increased trade openness and better economic infrastructure result in more FDI inflows. The interaction term between the level of economic infrastructure and the degree of trade openness is found to be negatively correlated with inward FDI.

Keywords: Foreign Direct Investment, Economic Infrastructure, Trade Openness

THE DEVELOPMENT OF TRADE IN HIDES & SKIN AND THE DOMINANCE OF MULTINATIONAL NATIONAL CORPORATIONS IN ZAMFARA, NORTHERN NIGERIA

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A Multinational or Trans - National Corporation refers to an enterprise operating in several countries but managed from one (home) country. Precisely, any company or group that derives a quarter of its revenue from operations outside its home country is considered as a Multinational Corporation. In Nigeria, most of these corporations were from Britain before the grant of political Independence. The trade in hides and skin was a profitable business that attracted the participation of different Multinational Companies, because of the multiple uses of leather and its value chain. However in the conduct of the trade in hides and skin, there was exclusive control of the production and the trade system. This control made possible the manipulation of prices following the enormous privileges enjoyed by these Trans-National firms. This paper intends to unravel the factors that facilitated the production and processing of hides and skin in Zamfara, northern Nigeria, the collapsed of some domestic tanning industries, the dominance exerted by the hides and skin foreign investors, undue privileges enjoyed by the expatriates firms and how indigenous investors were gradually but dramatically dominated in the conduct of the trade in hides and skin in their home country. The paper argued the need to overhaul this vital economic sector in order to move towards economic productivity, self – reliance and sustainable development goals. The paper adopted an empirical and multi-disciplinary approach in its methodology. The findings revealed how colonialism and imperialism has shaped the political economy of Nigeria.

Keywords- Hides, Skin, Production, Multi - National Corporations, Trade, dominance

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STOCK MARKET PRICE AND THE PERFORMANCE OF THE RESIDENTIAL PROPERTY MARKET IN KENYA

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The purpose of the study was to assess the effect of stock market price on the performance of the residential property market in Kenya. The surge of the residential property prices in Kenya has ignited concerns about the affordability of residential property houses in Kenya. The escalation of residential property prices raises question as to whether it is in tandem with other markets in the Country especially the stock market. Researchers have inconclusive findings on the direction of causation or the strength of the relationship between stock market and performance of residential property market in Kenya. This study adopted a positivist philosophical attitude using causal research design. The study used quarterly secondary data from 2005 to 2018. The study employed vector error correction residual serial correlation langrange multiplier test and vector error residual heteroskedasticity test as the diagnostic tests. Vector error correction model and auto-regressive distributed lag model were employed to test the hypothesis in the short run and long run respectively. The study found that stock market price had a negative effect on performance of residential property market in Kenya in the short term suggesting substitution effect while in the long run stock market price had a positive effect on the performance of residential property market in line with the wealth effect. The study concludes that stock market information spills over and affects residential property market performance in Kenya both in the long run and short run. The study has also contributed to the confounding empirical and theoretical literature and narrowed the research gap especially on the conflicting substitution effect and wealth effect of stock market and residential property market performance in Kenya.

Keywords: Stock Market Price, Performance, Residential Property Market

SUB - THEME: ENVIRONMENT, NATURAL RESOURCES, CLIMATE CHANGE AND SUSTAINABILITY

CLIMATE CHANGE IN EXTREME NORTHERN NIGERIA: EVIDENCE FROM RAINFALL TREND IN SOKOTO

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The rainfall trends in Northern Nigeria are still poorly understood despite the significance of rainfall to agriculture. This study focused on climate change in extreme Northern Nigeria: evidence from Rainfall trend in Sokoto. In order to achieve this, rainfall data for Sokoto from 1956 to 2015 was used. Standardized coefficient of Skewness and Kurtosis for the meteorological station was employed to test the normality of the data. In order to examine the trend, 10-year running mean and linear trend lines was calculated and plotted using Microsoft Excel Statistical tool (2013). The rainfall series was also sub-divided into 10 years non-overlapping sub-periods and Cramer's test was then used to compare the means of the sub-periods with the mean of the whole record period. The result revealed that rainfall amount is generally increasing in the study area in recent years and that the amount is fluctuating. The study recommends that more opportunities should be provided by the government for professionals to study and develop realistic methods for utilization of ground water without socio-economic concerns, as well as managing flood events. In such a case, it would be possible to counter drought and flood crises occurrence in the study area and other areas having the same climatic conditions.

Keyword: Sokoto, rainfall, running mean, sub-periods and trend

RESPONSE OF SOIL ORGANIC CARBON AND ACID PHOSPHATASE ENZYME ACTIVITY TO PHOSPHATE ROCK AND ORGANIC INPUTS ON ACIDIC SOILS OF CENTRAL HIGHLANDS OF KENYA

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Soil organic carbon depletion is a major soil degradation process in a tropical environment. Soil enzymes is a promising soil quality indicator because of its relationship to soil biology, ease of measurement and rapid response to changes. The mechanisms controlling organic carbon and enzyme activities as influenced by phosphate rock and organic inputs on acidic *humic nitisols*, however, remain largely unresolved. We conducted a multi-season field experiment in Tharaka-Nithi County, Kenya to investigate the effects of phosphate rock and organic input in acidic *humic nitisols*. We laid the experiment in a Randomized Complete Block Design with seven treatments replicated thrice. The treatments were *Tithonia diversifolia*, Phosphate rock, manure, *Tithonia diversifolia* plus Phosphate rock, manure plus Phosphate rock, Triple Super Phosphate plus Calcium Ammonium Nitrate and a Control (no external inputs). Soil Organic Carbon and Phosphatase enzyme activities were determined using standard laboratory procedures. The data

were subjected to Analysis of Variance (ANOVA) in SAS 9.4 and mean separation done using Duncan's Multiple Range Test at P ≤ 0.05. Soil organic carbon was significantly (0.0001) influenced differently by the treatments. A highest of three-fold increase in soil organic carbon content under *Tithonia diversifolia* plus PR treatment in SR17 was observed. Use of *Tithonia diversifolia*, manure and PR noticeably increased the soil organic carbon with respect to the controls. No remarkable variations were observed in phosphatase enzyme activities during SR17 in the present study. In contrast, manure in either sole application or combined with PR reasonably increased the phosphatase activities with decreases under CAN plus TSP treatment. Overall our results indicate that manure and or combinations with PR remarkably enhanced soil organic carbon and acid phosphatase activities thus could be recommended for higher soil productivity in humic nitisols and similar agro-ecological zones.

Keywords; acid phosphatase activity, Phosphate rock, inorganic input, *Tithonia diversifolia*, agro-ecological zones

DEMAND FOR ENVIRONMENTAL CONDITIONAL CREDIT AS INCENTIVE FOR NATURAL RESOURCES MANAGEMENT IN KENYA; THE CASE OF ACTION RESEARCH IN SASUMUA SUB WATERSHED, KENYA

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The greatest challenge smallholder farm enterprises in Kenya face is soil degradation through soil erosion. Past command and control and other incentive based approaches to avert soil degradation have not been successful; they have focused on the downstream interests, while ignoring the value of good soil management practices within the farming enterprises. Farmers could potentially benefit from improved soil conservation and are interested in restoring and ensuring sustainable productivity of their soil asset, but they cannot afford initial costs and sometimes lack technical knowledge of establishing the appropriate technologies. Additionally, smallholder farmers lack incentives to invest in sustainable agricultural practices. Existing credit services providers do not consider soil as an asset and therefore do not have provisions for supporting its amendment. Appropriately designed credit scheme can provide both incentive and impetus for farmers to invest in sustainable soil and water management practices which reduce soil erosion and in the long run ensure restoration of soil fertility and land productivity. This study using action research among 325 smallholders revealed that there is demand for environmental conditional credit among smallholder farmers in Kenya and that green credit can be a strong incentive for behavior change towards natural resource management. The study recommends provision of tax breaks for financial institutions providing loans which improve ecosystem-based adaptation and prudential guidelines to require financial institutions to incorporate environmental analysis into lending decisions.

Key words: Environmental conditional credit; demand; farm enterprises; ecosystem services; sustainable finance

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ENVIRONMENTAL REHABILITATION OF KAPKANGANI-CHEPSONOI SURFACE WATER

John Bosco Namwamba, Yaw Twumasi, Kelvin Kiwale, Benir Mbabasi, Anne Ntombela, Eusebius Barasa Ngera, Susan Nekesa Ngera and Allan Maina Namunguba

During the period 1960s mid-1970s, clean, clear water flowed in streams in Kapkangani and Chepsonoi areas, Nandi District, Kenya. Clean water also flowed through the once mighty River Yala, which flows through these area. So clean was the water that people crossing or walking by these water ways could quench their thirst by scooping it by palms of their hands or cups, etc., to drink. The cool water tasted good. The streams in Kapkangani served as sources for drinking and cooking water since its water was clean and safe. Unfortunately the status of Kapkangani hydrology and environment in general has since changed. Presently, most of the streams in this area have shrunk, with some drying out. The shrinking of surface water is likely a result of introduction of eucalyptus trees. In order to diversify and increase profits on farms, many Kapkangani residents established eucalyptus stands in early 1980s. Planting of these trees for economic gain is still practiced here. Unfortunately this species of tree requires much moisture that it reduces soil moisture significantly. Water that flows through most of the streams and rivers in the area is no longer clean and clear. It is unsafe for human consumption. This can be attributed to high level of colli, chemical and physical pollutants. The levels of these pollutants could be reduced naturally by establishing well selected vegetation in riparian zones. However, the presure on land, driven by need for residential spaces, and food for the growing population in Kapkangani area led to human interference with land cover and riparian buffers. The importance of land cover, establishment of environmentally friendly vegetation and riparian buffers becomes clear one of the land parcels in Kapkangani which will be discussed in the paper shows. Here a functional spring is alive, with crystal clear clean water flowing. This project aims at assessing ecological value loss in Kapkangani. It also aims at proposing corresponding viable restoration practices and mitigation to check further degradation of Kapkangani's ecosystem. ArcGIS and statistical software will be used to analyse data from Kapkangani. The results of the analysis will enable researchers determine the ecological value loss and guide them achieve the goals of the study.

BIOPROSPECTING CELLULASES FROM ORGANIC WASTES FOR BIOETHANOL PRODUCTION IN KENYA

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Bioethanol is a unique renewable energy source. Cellulolytic bioconversion of fermentable sugars is a feasible process for bioethanol production. The purpose of the study was to bioprospect for cellulolytic bacteria in forest soils, ruminant fecal matter and saw mills.
A total of 72 soil samples were aseptically collected from Kakamega forest (28), Irangi forest(24) Gazi bay Mangrove forest (22) and categorized by source: Canopy, grassland, shrubs and rotting wood, in the case of from Kakamega and Irangi and intertidal waves, shrubs, plantation and grassland habitats for Gazi-bay. Initial sample processing involved measuring about 0.1g of soil, serial diluting with tap water (10^{-1}-10^{-10})

and spread plating on enriched solid cellulose and carboxymethyl cellulose (CMC) media. Distinct colonies were picked and streaked on both cellulose and CMC media. A total of 560 pure cultures were screened. A transparent zone was used as the cellulase activity indicator. The diameter of each isolate along with the diameter of the halo provided the enzymatic index (EI). Preliminary results indicate the optimal temperature and pH ranges as (37-40)°C and (7.0-7.4) respectively. There were no significant differences on duration of incubation. Total DNA has been extracted from soil samples and cow rumen. PCR amplification of the DNA form selected pure cultures is ongoing. Physico-chemical analysis of the soil samples and their influence on growth and proliferation of bacteria is also in progress. These results are discussed with respect to the specificity and efficiency of cellulases and their potential for bioethanol production.

Key Words: Bioconversion, cellulolytic bacteria, renewable energy, organic wastes.

MOLLUSC SHELLS AND FISH BY-PRODUCTS FROM LAKE VICTORIA: A VALUABLE RESOURCE NOT A NUISANCE WASTE PRODUCT

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The study was carried out to investigate and document mollusc shell species diversity, abundance and distribution along Lake Victoria shoreline in an attempt to focus their possible utilization. Proximate analysis was carried out to determine their nutrient value as well as tilapia fish by-products and waste with a view to formulate a diet for feeding *Oreochromis niloticus* in aquaculture. Bivalvia and Gastropoda shells were ubiquitous taxonomic classes. Higher diversity, species richness and abundance of gastropods than bivalves were recorded from habitats with receded water levels attributed to climate change. Gastropoda consisting of *Bellamyia unicolor* (Olivier) (74.6%) and *Melanoides tuberculata* (Muller) (15.1%) were the most abundant species. *Pila ovata* (Olivier) shells (collected from areas with algal blooms and sewage polluted sites), and the bivalves *Caelatura allaudi* Dautzenberg, *Etheria elliptica* Lamarck and *Sphaerium* spp. were modified into valuable ornaments. The analysis revealed that crude protein varied from 42.6% in fish offals and skeletons, to 47% in fish scales. The highest amount of ash was recorded from fish skeletons (47.8%) followed by fish scales (36.7%).Carbohydrate content varied from 21% in fish offals to 5.3% in fish skeletons. Dried fish heads infested with skin beetles had the highest amount of lipids at 24.8% followed by *B. unicolor*. The trace elements nitrogen, phosphorus and magnesium occurred in high amounts. Lake Victoria mollusc shells and fish by-products are natural resources that can be exploited for growth and development of fish. Constant removal and use would result in improved environmental health.

Key words: shells, mollusc, proximate analysis, fish byproducts, Lake Victoria

EFFECTS OF LAND USE ON SPRING AND STREAMFLOW WATER QUALITY IN RIVER MALAGET SUB-CATCHMENT, KERICHO COUNTY, KENYA

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Various studies have found that land use effects on water quality are attributable to about 80 % of diseases in the developing world. The main objective of the study was to evaluate the effects of land use on water quality in River Malaget sub-catchment. Stratified and purposive sampling techniques were used to select 33 sampling points. Water samples from each sampling point were tested for 15 parameters of interest and MANOVA was used to compare the means from three agro-ecological zones. Results revealed that all samples tested for temperature, electrical conductivity, DO, nitrites and total hardness were within the recommended levels. However, some of the samples tested for nitrates, ammonia, pH, turbidity, total dissolved and suspended solids, BOD, *E. coli*, fluorides, and phosphates were found to exceed the recommended levels. Pillai's trace in MANOVA, revealed a significant variability in the distribution of the water quality parameters in relation to land use, as the means of the three agro-ecological zones were significantly different, V =1.535, F (20, 44) =7.262, p <.05. In conclusion, indeed, land use has had effects on spring and streamflow water quality. It is recommended that farming activities are done far from water sources, drinking water should be boiled and all springs should be protected fully against contamination.

Key words: MANOVA, spring, water quality, streamflow, agro-ecological zone.

EVALUATING DEMOGRAPHIC INFLUENCE ON THE WATER REST LEVELS IN BOREHOLES IN KAMITI-MARENGETA SUB CATCHMENT NAIROBI-KENYA

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The Kamiti-Marengeta sub catchment, lying on the highly explored Nairobi aquifer is an area of dense population and has recorded varying rainfall trends over the past years. A main university campus which has attracted other major social amenities and caused emergence of estates lies within this catchment as well. This together with other population-attracting social amenities has caused notable demographic changes and increased groundwater exploration due to the unreliability of piped municipal water in the region. Few studies have been done to establish the impact of these demographic changes to the hydrogeology of this area. With the continued withdrawal from the aquifer and the varying rainfall trends, the environmental impact, and the sustainability of the water resource is a concern. This article provides an evaluation on the hydrogeological effect resulted by the increased water withdrawals from the aquifers under increasing demographic numbers and varying rainfall. The methodology involved collection of water rest level data using a deeper and the mean rest level of each region was calculated. This data was

correlated with population data of the selected regions to check weather or not population dynamics affect the water rest levels in borehole. From the results, it was found that the population densities and student demographic fluctuations did not directly impact the hydrogeology of the regions. This was found to be so due to other factors that determine the water rest levels, including but not limited to abstraction, water table, groundwater quantity, recharge and discharge from the aquifers.

Keywords: Hydrogeology, demographic changes, rainfall trends, Nairobi-Kenya.

VEGETATION RESPONSE TO DROUGHT IN CHYULU- AMBOSELI ECOSYSTEM OF KENYA

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Remote sensing techniques have been widely used to monitor moisture-related vegetation conditions. Vegetation vigour response to moisture availability, however is complex and has not been adequately studied using satellite sensor data. The objective of this paper was to investigate the response of vegetation greenness to drought in Kenya's Chyulu-Amboseli ecosystem using remote techniques. Precipitation data was derived from the Soil Water Assessment Tool (SWAT) database, while pre-processed NDVI images were downloaded from the Moderate Resolution Imaging Spectro-radiometer (MODIS) aboard the Terra and AQUA satellites were sourced from the University of Natural Resources and Life Sciences (BOKU), Vienna. The images had 250 m spatial resolution and a temporal resolution of 16 days between 2000 and 2014. Descriptive statistics and autoregression analysis were used to understand the relationship between the aforementioned indices. Results showed that severe droughts were most common (69 months), followed by moderate droughts (57 months), while extreme droughts occurred in 19 months, during the study period. Average value of NDVI was 0.337, which is below the mean condition (0.5). Worst vegetation condition with a value of 0.193 was recorded in September 2004. Four out of ten months with the lowest vegetation vigour fell in a single year 2009 (August, September, July, June). Vegetation conditions tended to increase along a transect line from low elevation areas towards the Chyulu hills. Results of autocorrelation regression yielded an R^2 of 59.7 per cent with a lag of 2 months. An important finding is that NDVI can be used to monitor drought conditions in the area, but the lag effect should be taken into consideration. A better understanding of the relationship between NDVI and SPI can improve planning of interventions on sustainable development of natural based activities and enhance resilience to future climate shocks.

Key words: Drought; SPI; MODIS; NDVI; Vegetation; Autogression analysis.

PREPARATION FOR PARTNERSHIPS IN THE ESTABLISHMENT OF FOREST RESOURCES AND RESOURCE USER'S BOUNDARIES IN KENYA

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Participatory forest management has been globally studied and it has been argued that clearly defined boundaries for access of the community forest resources will lead to sustainable use of the resources and enhanced sustainable livelihoods to the communities dependent on the forests for their survival. In contrast, however current studies indicate that while there are efforts to define spatial boundaries of resource use and the resource users within the community based forest management approaches, the definition of boundaries of resource use and resources users has proved more difficult, for instance when gathering relevant information and tools that can promote forest resource users partnerships, engagement of different stakeholders, assisting local communities to organize, preparing for negotiations for meetings, procedures, rules, logistics and equity considerations, negotiating for the establishment of agreements and empowering of the local communities**.** This study therefore aims at investigating on how the preparation for partnership when establishing forest management boundaries can be done to enhance sustainable use of forest resources and improve the livelihoods of communities depended on forest for their survival by overcoming these difficulties. Qualitative research design was employed in the study. All the forests involved in participatory forest management in Kenya namely: Keraite; Nyamweru, Arabuko-Sokoke Forest, Kakamega, Loita, and upper Imenti were selected for study. All the respondents were purposefully sampled from each category of interviewees namely: households living adjacent to the forest, various groups that are working in or with the communities in the management of the forest resources. Policy makers from government and a group of experts e.g. head of various government ministries and NGO. To collect data semi-structured interviews were done for the respondents. All the data collected was analyzed through coding and grouping similar important ideas or phenomena from the study and then used for writing the final reports. The study found out that forest resources and resource users boundaries are needed for effective community participation. It is recommended that spatial boundaries of resource use and the resource users within the community based forest management approaches is a key element in sustainable use of the forest resources and enhanced community livelihoods for the forest dependent communities.

Key words: partnerships, forest resources and resource user's boundaries, Kenya

ROADS: INSTRUMENTS FOR RAINWATER HARVESTING, FOOD SECURITY AND CLIMATE RESILIENCE IN ARID AND SEMI-ARID AREAS

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With an investment of 7–10 billion USD in sub-Saharan Africa, the development of roads is a major factor in the change of landscapes and the drainage patterns. Thus, roads often act as conveyance systems, but the impact is often negative, leading to erosion, waterlogging and flooding. These impacts come down hardest on the more vulnerable and least resilient, such as poor female-headed households. Yet these negative effects can be turned around and roads can be made into instruments for rainwater harvesting, food security and climate resilience. What drives the transformation of roads is a change in governance too—better coordination between road builders and water resource and agricultural departments and closer interaction with roadside communities. This chapter provides evidence from Ukambani regions (Kitui, Machakos and Makueni) in Kenya, where road water harvesting has systematically been introduced

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since 2016. The chapter describes the process of promoting road water harvesting, the techniques used, the potential of road water harvesting to increase resilience and the hydrological and socio-economic effects. The results indicate that, households that carry out road water harvesting are more food secure compared to their counterparts who don't utilize road water. This benefit is expected to shoot up if farmers adopt more advanced road water harvesting systems as compared to the simple structures consisting of diversion channels to their farms. Options include cut-off from side drains, deep trenches, diversion from culvert, rolling dips, farm pond, tree planting, gully prevention and reclamation.

Keywords: Road water harvesting, climate resilience, waterlogging, food security

EARLY DRY SEASON SPECIES DIVERSITY, POPULATION SIZE AND HABITAT ASSOCIATION OF BIRDS IN KANO, NORTHERN NIGERIA

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The research was conducted for the period of five months; three months spared for the birds' population studies (November, 2016 to January, 2017) and two months for vegetation parameters, i.e. from February to March, 2017, where tree plants were sampled. The frequency of birds' species encountered in the field changes as the dry season progresses. The diversity of birds was examined using point count protocol in four partially protected sites, namely, Bayero University Old Campus, Bayero University Kano New Campus, Kano State Zoological and Wildlife Management Agency and Aminu Kano Teaching Hospital. Checklist records42 individual species belonging to 24 families. The distributions of birds were high at BUK New Campus with 1609 birds, followed by the BUK Old Campus with 677 and the least was Aminu Kano Teaching Hospital with 498. Most of these species were common to three of the four study sites, and a few, such as Squaco Heron, *Ardeolaralloides*, was encountered only at Kano State Zoological and Wildlife Management Agency, a small patch of wetland that contrasts with the other drier sites. The Shannon Diversity Index was moderate at the Kano State Zoological and Wildlife Management Agency, 2.76. The Piapiac, *Ptilostomisafer* was peculiar to Aminu Kano Teaching Hospital. Correlation analysis showed influence of bird species distribution on the observatory sites, ($P<0.05$; $F=2.9$). However, there was 'no significant difference observed between the individual sites ($P>0.05$).

Keywords: Kano, early dry season, species diversity, habitat association, Northern Nigeria.

POTENTIAL OF ROOF CATCHMENT RAINWATER HARVESTING AND MANAGEMENT IMPLICATIONS AT KENYATTA UNIVERSITY KENYA

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The importance of water as an ecosystem service cannot be overemphasised. Water scarcity is however becoming a pressing challenge world wide with most countries shifting from water vulnerable to water stress and then water scarcity nations. Policy and practice must look for alternative supplies away from conventioanl metered supplies. This paper discusses this challenge based on the potential of rainwater harvesting and management at Kenyatta University. The choice of the University was based on its status as society's think tank on development agenda and its potential to influence positive change in water resources management in communities. Spatial data focuses on computing roof catchment footprints. This was done using GIS procedures. Data on institutional water policy was collected by interviewing key respondents responsible for this sector in the University. Results show that by virtue of its expansive total area, roof catchments at various zones in the University can yield substantial quantities of water to supplement metered and bore hole water for critical functions like sanitation, washing and bathing, and greening of the university landscape. Most buildings in the university already have gutters and drainage pipes installed. But for not having storage tanks, the harvested water is safely disposed away as runoff. Although the rainfall is erratic and annual totals are low, much water can still be harvested during the two rainy seasons totalling about 5 months in a year. That the elites seem not to bother about water harvesting is a research agenda that should inform policy decisions for the future.

Key words: Rainwater Harvesting, Roof catchment footprints, University, Kenya

IMPACT OF CONSERVATION STATUS DYNAMICS ON RESILIENCE AND PRODUCTIVITY OF HERBACEOUS FORAGE IN KIVAA AND NTUGI WATERSHEDS IN EASTERN KENYA

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Rangelands are extensive tracts of land where natural vegetation is the main forage resource for both domestic and wild ungulates. They greatly contribute to local communities', national and global development. In Kenya, despite rangelands constituting about 70% of total land mass their development has not been prioritized over the years. For instance, Sessional Paper No. 10 of 1965 gave priority to development of high potential areas thereby neglecting arid and semi-arid areas supposedly due to their low economic potential. Despite this neglect, rangelands host about 30% of Kenyan population and produce about 60% of all beef. This neglect of rangelands is however being addressed through the Constitution of Kenya (2010) whose Cap 5 Article 69 states that; *land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable*. This new Constitution provides for devolution of resources to the grassroots including the rangeland areas. This study aimed at investigating the impact of rangeland conservation status and trend on resilience and productivity of herbaceous forage species in Kivaa and Ntugi watersheds in Eastern Kenya. The study hopes to address the problem emanating from exploiting rangeland resources at levels not consistent with their regenerative capacity leading to their depletion. Completely randomized block design was used to pick the sample and belt transects were established along which experimental plots measuring 5metres by 5metres were established. Key forage species were identified through purposeful sampling and interviewing of respondents from among local agro-pastoralists, elders and local Livestock Department officers using semi-structured questionnaire. Soil and forage samples were obtained from the experimental plots and nutrient analysis done to determine soil fertility and herbaceous forage biomass yields and quality. The data collected was analyzed qualitatively and quantitatively using PAST, STATA and CANOCO. The study found that conservation status varied both spatially and temporally under the influence of both natural and anthropogenic factors. Conservation

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status (range condition) which was traditionally monitored using soil, herb and shrub layers, can be effectively monitored using NDVI, LULC images, forage value of species and hydrologic potential. Range condition had significant influence on resilience of herbaceous forage species. Some of the most valuable and resilient forage species identified include; *Dichanthium annulatum, Themeda triandra, Cenchrus ciliaris, Rhynchelytrum repens, Digitaria abyssinica, Chloris roxburghiana* and *Cyperus rotundus*. There were significant differences in range condition between Kivaa and Ntugi based on the NDVI over the three years at p≤ 0.05 (F= 3.67; P = 0.036). Precipitation had a significant positive effect on both the herbaceous forage biomass production (r = 0.724, P = 0.0001) and vegetation health (NDVI) (F = 7.42, P = 0.008) at p ≤ 0.05. Soil moisture content had a significant positive effect on the herbaceous forage biomass production (r = 0.649, P = 0.042). Soil bulk density had a significant positive effect on grass biomass (r = 0.231, P = 0.0001) and a significant negative effect (reduction) on non-grass herbaceous forage species biomass production (r = -0.141, P = 0.023). Canonical Correspondence Analysis (CCA) revealed that soil pH, nitrogen, organic carbon and Zinc had the strongest positive influence on herbaceous forage biomass production in Kivaa. In Ntugi, soil pH, Phosphorus, Iron, Manganese and calcium had the strongest positive effect. This study concludes that the classical parameters used in range condition and trend assessment are not adequate and recommends that they should be reinforced by use of hydrologic potential, NDVI and LULC change and forage value of plant species. The type and level of various nutrients in a particular soil significantly affect the type and level of nutrients in the tissues of plants growing in that soil. These findings will be a useful in determining stocking rates consistent with various range sites' carrying capacities as well as in assessing hydrologic potential of rangeland watersheds. It will also be useful in developing effective strategies for sustainable management of rangeland resources.

BIOPROSPECTING OF ENDOPHYTIC BACTERIA FROM SELECTED KENYAN MANGROVE PLANTS AS POTENTIAL SOURCES OF ENZYMES AND ANTIMICROBIAL.

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Marine plants have been used for the longest time to provide medicinal products due to their bioactive secondary metabolites. This has caused destructions of the mangrove forests and some medicinal plants are becoming extinct due over use resulting in negative impact to the environment. Endophytes are microbes that live within the tissues of these plants without causing any disease and are also sources of secondary metabolites. The study aims at bioprospecting for potential bacterial endophytes in selected Kenyan mangroves plants that can produce antimicrobials against pathogens and enzymes for industry.
A total of 270 bacterial endophytes were isolated from surface sterilized roots and leaves of seven mangrove plants using unconventional media. The endophytes were screened for antimicrobial activities against test pathogens in addition to screening for various enzymatic activities. The bacterial isolates were also identified through 16S rRNA gene sequence analysis.
Molecular characterisation showed the isolates belonging to the Phylum Firmicutes, Proteobacteria, Actinobacteria, and Bacteroidetes. Enzymatic activity assays of isolates showed pectinases, cellulases and chitinases. Antimicrobial screening of metabolites extracted through broth fermentation showed 51% of the isolates had antimicrobial activity against Gram positive bacteria, 50% of the isolates had antimicrobial activity against Gram negative pathogens while 24% had antifungal activity.
The study shows innovation where bacterial endophytes from mangrove plants can be isolated and processed to produce antimicrobials against pathogens instead of destroying the plants to produce. The study also screens the bacteria endophytes for enzymes that can be explored in industry hence harnessing our marine natural resources for use in industries and biotechnology.

Key words: Mangroves, Bacterial endophytes, Enzymes, Antimicrobials

SPATIAL AND GENDERED PERCEPTION OF IMPACTS OF RAINFALL VARIABILITY ON RURAL LIVELIHOODS: INTER-HOUSEHOLD ASSESSMENT OF THREE LIVELIHOOD ZONES IN LOWER EASTERN KENYA.

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Although studies have been done on gender and climate change, past studies have focused on perceptions about changes in climate but have failed to exhaustively focus on gendered perceptions about the impacts of these changes on livelihoods. Past studies have also focused on household as homogenous groups without taking into account different livelihood strategies that they depend on. To address these gaps this study focused on a more nuanced gender analysis, examining how women and men perceive the impacts of climate changes in three agricultural livelihood zones of the study area. The study used mixed methods approach to obtain both quantitative and qualitative data. Data was obtained from inter-household survey consisting of 420 households that were stratified equally depending on the gender of the target respondents. Results of the study showed that perception of rainfall variability was not significantly related to gender as follows; late onset (ß=-0.175, p=0.420), rainfall reduction (ß=0.023, p=0.914), early cessation (ß=-0.256, p=0.236), unpredictability (ß=-0.462, p=0.086) and shortened duration (ß=-0.458, p=0.116). However perception of rainfall variability was significantly related to livelihood zones. Women perceived the impacts of climate variability on livelihoods activities more than men. Impacts that were perceived more significantly by women include: lack of water for livestock (z=-3.286, p=<0.001), loss of income (z=-3.313, p=<0.001), crop/livestock diseases (z=-3.032, p=<0.002), human diseases (z=-2.205, p=<0.027), shortage of water for domestic use (z=-8.039, p=<0.001), insufficient pasture (z=-2.287, p=<0.004) and food insecurity (z=-3.027, p=<0.001). From the study it was concluded that women were more significantly affected by the impacts of climate variability compared to their male counterparts. Perceptions to the impacts of climate variability were shaped by sensitivity of livelihoods activities and level of exposure of the respondent. Generally women were more exposed to the extreme conditions of variable climate since they spent most of their time on the farms and around their homes where the impacts of climate change were felt more.

Key words: Gender, Makueni County, rainfall variability, rural livelihoods, Kenya.

SUB - THEME: NATIONAL VALUES, SOCIAL COHESION, PEACE AND DEVELOPMENT

UTILIZATION OF COMMUNITY BASED TOURIST ATTRACTIONS AND THEIR CONTRIBUTION TO REGIONAL DEVELOPMENT IN BUSIA COUNTY

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Regional development has a strong economic basis and focuses on what firms do in regions and how their performance influence a range of economic indicators such as employment, profit, Gross Domestic Product (GDP) and growth. Tourism has been referred worldwide as the industry of the 21st century and it is one of the most important economic, social, cultural and political phenomena of the century which the State cannot be indifferent to. The tourism sector in Kenya plays a significant role in the country's economic development in terms of foreign exchange earnings, job creation, and poverty alleviation, particularly in the rural areas. Tourism accounts for about ten percent (10%) of the Gross Domestic Product, making it the third largest contributor to the GDP after agriculture and manufacturing. Indeed, due to its high multiplier effects, tourism in Kenya acts as a stimulus to the growth of other sectors, including agriculture, transport, entertainment as well as trade and industry. Economic survey report of 2018 by the Kenya National Bureau of Statistics, highlights tourism as the third largest contributor to the GDP. Accommodation and food service activities sector grew by **14.7%** in 2017. Tourism earnings increased by **20.3%** to KSh**119.9**billion in 2017 compared with **KSh. 99.7** billion in 2016. International visitor arrivals rose by **8.1**% to **1,448.8** thousand in 2017 from **1,339.7** in 2016. It is with regard that this study aims at examining the role of tourism to regional development through utilization of Community based tourism attractions. The study will be aimed at addressing the factors for the development of the community based tourist attractions and how their utilization contributes to the tourism Economic development in Busia County as a region.

The objectives of the study will be: (a) To map out the Geographical Positions of the various community based tourist attractions in Busia County; (b) To assess the direct and indirect contribution of community based tourist attractions to regional tourism development in Busia county; (c)To identify the gaps in the community based tourist attractions value chain; and (d) To propose the planning interventions through the community based tourist attractions can be used to enhance sustainable regional development in Busia County.

A sample will be drawn from the study population where primary data will be sourced from the local community, Domestic and inbound tourists, employees within accommodation facilities, local guides and porters in the destinations, key informants from Kenya Forest Service, the county government and National Environment Management Authority (NEMA) officers. Interviews, Focused group discussions, Library research and observation will be used to get primary data from the respondents. In addition, the study will also rely on secondary data through library research to get related literature for any relevant data on the topics that have already been done in this study area.
The findings from the study will be of great importance as they will be used to reveal how community based tourist attractions aid in regional development through income generation and creation of employment influenced by entrepreneurs in the establishment of village tourist centres. The study will also offer some important contributions to scholars, to researchers, to the tourism sector in the form of new maps, updated data and tourism models as well as to the County government of Busia and Kenya as a whole, through the Ministry of Tourism Development as it will form a basis for formulating policies, guidelines and plans for sustainable Community Based Tourism Development.

IMPACT OF COMMUNAL CRISES ON EDUCATIONAL DEVELOPMENT OF NORTH-EAST SENATORIAL DISTRICT OF BENUE STATE.

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The study investigated impact of communal crises on educational development of North-East Senatorial District of Benue State. Four research questions and hypotheses guided the study. A survey research design was adopted for the study. A sample of two hundred respondents was used for the study. 20 items structured questionnaire constructed by the researcher titled “Impact of Communal Crisis on Educational Development of North-East Senatorial District of Benue State” (ICCEDNESDBS), was used to collect data. Mean and standard deviations were used to answer research questions, while chi-square test was used to test the hypotheses at 0.05 level of significance. The results of the study revealed that communal crises has significant impact on physical infrastructure of schools, students enrollment, teachers commitment to work and students’ school attendance among others. Based on the results of this study, the researcher recommended among others, government should create more job opportunities for the teeming youths, vigorous public enlightment programme by government and non-governmental organizations on ethnic and inter-group relations, security agencies be trained on crises management and elites who have been manipulating ethnic crises should be identified and brought to justice.

NATIONAL VALUES AND SOCIAL COHESION: A PANACEA FOR THE ATTAINMENT OF PEACE AND SUSTAINABLE DEVELOPMENT IN NIGERIA

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Lack of national values and social cohesion in any nation turn to create undoubtedly a very fundamental malaise that eroded the public probity and morality, therefore, it threatens the survival of many nations especially in the developing countries of the world. Africa having the most poorest and least developed countries of third world is seriously battered by the absence of national values and social cohesion, thus subverting the attainment of national development objectives in Nigeria. The researcher rely on qualitative method of research, where previous literatures would be reviewed. The paper examines the ways by which lack of national values and social cohesion inhibited the realization of peace and sustainable development in Nigeria. This is fondly blamed on corruption, poverty, ethnicity, communal/religious crises and other social vices such as commercial sex, drug abuse, electoral mal-practice, indecent dressing, etc. As a mental pill, the paper seek t explore possible solution to the problems of lack of peace and under-development in Nigeria. Consequently the paper recommend a re-orientation of national values and social cohesion amongst the citizenry: the above will serve as a key to the problems of the decline in our values. Moral approaches should be advance in the right direction. These steps be taken so as to reposition our national values, in order to meet the challenges of our time in the contemporary Nigeria.

Keywords: National Values, Social Cohesion, Peace, Corruption, Ethnicity, Development, Crises.

KANTIANISM AS A DETERMINANT OF DISCIPLINE IN SECONDARY SCHOOLS IN KENYA

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Discipline problem has been an issue of concern in the Kenyan secondary school due to an increase in the cases on school unrests in the recent past. Guidance and counseling as discipline strategies in the schools have failed to conclusively deal with the issues of discipline in schools. The purpose of this study was to conduct an assessment of the utility of Kantianism as a discipline strategy in Kenyan secondary schools. The study was guided by three objectives namely; to analyze the relevance of current strategies of discipline in secondary schools in Kenya, to examine the role of education stakeholders such as teachers, parents, and ministry of education in enhancing discipline in secondary schools in Kenya, and to attempt a proposal of Kantianism as a discipline strategy for secondary schools in Kenya. The study employed a critical method. Despite the fact that Kantianism as a discipline strategy is not currently being implemented in Kenyan secondary school, Kantianism has come out strongly as an alternative method to other conventional discipline strategies like guidance of counseling that have failed to tame the discipline problem. Kantianism advocates for autonomy, respecting of students as rational beings and the involvement of students in determining the discipline agenda in schools.

BIG SCIENCE FOR NATIONAL AND REGIONAL UNITY

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Kenya is one of the partner countries of the Square Kilometer Array (SKA) and the African Very Large Baseline Interferometry Network (AVN). The SKA is the world’s largest array of radio telescopes to be operated in Africa and Australia. The project aims to address some of the fundamental unanswered questions about the Universe including the nature of dark matter, cosmic magnetism, extra-terrestrial intelligence, evolution of galaxies. This is the world’s largest science project that will involve experts from diverse disciplines in the region. Experience elsewhere, for example in Europe and Middle-East has shown that big science projects have enabled for nations to work together in achieving their common science goals. Therefore the involvement of the country in big science projects, such as the SKA / AVN presents a unique opportunity to use big science as a means to attain national and regional cohesion and unity. This paper focusses on the experiences of big science in Europe, for example particle physics at CERN and project on the potential for enhancing national and regional unity through participation in big science projects in Africa.

POLITICS AND ARCHITECTURE: DO KENYA'S COUNTY ASSEMBLIES' DESIGN CARRY DEMOCRATIC SOCIO-POLITICAL AND CULTURAL SYMBOLISM?

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This paper seeks to interrogate the exterior and interior architectural designs in Kenya's 47 counties assemblies in order to question the relationship that exists between them and democratic governance and also how representative they are to the cultures of the people they serve and the natural landscape. Exterior architecture of the legislative buildings in many countries have been modelled to capture the philosophies, culture and the natural environment of the respective societies. Furthermore, the interior design of the debating chambers have been modelled symbolically to capture the philosophy of decision-making processes that may be consensual, adversarial, or leader-centered. As Charles T. Goodsell notes, "parliamentary buildings are most prominent symbols of governance in any polity." He further contends that "as self-consciously built stages for the performance of political rituals … they may be assumed to reflect the shared norms of governance and underlying patterns of political behavior that constitute political culture"[4]. It is from such a background that this paper proceeds by asking some key questions: What were the exterior architectural designs adopted by the county assemblies at the establishment of devolved government structures in Kenya in 2013? Did the designs have any symbolic or cultural values? Did the designs borrow any natural environmental landscape within the county? What were the interior architectural designs adopted by the county assemblies? Did the interior designs adopted have any guiding philosophies? This paper is drawn a larger ongoing study that investigates the *Hansard Report Production Processes in Devolved Government Structure in Kenya*. The paper specifically interrogates how infrastructure impacts on democracy and governance. The paper is based on findings from data collected in the 47 county assemblies in Kenya using qesterviews and observation checklist.

Key Words: County Assemblies, Architectural Design, Democracy and decision-making, symbolism, philosophy, Culture

EXAMINING THE NEXUS BETWEEN SOCIAL VALUES, CONFORMITY AND DEVIANCE FOR NATIONAL SECURITY.

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Human societies the world over develop social values to promote conformity and to check deviance. Prevailing needs, problems and challenges of the social and physical environment are usually the determinant factors of developing such values. Perhaps, a society with sound and realistic values developed in line with her needs, problems and detects of the physical environment is expected to reap progress, peace and tranquility. Nigeria as a nation –state is presently experiencing recurrent and persistent crisis with attendant pockets of insecurity. This is a worry to many concern Nigerians. Many tie the phenomenon to poor governance, large- scale unemployment, corruption and weak institutions. This paper however examines the connection that exists between social values, conformity and deviance and its impact on national security. It relied on secondary sources and interview. It revealed that, the nexus between social values, conformity and deviance has negative impact on Nigeria's national security. The paper then recommend for vigorous efforts aimed at value reorientation by various agents concerned.

Keywords: Conformity, Deviance, National Security, Insecurity.

HANSARD PRODUCTION HUMAN RESOURCE CAPACITIES IN COUNTY ASSEMBLIES IN KENYA AND THEIR IMPACT ON DEMOCRATIC GOVERNANCE

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Hansard reports – the verbatim recording of legislative proceedings – form vital software of the democratic governance process since they serve as the official record of the legislative processes. Hansard reports are referenced to by the legislature itself, the judiciary, the executive, oversight bodies such as the auditor-general, and the various publics interested in legislative business. In essence, Hansard reports make transparent the decision-making process of people's representatives in the legislative process, allowing key state actors and citizens to understand, support and assess the decisions made by the legislature as well as take appropriate civic actions. Thus Hansard reports' authenticity, accuracy, conciseness and accessibility or lack of therein impacts on the quality of democratic governance process. At the inception of the devolved government structure in 2013, the only institution of its kind in the country employing the technical infrastructure and expertise for Hansard report production was the National Parliament. In the new devolved government structure, 47 county Assemblies plus the Senate needed to use the technical infrastructure and expertise for Hansard report production. The capacity to record, produce, preserve and disseminate authentic, accurate and concise Hansard reports rests on the ability of the legislative assembly

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to have in place quality infrastructure and technologies, highly competent human resource, and enabling policies to manage the Hansard report production functions. An investigation of all these aspects are the subject of an ongoing sequential explanatory mixed-method study in which the quantitative phase collects data from 47 County Assemblies through questionnaires and observation checklist. The findings of this phase are meant to inform the sampling of about one third of the counties for further in-depth qualitative study. The present paper seeks to present the findings of part of the quantitative phase of the study, which specifically investigates the status of the human resource capacities and policies in the Hansard production processes in the 47 County Assemblies and how the two impact on the entrenchment of democracy in the devolved government structure in Kenya.

Key Words: Hansard reports, County Assemblies, Human Resource Capacities, Democratic Governance, Kenya

THE RELATIONSHIP BETWEEN SOCIAL DEMOGRAPHIC FACTORS AND JOB STABILITY OF UNIVERSITY CATERING EMPLOYEES IN NAIROBI CITY COUNTY, KENYA

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The study sought to establish the relationship between the social demographic factors and job stability of university catering employees in Nairobi City County, Kenya. The study also sought the relationship between the adequacy of welfare initiatives and job stability of university catering employees. The study covered aspects of, employee's characteristics such as job tenure, formal education, professional qualifications, age, attention to the needs of the employees, provision of efficient staff welfare initiatives, implementation and improvement of welfare programs, indirect compensation, employees awareness of welfare initiatives, welfare measures, non-monetary welfare programs, a feeling of being secure, valued, cared and having a positive motivation to remain in an organization. The study demonstrated how employee's social demographic characteristics relate with key facets of job stability such as employees commitment, job satisfaction, organizational commitment and employees retention. It also demonstrated how the adequacy of welfare initiatives relates with key facets of job stability such as satisfaction, conducive working environment, positive attitude and an improved performance. The study was descriptive covering a stratified sample of 189 respondents drawn from 300 employees. Data was collected through self-administered questionnaires and an interview guide questions. The two tailed Pearson product moment correlation was used and interpreted as follows; 0.010 to 0.041 implied, insignificant relationships; 0.041 to 0.70 implied, a moderate relationship; while> 0.70 implied a significant positive relationship. Meanwhile, negative value implied an inverse relationship. On the relationship between social demographic factors and job stability, the demographic factors of; gender (r = 0.881, ∞ = 0.012), age (r = 0.993, ∞= 0.001), marital status, (r = 0.994), ∞ =-0.001, employees experience, (r = 0.803, ∞ = 0.020), employment status (r = 0.806, ∞ = 0.020) and job stability. Moreover, the findings revealed that, there is a moderate positive relationship between job description (r=.577, ∞=-.046) and job stability. On the relationship between the adequacy of welfare initiatives and job stability of university catering employees, A Pearson correlation results p-value of 0.942 was obtained, meaning that there is a strong significant positive relationship between adequacy of welfare initiatives and job stability.

Key Words; social demographic factors, job stability, employee's characteristics, employee's commitment, facets of job stability, job stability, welfare programs, indirect compensation, welfare measures, employee's embeddedness and non-monetary welfare programs.

ASCERTAINING THE INFLUENCE OF GOVERNMENT DYNAMICS ON JUVENILE CRIMINALITY IN NAKURU SUB-COUNTY, KENYA

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Sustainable development is the development that meets the needs of the present without compromising the ability of future generations. It also involves issues of economic development. As examples of Sustainable Development Goals (SDGs), there is need to end poverty in all its forms; promote sustainable economic growth and provide employment for all. The purpose of the study is to ascertain the influence of government dynamics on juvenile criminality in Nakuru sub-county, Kenya. The study objective is: to ascertain the influence of government dynamics on juvenile criminality in Nakuru sub-county, Kenya. The study will be grounded on Social disorganization theory and Social learning theory. The researcher will adopt a mixed methodology approach to carry out the study, since it will have both qualitative and quantitative aspects. Concurrent triangulation design will be used. The study will be carried out at Nakuru sub-county within Nakuru County. The researcher will use a questionnaire and an interview schedule to collect views on the ascertaining the influence of economic dynamics and juvenile criminality in Nakuru sub-county, Kenya. Secondary data will be obtained from crime records, state of juvenile in various urban areas in the world; it will also be collected from police stations, courts, children rehabilitation centers, books, journals, published and unpublished reports from legal and human right center, libraries and web-based materials. The collected qualitative data will be organized into themes and contents. Descriptive statistics will be used to analyze the quantitative data obtained. That specifically will include percentages, frequency counts, charts, mean, standard deviation and inferential statistical analysis of correlation to test the relationship between the dependent and the independent variables. The study will justify if there is an important positive association between all the measures of government dynamics on juvenile criminality in Nakuru sub-county.

EDUCATION FOR PEACE AND SECURITY AND SUSTAINABLE DEVELOPMENT IN THE 21ST CENTURY NIGERIA

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Nigeria of the 21st century has been wobbling and tumbling in its stalled developmental strides. Hopes have been dashed. The rate of change is like one step forward, two backwards. In the light of this, insecurity is observed to be the order of the day. The country grapples with peace and security challenges ranging from Boko Haram insurgency in the North to Niger Delta militancy in the South, kidnapping in the East

and herders-farmers clash in the Middle Belt. Socioeconomic activities have been grounded. Investors are fleeing. Poverty and hunger are on the increase.It was against this backdrop that the researchers sought to examine the relationship between Peace and Security Education and sustainable development in Nigeria. Two hypotheses guided the study. Literatures were reviewed. Survey research design was adopted for the study. The population comprised educators of Peace, Conflict and Security and Development Studies in South-South and North-Central Nigeria. Cluster sampling technique was used to select a sample of 88 respondents from the Universities of Calabar and Benue State. Data was collected by means of structured questionnaires. Both descriptive and inferential statistics were employed for data analysis. Results of the study showed that educating for peace and security at the secondary school level and at non-formal levels of interactionhave predictive relationships with sustainable development in Nigeria. Accordingly, it was recommended that stakeholders in the field of Peace, Conflict and Security as well as Development Studies channel their attention to peace-building enlightenment campaigns through symposia, conferences/ seminars and jingles.

Key words: Peace, Conflict, Security, Education, Sustainable development, 21st century Nigeria.

SUCCESSFUL BUSINESS RELIES ON EFFECTIVE TEAM WITH A HIGH LEVEL OF TEAM COHESIVENESS.

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Background: Teams play an important role in most organizations in today's modern economy. The use of teams has expanded dramatically in response to competitive challenges. Research indicates that teamwork can achieve outcomes that could not be achieved by the same number of individuals working in isolation. However, teams need to be cohesive and effective in order to be successful. Teams drive organizational success, though developing and leading high-performance teams is one of the most complex tasks facing any leader in the current competitive work environment. Cohesiveness is the key factor in implementing effective, high-performance teams. Emotional intelligence also plays a key role in building high-performance teams in that emotional intelligence fosters cohesiveness Druskat, V. and Wolff, S (2001

Material and methods: The author will use library data collection in order to come up with the information regarding effective teams and cohesiveness

Results: A number of organizations depends on effective teamwork as this forms an integral part of their daily work activities. Therefore, teams in need to be highly cohesive in order to enhance team effectiveness. Leaders must understand how team cohesiveness works and how bonding in a team will build energy. Leaders must inspire team members through reinforcing the sense of belonging, empathy in bonding and mutual respect, in addition to giving people choice and power over what they can do. Ross, Judith A., (2006). . Once that sense of support, that foundation, is created, the result is limitless inventiveness.

Conclusions: As a manager one needs to take the lead in creating a positive, team-oriented environment. This requires much more than just pulling a group of employees and labelling them a 'team' one needs to turn the talents, knowledge and efforts of individuals into a collective force.

Keywords: groups, group cohesion, role perception, performance, motivation, cohesiveness

SUB - THEME: VISUAL AND PERFORMING ARTS, MUSIC, SPORTS, HOSPITALITY, TOURISM AND DEVELOPMENT

THE ROLE OF TOURISM ENTREPRENEURSHIP IN BRIDGING THE GENDER GAP AND PROMOTING SUSTAINABLE DEVELOPMENT: CHALLENGES AND OPPORTUNITIES

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Tourism is a key pillar of sustainable development globally. In Kenya, it contributes to 10% GDP and is responsible for creation of 1 in every 11 jobs. It is therefore a useful tool for poverty alleviation, empowerment and improvement of the quality of life people. Tourism also provides the impetus for conservation of both the natural and cultural resources thereby contributing to the economic, social and environmental pillars of sustainable development. Given its significant contribution to the country's development agenda (the big four) and ultimately the sustainable development goals, it is imperative that both gender be empowered to meaningfully participate in tourism. This paper aims at reviewing literature on the role of tourism entrepreneurship in bridging the gender gap and promoting sustainable development. The objectives will include; establishing the gender gap, examining the opportunities available to women entrepreneurs, identifying the challenges facing women entrepreneurs, and making recommendations on how to close the gender gap. The paper will review literature published in scientific journals, books, theses, government publications and reports by searching electronic data bases and perusing hard copy documents using the key terms below. The resultant data will be analysed using content analysis. It is envisaged that the findings from this paper will yield comprehensive documentation, insights and trends, identify gaps and provide direction for future research on gender, tourism entrepreneurship and sustainable development.

Keywords: Tourism entrepreneurship, gender, sustainable development, poverty, opportunities, challenges.

THE ROLE OF UNIVERSITIES IN SUSTAINABLE DEVELOPMENT GOALS: THE ERASMUS+ PROGRAM FOCUS

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Education, research, innovation and climate change factors are unequivocally apprehended in a number of Sustainable Development Goals (SGDs) where universities enjoy a first hand-role in addressing them. Universities, under their thorough research and exertions, have a vital role in the provision of necessary and reliable knowledge, evidence-based, answers and coinages to support achieving SDGs. The SDGs provide a platform for the educational institutions to give back to the community by exhibiting their desire and meaningful opportunities to develop their own countries. This anchors the need for this paper in examining the role of universities in achieving the SDGs through research, leadership, and innovation. In addition, examine the barriers towards implementation of SDGs; budgetary, political and resource constraints, globalization, and trade-off of goods and services, lack of positive interlinkages, timescale factor and special scale. The study has a keen interest on the works already done by the European Commission through the Erasmus+ program (2009-2013) and Erasmus+ programs (higher education students, stuff mobility programs, and Jean Monnet initiatives). The study also covers how these programs have contributed to collaborations and partnerships with even the third world countries on matters of education, training, innovation, youth empowerment, and research i.e. Konstantinos and Marilena initiatives. All the results identified points that 82 % completion rates which translate to 74% success in achieving SDGs.The paper concludes by urging that; change-makers require the knowledge, skills, values, and attitudes that empower them to contribute to sustainable development. Higher education, therefore, is crucial for the achievement of sustainable development.

Key words: Sustainable development Goals, Mobility program**,** Higher Education**,** Knowledge, European Commission.

THE EFFICACY OF TALENT MANAGEMENT ADOPTION ON ENHANCING TOURISM AND HOSPITALITY PRODUCT (CLASSIFICATION AND STANDARDIZATION) IN FIVE STAR HOTELS IN NAIROBI COUNTY

Omoke Japheth Omae

The adoption of talent management creates resources that are rare and difficult to imitate but produce unique and quality products which lead to sustained competitive advantage. These rare resources are talent individuals who have intellectual capital, knowledge, skills, and unusual innate ability. Hotels would need to attain a certain number of these for these individuals for them to be considered as five star hotels. Thus classification of hotels into different classes creates expectations and perceptions on the quality of their products. For instance; talent individuals in five star hotels must demonstrate high level of technical skills to produce dishes of the highest international standards. In addition, these talent individual must be knowledgeable and express emotional intelligence all the time so that quality products are not overshadowed by unsatisfactory service. These aspects will contribute to an overall superior product. Greater approvals of these products by guest would lead to their standardization which provides them with competitive advantage. The World Bank's report on Kenya's Tourism, 2010; The National Tourism Strategy 2013-2018; and The German Development Cooperation (2017) found out that hospitality organizations are struggling to find suitable workforce for technical jobs. The adoption of talent management enables organizations to developed workforce with technical abilities. The objective of this paper was; to evaluate the extent of talent management adoption among five–star hotels in Nairobi County. The study adopted a mixed method research design, and specifically QUAL + quan mixed method design. Purposive sampling was used to select five star hotels in Nairobi County and the management team respondents. Simple random sampling technique was used to select guest participants. Pre-testing of the research instruments was carried out in two hotels that were five star-rated. Cronbach's coefficient Alpha was used to assess the reliability of the research instruments and alphas less than 0.6 were dropped. Data were collected from 145 informants using semi-structured questionnaire. Analysis was done using; descriptive statistics (percentages, mean, standard deviation), multiple regression analysis. Multiple regression results revealed that; the regression model correlation coefficient R was (0.952) which indicated that there was a significant relationship between the predictor variables and the dependent variable. Moreover, results showed a significant overall regression model coefficient of determination of R^2 = 0.907, indicating that approximately 90.7% of the variance in competiveness of five star hotels could be explained by the model significant predictor variables. The predicators were: hotels systematically identify future business needs

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in terms of knowledge, skills and capabilities; hotels identify pivotal talent positions; hotels identify pools of high potential and high performing incumbents in pivotal talent positions; hotels consistently attract high-quality applicants to constitute a talent pool for future deployment; hotels train and develop only talented individuals that are likely to add value to the hotel; formal succession management is used to fill executive positions throughout hotels; hotels provides a meaningful pay differentiation to high performers; hotels have leadership programs focus on high potential talent to grow; hotels' talent management plan involve only pivotal jobs and positions; and individuals are treated differently on the basis of whether their work is pivotal to the success of hotels. The implication is that; five star hotels in Nairobi County have adopted talent management approaches that enables them develop talent individuals who make unique and quality products. This strengthens their status as five star rated.

Key words: Talent Management; Classification; Standardization; Talent Individuals; Technical skills; and Knowledge Intensive Positions

ROLE OF CUSTOMERS' BRAND PERCEPTIONS ON PLACE BRAND EQUITY IN WESTERN KENYA TOURISM CIRCUIT

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Many destinations have open up to and invested in the tourism industry leading to heightened competition between them. This has brought to fore the concept of place brand equity, where destinations seek to highlight their value to not only visitors, but also residents and investors. Tourism destinations have therefore developed strategies to enhance their brands. In Kenya, the National Tourism Blueprint 2030 recognizes that the tourism industry plays an important role in
Kenya's economy. It also acknowledges that various tourism circuits in Kenya are at different levels of tourism development, which is attributed to each circuit's place brand equity. The purpose of this study therefore, was to examine the role of customers' perceptions in influencing place brand equity in the WKTC. The study was guided by four specific objectives:- to determine the influence of customers' brand awareness perceptions on place brand equity; to evaluate the of customers brand quality perceptions on place brand equity; to explore the effect of customers' brand image on place brand equity and to investigate the role of customers' brand loyalty on place brand equity. The study employed a cross sectional descriptive survey design, using a mixed methods approach. The study's sample size was 309 customers to tourism enterprises in the four Counties Kakamega, Kisumu, Kisii and Busia in the WKTC. Data collected was analyzed in SPSS 21, using descriptive statistics to infer variable characteristics. The results of the Pearson correlation coefficient analysis r=0.588, p=0.000, adjusted R^2=0.343 showed that 34.3% variation in place brand equity can be explained by customer brand perceptions. The findings of the study show that customers brand perceptions statistically significantly influence place brand equity in the WKTC, with the most significant predictors being brand awareness and brand loyalty. The study recommends that the WKTC County Governments and the national government spearhead development and management of the WKTC destination brand. This will enhance awareness about WKTC and improve loyalty to the destination. Tourism entrepreneurs in the region also need to take advantage of the numerous resources that abound in the region to develop products and services in order to enhance the WKTC brand.

THE NATURE OF URBAN TOURISM DEVELOPMENT; USING THE DESTINATION TRANSITION POSSIBILITIES FOR NAIROBI CITY COUNTY, KENYA

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Nairobi, the Capital City of Kenya, has since 1890 grown from a simple Uganda railway construction camp named "*enairobe*" in Maasai language to a modern center of commercial, financial, manufacturing and tourist destination. However, statistics have shown some downward trends in city tourism performance in the recent years. This study aimed therefore to investigate the status of the Urban Tourism development, using the options of destination transition possibilities of either sustainable or unsustainable mass tourism. The main tools of data collection were structured questionnaires and interview schedules while the target population for the study was tourists who had visited Nairobi's attractions and the facility managers. Purposive sampling was used to select the facility managers interviewed while a sample of 200 tourists was achieved through convenient random sampling. The study found out that the City of Nairobi is developing into a unsustainable mass tourism destination characterized by high volumes of tourists mainly on package tours; has distinct high and low seasons; tourists coming from a few dominant markets; non local owned large corporations, with linkages being mainly external; has extensive income leakages characterized by low multiplier effect; controlled by non-local private sector with minimal amount of regulation; is controlled by free market forces, with economic growth, profits that are sector-specific, and finally regulated by short term gains. Comparatively, tourists from the rest of Africa showed highest levels of satisfaction of their holidays. The study concludes that Nairobi is a viable tourist destination in Africa, and recommends that all efforts should be put to develop it; establish and implement a master plan by all the stakeholders; and encourages the Nairobi City County Government, the Kenya Tourist Development Corporation, Kenya tourist Board and other stakeholders to focus on the development of tourism infrastructure and marketing for the city.

Key words: Urban tourism, Sustainable mass tourism, alternative tourism, tourism development

FORT PORTAL: UGANDA'S TOURISM CITY?

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Globally, tourism continue to be recognized as a dynamic sector of development contributing substantially to Gross Domestic Product, employment, conservation and social economic development. In Uganda, with an annual growth rate of 7.1% it contributes US$1,914 million, 7.5% of GDP, and 6.6% of total employment and is the leading service export. Uganda has been divided into tourism clusters and the Rwenzori cluster on the Western Tourism Circuit is headquartered in the colonial town of Fort Portal which is 297 kilometres west of Kampala the capital city. The objective of this paper was to use the International Key Performance

Areas to establish if Fort Portal qualifies to be a tourism city. Quantitative and Qualitative data was collected through field visits and interviewing the main stakeholders on the performance of Fort Portal in respect of the Key Performance Areas namely: destination management, economic, social and environmental perspectives; technology and new business models. The results indicated that tourism management in Fort Portal and Kabarole district as a whole is headed by the District Tourism Officer under the Ministry of Tourism Wildlife and Antiquities, while the Rwenzori tourism cluster has District Association management teams. Fort Portal has diverse tourism attractions which include the royal palace, royal burial grounds, cultural events, botanical gardens, crater lakes, caves the most popular being the Amabere ga Nyinamwiru. Fort Portal is the gate way to Kibale, Queen Elizabeth, Semuliki, Mt. Rwenzori and Murchison falls National parks. The town is easily accessible by road and telecommunication to the national parks, major towns while banking, medical facilities, travel agents, hotels, hostels, restaurants, recreation and exclusive high class accommodation facilities are available. These results indicate that Fort Portal is a dawning tourism developer with emerging tourism infrastructure, gradual tourism growth, lower tourism concentration but with potential to grow.

Key words: city tourism, sustainable product development, cultural heritage, conservation, crater lakes.

PROMOTING SECONDARY SCHOOL STUDENTS' LEARNING OF SOCCER SKILLS THROUGH SCIENCE PROCESS SKILLS

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Science is important to the world today and also to the future. However, the use of different skills in teaching and learning of Sport can help learner to take responsibility of their own learning. Soccer is among the most thoroughly researched areas in sport education which often includes among other things, the physiological demands on players as well as skill acquisition and interventions to maintain such skills. Therefore, enhancing players' skill which can be tactical and technical in nature requires higher level order of thinking processes which can be made available by science process skills. This study suggests science process skills acquisition by these future soccer players in order to develop effective mental attitude and aptitude during training. It is an experimental study which involves forty four (44) junior secondary school students purposefully selected from four (4) secondary schools football team randomly selected from the eight (8) public secondary schools in Ikere local government area of Ekiti State, Nigeria. The schools were randomly assigned to two experimental and two control groups. The experimental groups were trained for a period of eleven (11) weeks with the aid of science process skills while the control groups were trained based on usual football training session. Thereafter, the two (2) groups were made to engage in football competition with the intention of looking for the impact of science process skills acquisition on soccer players. The three (3) research questions generated for the study were answered using inferential statistic of ANCOVA based on the data collected on pre and post test basis. The result revealed significant difference in the skills and attitudes of the two groups of schools; it was therefore recommended that schools and soccer clubs should adopt the use of science process skills to enhance players' skills acquisition in Nigeria.

Keywords: Science, Sport, Soccer skills, Science process skills, Attitude, Training, Education

DEVELOPING AND MARKETING CULTURAL TOURISM IN KENYA USING GEOGRAPHIC INFORMATION SYSTEM

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Cultural tourism is one of the fastest growing and most popular niche markets today. Kenya is well known for the warmth and welcoming spirit of its people. This country, which is full of contrasts and diversity, has been crossed by the paths of a long and complex history, therefore becoming one of the most diverse African regions culturally and linguistically, with forty three distinct ethnic communities. Although some native African cultures have been diluted in many parts of the country by outside influences, many traditional societies and culture with modern norms and values still exist. On the other hand, some communities still retain their traditional culture and ways of living. Rich cultural experiences are developed in the country including song and dance, cuisine, arts and crafts, clothing, stories, religion, sports, language and theatre. The successful development and marketing of cultural tourism can be achieved through the use of Geographic Information System (GIS). GIS is a computer-based database used to store, integrate in layers and display data of a geographical nature. This study uses GIS in describing the potential for cultural tourism in Kenya, for both international and domestic tourists. This has been done by mapping cultural tourism in the county, with detailed account of what makes every culture unique. This will help develop cultural products and services that capture the imagination and exceed the expectations of target consumers. GIS makes the product compelling, distinctive, joined-up and consumer needs-focused. This will enhance planning and implementation that involves cooperation and coordination within the country. It will also enable marketing culture in line with current destination concepts and provide a platform for improving the economic performance and sustainability of tourism in the country.

TOURISM RESILIENCE AND BUSINESS CONTINUITY IN THE HOTEL SECTOR IN KENYA

Angeline Wangui Kinyanjui

Tourism has been recognized as one of the key drivers of economic growth and poverty reduction in Kenya, due to its great multiplier effect and its ability to catalyze growth in all sectors of the economy. The performance of the hospitality sector in the country as a whole has been on the decline. In the recent past, the industry has been hard hit by various crises. High on the list are the acts of terrorism and the accompanying travel advisories from source markets due to insecurity. Crises from and linked to developments in the economic, socio-cultural, political and environmental spheres with profound effects on demand for, and supply of related services have been a constant threat to the hospitality industry as evidenced by a downward trend of the Key Performance Indicators such as occupancy rates, revenue per available room among others. Slight improvent on annual occupancy rates for two years 2016 and 2017 was noted, although regardless of the observed growth, the combined total number of visitor arrivals in 2017 was below the 2013 levels (KNBS, 2018) and below the countrys second medium term plan 2013-2017,

(KIPPRA, 2018), leading to; reduced revenue contribution to the economy by the industry, loss of profits by the enterprises, loss of job opportunities and scalling down of operations by affected hospitality businesses, (KIPPRA, 2016). These fluactuations reflect the impacts of macro events such as global financial crisis, political instability, terrorist activities and the accompanying travel advisories by major source markets, natural disasters among other crises on the perfomance of the industry. The vulnerability of the industries to crises and resultant negative impacts magnifies the importance of business continuity planning and making much needed efforts to create befitting crisis management approach as to engender resilience. Business continuity is a critical crisis management approach. Understanding preparedness and risk coping mechanism by which industry resilience is achieved is of importance, due to the ever increasing frequency of negative events impacting on the the industry in thus increasing its vulnerability to external events. Resilience is seen as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions, In this case it relates to the ability of the hotel business to withstand the impacts of external forces while retaining their integrity and ability to continue functioning.The vulnerable nature of the hospitality and tourism industry makes planning for and improving resilience a priority for all destinations for sustainability. Assessing resilience of a destination is challenging, hence good planning and preparedness is paramount. An insight into the nature and extent of the sectors' resilience to shocks cannot be overemphasized more so, for the country's' economic growth and development. There are two major facets of business resilience. Planned resilience which is the existing planning capacity in an organisation which enables it to ensure business continuity and undertake standard risk management initiatives, and adaptive resilience which is the ability of an organisation to respond successfully to a crisis. Organization resilience is attendant to the ability of an organization to operate in critical emergency functions, to induce decision making and to take necessary action. It allows maintainence of normalcy during a major crisis and timely recovery without excessive damage or loss, accomplished through the transmission of resources and shared information. This in essence involves Business Continuity planning which provides a framework for building organizational resilience with the capability of an effective response that safeguards the interests of its key stakeholders, reputation, brand and value creating abilities

ENABLING COMMUNITY PARTICIPATION IN THE TOURISM VALUE CHAIN: AN EVALUATION OF THE HANDICRAFT INDUSTRY IN UGANDA.

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Despite the appealing growth and development of the tourism sector in developing countries, local linkages in the value chain are still constrained by its vertical organization which does not allow domestic stakeholders to derive a formidable share of value from the sector. This implies that tourism development in the developing countries does not automatically steer local development. However, the handicraft sub sector has been advanced as one of the main channels through which communities can join the tourism value chain and benefit from the accruing revenue. In Uganda, the handicraft sector which has been hither to cultural is increasingly becoming commercial due to the increasing demand for the products both locally and internationally more especially with the development of the tourism industry and promotion of non-traditional exports. Using data generated through key stakeholder interviews, secondary sources, site visits, observation and focus group discussions, this paper evaluates the handicraft sector in Uganda and draws a value chain map for the handicraft related business and the implication of this sub sector on local development and community empowerment. The value chain is made up of raw material suppliers, producers, marketers and consumers. It is externally impacted on directly and indirectly by Government, Non-Government Organizations, development partners and private sector who focus on improving the quality of the final product, empowering the local stakeholders and increase their earnings. Handicraft production is cultural/ traditional from a predominantly cottage industry dominated by the youth, women and physically challenged persons most of whom have no or limited formal education. It is stimulating rural entrepreneurship, employment, indigenous knowledge, skills, adding value to the raw material, reducing poverty at household level and export diversification. The major challenges are inconsistent raw material supplies, fragmentation/individualism of the players, inadequate capital and skills, marketing and consumption controlled by external players.

Key words: participation, value chain, handicrafts, empowerment, tourism.

INFLUENCE OF ORGANIZATIONAL CULTURE ON WOMEN CAREER ADVANCEMENT IN THREE TO FIVE STAR HOTELS IN NAIROBI CITY COUNTY.

Leah. W. K. Maringa

The profile of the hospitality industry is characterised as youthful with a high proportion of women. Statistics show that even though the majority of the hospitality industry's workforce is female, women are still under-represented in senior positions and general management roles. There is a gap in the understanding of the organizational culture factors that either enable or inhibit advancement of women into the top management levels in 3 to 5 classified hotels in Nairobi City County Kenyan. This study seeks to understand if organizational culture in hotels influences women career advancement. The main objective is to identify the organizational cultural factors that promote or inhibit women career advancement in the Nairobi City County Classified hotels. The conceptual model proposes that due to certain characteristics such as culture beliefs about gender, found in hotels organizational culture can greatly impact on woman's career advancement. Qualitative approach will be used to collect the required data using interview schedules for 35 top hotel managers. Descriptive statistical measures will be used to describe factors and causes of the gender disparities in the hotel. The study will use simple regression analysis to test the hypothesis developed and will provide a means of objectively assess the degree and the character of the relationship between the dependent variable organizational culture and the independent variable women career advancement.

BUILDING ON THE TOURISM CIRCUIT IN KENYA: THE ROLE OF MARKET DEVELOPMENT STRATEGIES IN HOTEL INDUSTRY

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Tourism development in Kenya is supported by the government Vision 2030, under the economic and macro pillar. Kenya as one of the many recognized tourism attraction countries has gained popularity and seen a surge of international tourists in the country exploring the tourist attraction sites. With the increased growth of tourism there's also increase in demands by tourists such that failure to provide a variety of customer experience causes reduce inflow of these international tourists, as suggested by past studies. Currently, the Kenya government has embarked on efforts to promote domestic tourisms, most notably by the establishment of tourism circuits. Tourism circuit enables the grouping of various tourism activities within a region and provide them as a package to tourists. In Kenya, tourism circuits include Central, Western, Northrift , Southrift, Nairobi, North Eastern ,Coastal and Eastern circuits. Despite these efforts, domestic tourism remains seasonal and a phenomenon to be solved. To address this issue, the study sought to establish the role of market development on the building of tourism circuits in Kenya. The study was anchored majorly on the Ansoff's matrix. The study used secondary research design where past empirical studies were analyzed. The study found out a significant influence of market development on tourism circuit and suggests a future empirical study for comparison purposes, the study further proposes a conceptual model to further inform the relationship between market development strategies and growth of tourism circuit in the hotel industry.

Keywords: tourism circuit, domestic tourism, market development, product usage,

VALUE CO-CREATION ON GUESTS' LOYALTY IN CLASSIFIED VACATION HOTELS IN MOMBASA COUNTY, KENYA

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Value co-creation is a business strategy that can enhance the performance of modern hospitality firms. This study sought to investigate the influence of value co-creation on guests' loyalty in classified vacation hotels in Mombasa County, Kenya. The study was guided by the Dialogue, Access, Risk Taking return and Transparency (DART) model of value co-creation and the confirmation-disconfirmation theory. The researcher adopted the embedded mixed method research design and pragmatism paradigms and philosophical assumptions. General Managers (n=7) participated in interviews by purposive sampling whereas the guests (n=100) by simple random sampling with 14 guests from each hotel. Two hotels were used for pretesting. The relationship between value co-creation and guest loyalty was measured using Pearson Product Moment Correlation coefficient while the mediating role of guests satisfaction on the relationship between value co-creation and guest loyalty was analyzed using multiple regression analysis. Out of the 94 guests who responded, 60.6% of them were males. Majority of the guests aged between 31 and 40 years and they had attained post- secondary education. In terms of nationality, most of the guests (47.9%) in classified hotels were Kenyans. The main reason for visiting the classified vacation hotels in Mombasa was mainly leisure purposes. The study further established a Significant positive relationship between dialogue (r=0.228, p=0.27), risk taking return (r=0.299, p=0.003), access to hotels through ICT (r=0.259, p=0.05) and transparency (r=0.239, p=0.021) and guest loyalty in classified vacation hotels. The study further found out that guest satisfaction played a mediating role between value co-creation and guest loyalty. This means that value co-creation increases guest satisfaction, and in turn guest satisfaction increases guest loyalty.

Key Words; Value Co-creation, Guests Satisfaction, Dialogue, Access, Risk Taking Return, Transparency, Guests Loyalty.

COMPOSITION OF MOSQUITOES IN ECOLOGICAL HABITATS OF LAKE BARINGO BASIN DURING UNPRECEDENTED FLOODING

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Geological disturbances were previously reported to cause unprecedented flooding of Lake Baringo 50 years ago. Recently, this phenomenon reoccurred between the years 2011 to 2014. A total of 88 Km^2 (61.3%) of shoreline land was submerged. Because of the importance of the basin as habitat to mosquitoes that transmit arboviral diseases, a study on their composition and distribution was carried out during the flooding phenomenon in three ecological habitats. The habitats were swamp marshy, flooding shoreline and dry rangeland habitats. Eighteen (18) CDC light traps were used to trap mosquitoes around homesteads and grazing fields located in the ecological habitats for a period of 12 months. A total of 386,624 mosquito individuals were captured. There were 10 genera of mosquitoes identified with genus Mansonia constituting 84.9%, Culex 10% and Anopheles 3%. Other genera were rare, constituting only 1.5%. The composition of mosquito genera also differed significantly in ecological habitats. In conclusion, the unprecedented flooding did influence the composition and distribution of mosquitoes in the basin which could affect the risk to arboviral diseases.

Key words: Mosquitoes species, flooding; composition

ORGANIZATION CULTURE ORIENTATIONS AND EMPLOYEES TURNOVER AMONG PRIVATE MEMBERS GOLF CLUBS WITHIN NAIROBI CITY COUNTY- KENYA

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In a recent survey conducted by Hillier Hopkins LL across United Kingdom, findings indicated that there was a decrease in the average staffing number in members' golf clubs as compared to 2015. The numbers had fallen by 21.4%. The decreases was occasioned by raising staff cost. This implies that the cost of recruiting new employees in the private members' golf clubs will continue to raise. In a conference presentation by National Club Association Southwest Regional Conference (USA) in January 2014, it asserted that the golf clubs will continue to encounter difficulties in acquiring and retaining right employees. Clubs often serves as training ground for staff who then leave for greener pastures. Kenya Vision 2030 of maintaining a sustained economic growth of 10% per annum over the next 25 years will only be possible if organizations develops mechanism to retain their manpower who will offer premium quality service. Kenya bureau of statistics indicates that in 2016 international arrivals by purpose, 72% of the total arrivals were on holiday. A 10% employee turnover annually in an organization may look to be low and healthy. But if the staff quitting are topmost performers, that's a strong warning that the organization's employee turnover is unhealthy. This study will evaluate the influence of organization culture orientations on employees' turnover among private members' golf clubs employees in Nairobi City County. To achieve this goal, the study will determine the influence of clan, adhocracy, market and hierarchy culture orientation, and evaluate the moderating effect of employees demographics on employees' labour wastage indexes among employees working in private 18-holes golf course members' clubs in Nairobi City County.

CONNECTING FARMERS TO THE MARKET THROUGH AGRICULTURAL MARKETING AUTOMATION FOR FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

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Food security is a key pillar to achieving sustainable development goals and the other three pillars outlined in the Big Four Agenda. Eradicating poverty and hunger as well as improving health and wellbeing depends largely on the success of agricultural marketing. The current global warming and climate change has caused widespread unpredictability in the demand and supply of agricultural produce. Most farmers lack access to market information about demand, supply and appropriate pricing. This has increased losses for perishable produce and high costs of storage for nonperishables. The agricultural value chain is too long, with several middlemen, which robs the farmer a fortune. The purpose of this paper was to conduct an action research on how technology can be used to connect farmers to the market, provide them with information on demand, supply, pricing and link producers directly to consumers. The researchers adopted a secondary data method and market intelligence to review challenges in the agricultural market and existing technological marketing platforms including social media and models an open market place solution to bridge the market gap. This review led to the development of a technological innovation that links a seller to a buyer through an Android Mobile phone application referred to as SokoBora. The core role of SokoBora is to link sellers with the buyers with the aim of minimizing the cost of transport through matching the nearest buyer to the nearest seller by region, revealing demand and reducing wastage caused by slow demand, consolidating data on demand and supply of products by region, and opening up external markets to farmers. In this paper, we explore how this application can connect farmers to the market through an automated system, and the relevant countrywide reports that can be generated to guide agricultural production and supply that matches the demand by region. This application can be accessed via the link below

Keywords: Food security, Agricultural Marketing, Technology, Customer Relationship Management, Automation, Market Access, Farmers, Agricultural Produce, Big Four Agenda, Sustainable Development goals

COLLABORATIVE RESEARCH APPROACH FOR CONTROL OF EMERGING NEGLECTED ZOONOTIC DISEASES IN KIAMBU COUNTY, KENYA

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Background: Emerging infectious diseases are a threat to public, with estimates of 60% of the known infectious diseases in people being zoonotic and 75% of new emerging diseases are from animals. Neglected diseases such as Taenia solium taeniasis/ Cysticercosis (Pork tapeworm) pose a huge health burden and reduce the value of livestock assets. A multidisciplinary, multisectorial consortium was formed to investigate the emergence of cysticercosis, a neglected meat borne infection in Thika Sub-County, Kiambu. The study was done from May 2016 to June 2017 with the purpose to investigate the prevalence and factors associated with taeniosis and porcine cysticercosis in Thika Sub County. The specific objectives were to determine the prevalence and factors associated with Taenia solium taeniosis/ cysticercosis, prevalence of porcine cysticercosis in pig farms and seroprevalence of porcine cysticercosis in pigs slaughtered in abattoirs in Thika.

Findings: Taeniosis was present among the community members with prevalence at 6.3 % while thirteen cases of cysicercosis have been recorded in Thika Level 5 Hospital. The level of awareness among pig consumers and vendors on taeniosis/ cysticercosis was found to be low with fried pork being the most preferred method for pork preparation. Prevalence of porcine cysticercosis by lingual palpation was reported at 1.81% among the farms surveyed and seroprevalence using antigen ELISA was 1.83% in slaughter pigs at the abattoirs.
Impact achieved: Awareness of this disease was created to stakeholders in a research dissemination workshop. A linkage of Kenyatta University and Kiambu County was formed.
A policy brief was developed.

Relevance to the conference theme: Provides a model and platform for future collaborations and is in line with the conference theme of sustainable development goal, Universal Healthcare.

Key words: Taenia, solium, Abattoir, surveillance, Pork, tapeworm, Cysticercosis, Zoonosis

CONSTRUCTION AND GOVERNANCE OF TRANSNATIONAL HIGHER EDUCATION RESEARCH PARTNERSHIPS IN KENYA AND UGANDA

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The significance of cross-border partnerships in strengthening institutional capacities, and promoting economic competitiveness and sustainable growth is not in dispute. This study was designed to critically examine and evaluate the organization, policy frameworks, and governance structures associated with diverse forms of transnational research partnerships in six universities in Kenya and Uganda; including how existing research networks interface with national development and institutional priorities. Traditionally, universities in the two countries have embraced transnational partnerships and collaborations mostly as a source of revenue and academic capacity building; while more recently the focus has been to enhance institutional reputation and improve university ranking scores. Findings show that the study universities have put in place at least some form of policy framework to guide partnerships development as well as governance structures to manage the partnerships. Some of the reported benefits associated with transnational partnerships in the study universities include building teaching and research capacity and development of curriculum. This is however not without challenges that need to be addressed for optimal benefits. Among the challenges experienced are, inadequate funding and low university investment in research in Kenya and Uganda.

Key words: Research, Transnational partnerships, Governance

INFLUENCE OF ORGANIZATIONAL LEADERSHIP ON IMPLEMENTATION OF STRATEGIC PLANS IN UNIVERSITIES IN MOUNT KENYA REGION, KENYA

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In this period of globalization when the world is consistently experiencing numerous rapid changes in various fields, the environment in which organizations now operate is never predictable and stable. This has led to strategic planning to provide an operational framework allowing organizations to cope with changes and gain a competitive edge. The purpose of this study was to determine how leaders in an organization can influence the implementation of strategic plans with a focus on Mt Kenya Region. A descriptive cross sectional survey was used in this study. The study's target population was 295 heads of departments from 8 universities in Mt Kenya Region. Stratified sampling and later purposive sampling technique was used incorporating the slovin's formula to get a sample size of 170 respondents. Data analysis was carried out using appropriate statistical techniques and results presented in standard format. The study carried out a correlational analysis in order to ascertain the relationship and strength of associations between organizational leadership and implementation of strategic plans. The findings indicated that organizational leadership had a moderate and significant relationship with implementation of strategic

plans. The study revealed that the leadership attributes that influence implementation of strategic plans in Universities include communication effectiveness, availability of strategic plan, commitment towards the strategic plan, explaining the benefits of the strategic plan to employees and delegating power to employees in decision making. The study concluded that organizational leadership has an influence on implementation of strategic plans in Universities Mt Kenya region.

Keywords: Implementation, Strategy, Strategic Plan, Organizational leadership, Communication

ANTIPROLIFERATIVE POTENTIAL OF SELECTED KENYAN AROMATIC PLANTS AGAINST BREAST AND PROSTATE CANCER

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Cancer is among the leading causes of morbidity and mortality worldwide and accounts for up to 32,000 deaths annually in Kenya. Surgery, radiation and chemotherapy are the current treatment techniques for cancer; however, these methods are expensive, have high failure rates and have been associated with detrimental side effects. Essential oils have been shown to target cancer cells and are able to increase the efficacy of commonly used chemotherapy drugs. The present paper reports the *in vitro* antiproliferative potential of twenty nine essential oils against breast (HCC 1395) and prostate (DU145) cancer cell lines. Cytotoxicity of these essential oils was also evaluated on normal (Vero E6) cells. MTT dye was used in the determination of the antiproliferative activity. The selective inhibitory activity was also determined and expressed as selectivity index (SI). On breast cancer cells, E8 and E21 exhibited the most inhibition with IC_{50} values of 2.12 µg/ml and 4.96 µg/ml respectively. A number of oils including E5, E6, E7, E10 and E17 showed high antiproliferative potential with IC_{50}< 20 µg/ml. On prostate cancer cells, most of the essential oils exhibited very high antiproliferative activities. E3, E4, E7, E8, E10, E11, E12, E15, E16, E17, E19, E20, E23 and E25 had IC_{50}< 5 µg/ml showing their very effective antiproliferative properties. From the results obtained, the essential oils exhibited selective inhibition to cancer cells while sparing the normal cells (SI ≥ 3). However, cytotoxicity to the normal cells was observed in some essential oils (SI ≤ 3). In conclusion, this study confirms potential application of these essential oils in cancer management and act as a lead to cancer drug development.

Kewords: breast cancer, prostate cancer, aromatic plants, essential oils, cancer cell lines

KNOWLEDGE MANAGEMENT AND ENTREPRENUERSHIP IN UNIVERSITIES

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Universities have been recognised both locally and globally as key drivers of technology, creativity and innovation across various disciplines. The significance of these higher learning institutions particularly is marked by its inclusion under the social pillar of the Kenya Vision 2030. These universities for decades been known for enterprising culture where for instance Moi university and Egerton universities are known for agricultural products , Jomo Kenyatta university is known for technological innovation aside from other universities having facilities such as hospitals and even funeral homes, bookshops, event hosting arenas , conference and accommodation facilities. Despite this enterprising culture, past studies suggest that these universities continue to grapple with financial downturn where workers remain unpaid, facilities face dilapidation and in the long run pose a threat to continued student attraction and service quality, hence a managerial issue as to acquisition of relevant knowledge and use of knowledge for sustainability of universities. In bid to address this issue, the study embarked on evaluating the types of knowledge management practises available for university management and the moderating role of university governance on the relationship between knowledge management and entrepreneurship. Secondary content analysis was considered as the main research design, where past studies on knowledge management and entrepreneurship in universities were reviewed. The study established existing relationship and concludes that knowledge management plays a critical role in entrepreneurship. Further, a conceptual model was established for further empirical investigation

Key words: Entrepreneurship, Governance, Knowledge Management, Entrepreneurial culture

UBORA: COLLABORATIVE OPEN DESIGN FOR SAFER MEDICAL DEVICES

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UBORA (“excellence” in Swahili), a project funded by European Union, brings together European and African Universities and their associated technological hubs to create an e-Infrastructure for the co-design of open source biomedical devices to address current and future global healthcare challenges with particular attention to local needs and constraints. The e-Infrastructure is aimed at stimulating innovation in the field of BME through knowledge distribution, promoting harmonization of biomedical device requirements with subsequent impacts on healthcare services and ultimately on patient safety.

This e-infrastructure enables a peer-to-peer evaluation before submitting the documentation to the regulatory authorities, if a company wants to transform the project into a product: this double check of the design might then lead to safer medical devices. Quality and safety guidelines for biomedical device, under the guidance of ISO standards and European Medical Device Directive, are at the foundation of the project, which will be spread to other institutions through partnerships and linkages embedded in the e-infrastructure 's architecture. UBORA will help also the sharing of open data on devices' statistics (performance, field tests, quality control), promoting the research on the highest priority medical devices backed with research on current disease burdens.

BUSINESS STRATEGY AND COMPETITIVENESS OF MEDIUM SCALE MANUFACTURING ENTERPRISES IN KENYA

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Sustainable Development Goals and Africa Agenda 2063 acknowledges SMEs as critical in promoting sustainable global economic development. However, most studies on competitiveness in Kenya have examined micro, small and large enterprises creating a missing middle with inadequate empirical data on medium scale enterprises. Kenya's big four agenda propose support to manufacturing sector so as to raise its GDP share to 15 percent by 2022 so as to realize Vision 2030. Unfortunately, growth in the manufacturing sector has stagnated at about USD 5 billion for over a decade and continues to lose market share and competitiveness internationally. This study therefore investigated Business Strategy and its effect on the competitiveness of medium scale manufacturing enterprises in Kenya. Data was collected from 66 senior management staff. Mean responses received in a Likert scale of 1 – 5 for each of the tested item was calculated by summing up all the codes and getting the average of the 66 respondents. This study established that in 56.1% of the MSMEs, there is a clearly written business unit mission statement (mean response of 4.3). In 54.5% of the firms, the business unit strategy is not adequate in light of competitive pressure (mean response 2.5) and the business unit strategy is not appropriate for exploiting opportunities in the future. In 48.5% of the firms, the business unit strategy is not formulated carefully by all levels of management (mean response 2.7) and there is no clearly developed long term business unit strategy (mean response 2.9). In 39.4% of these firms, the business unit strategy does not adequately reflect the strengths of the business unit (mean response 2.8). The study concluded that lack of an effective business strategy to direct the efforts of human resources in the desired direction would result in inability to realize the set organizational objectives. The study recommended that the entrepreneurs should organise strategic focus workshops and use the following criteria to identify crucial strategic issues: (a) The impact they could have on their enterprises, (b) the likelihood that the identified issues would materialize, and (c) the time frame over which they could develop. The number of these issues needs to be limited to a manageable number (three to nine) to enhance the chances of securing the commitment and resources necessary to effectively act on them. The expected study output would be enhanced competitiveness of MSME and realization of Kenya's vision 2030.

Key Words: Business Strategy, Competitiveness, Manufacturing, Medium scale Enterprises.

RECOGNITION PRACTICES AND EMPLOYEES' PERFORMANCE: UNDERSTANDING WORK ENGAGEMENT AS A MEDIATING PATHWAY IN KENYA CONTEXT.

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A number of studies have provided evidence buoying intrinsic rewards as Human Resource Interventions for enhancing firm performance at individual, functional, and organisational levels. While this evidence abounds mostly in the developed economies, the direct and indirect pathways through which intrinsic rewards such as recognition practices enhance employees' performance lacked empirical and theoretical investigation in the developing economies. Using a survey of 106 respondents pursuing MBA and Ph.D programmes at Kenyatta University, this study investigated the relationship between recognition practices, work engagement, and employees' performance in Kenya context. The various relationships hypothesised in this study were anchored on Social Exchange Theory. The study employed both descriptive and explanatory research designs, and multi-stage sampling techniques to select the study's respondents. This study obtained data from the respondents through self-administered questionnaires and the items were adapted instruments. The reliability of the instruments was conducted to determine the internal consistency and the results showed Cronbash's alpha values of .711, .843, and .819 for recognition practices, work engagement, and employees' performance respectively. These alpha values exceeded a threshold alpha value of .70. The study's instruments were also subjected to Principal Component Analysis and two factors solutions were extracted for each construct using Varimax rotational method for interpretation, The direct relationship between recognition practices and employees' performance was investigated using Pearson product-moment correlation coefficient. From the investigation, there was a strong positive correlation between recognition practices and employees' performance, r= .462, n= 106, α α .0005, with high level of recognition practices associated with employees' performance. Furthermore, employing three-variable model by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002) for testing mediation, this study used Process Macro by Hayes (2018) and found partial mediating effects of work engagement on the relationship between recognition practices and employees' performance. The practical implication of this study is that, for Kenya's big four agenda to be attained and sustainable, organisations need to invest in HRM interventions such as recognition practices so as to provoke work engagement that will in turn enhance performance on the part of employees, which will in turn occasion desired performance. This study has been able to contribute to knowledge in HRM literature by unearthing the so called 'black box' in underpinning the HRM practices and performance link.

Keywords: Recognition Practices, Work Engagement, Employees' Performance, Social Exchange Theory.

A CONSTRAINT-SATISTACTION BASED TIMETABLE SYSTEM FOR UNIVERSITY LECTURES ALLOCATION

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Introduction: Timetabling is the allocation, subject to constraints, of given resources to objects in space-time domain to satisfy a set of desirable objectives as nearly as possible.
Timetabling is a widely studied area and many potentially useful algorithms have been offered for solving timetabling problems. Most of the work in this area has been conducted using artificial data sets or based on actual problems that have been greatly simplified (Devis 2009).
University timetabling problem for classes or lectures can be viewed as fixing in time and space a sequence of meetings between instructors and students, while simultaneously satisfying a number of various essential conditions or constraints. Assigning lectures to time periods is equivalent to the graph coloring problem (Russell and Norvig 2010).
The timetabling problem concerns virtually every educational institution, be it high school, college, or university and thus requires to be solved effectively. This is usually done 'by hand', taking several days or weeks of iterative repair after feedback from lecturers complaining that the timetable is unfair to them in some way..

Timetabling involves allocation of lectures in time and space (lecture halls/rooms) satisfying certain requirement constraints. Present process of allocation at universities takes suboptimal time to formulate, is susceptible to not satisfying all constraints and can be difficult to update. This work used constraint propagation method to develop a system that addresses these problems while drawing relevant domain knowledge for improved usability. The system has been tested and has thrown to meet stated objectives. Future work should work at partial re-allocations for updates as well as provide more user-friendly interface for the system.

Keywords—timetable, constraint satisfaction, university lectures allocation.

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