

PHD

SCHOOL OF ECONOMICS

EFFECT OF GOVERNMENT EXPENDITURE ON THE PERFORMANCE OF PUBLIC PRIMARY SCHOOLS IN KENYA

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The government of Kenya has increased budgetary allocation to the education sector in its effort to achieve universal primary education and in line with the Social Pillar of Vision 2030 and global Sustainable Development Goal number four of Universal Primary Education. The budget allocation increased from 6.2 percent of Gross Domestic Product in 2002/03 to 7.4 percent in 2005/06. It, however, dropped to 5.3 percent in 2014/15 and further to 5.24 in 2017/18. As a result, Gross Enrolment Rate rose to 104 percent in 2003 from 92 percent in 2002 and rising further to 105.3 percent in 2017. As a consequence, class-pupil, and teacher-pupil ratio increased from 36:1 and 42:1 to 45:1 and 57:1 between 2002/03 and 2012/03 and further 42:1 and 55:1 in 2017, respectively. Despite the increased enrolment, the quality of education and technical efficiency levels in schools were compromised even with the positive changes in government expenditure on education were positive. Teachers concentrated more on the examination classes to boost Kenya Certificate of Primary Education results at the expense of skill acquisition in arithmetic and comprehension across all classes. Although the free primary education had shown remarkable milestones in enrolment rates, its impact on education quality and technical efficiency levels had not been assessed. Therefore, using the level of enrolment, quality of education and technical efficiency indicators to explain school performance, this study analyzed the relationship between government expenditure on education and educational outcomes. The study was guided by three objectives that involved: establishment of the effect of government expenditure on enrolment in public primary schools in Kenya; determination of the effect of government expenditure on the quality of education in public primary schools in Kenya; and measurement of the contribution of government expenditure to levels of technical efficiency in public primary schools within 47 counties in Kenya. School enrolments and class six scores were used as outcome variables. Technical Efficiency scores in the study were used to test and determine optimal utilization of school resources including government expenditures. The study used data collected from the class six scores undertaken by the South and Eastern African Consortium for Monitoring Education Quality nation-wide surveys of 2000, 2004, and 2012. More data was collected from the Kenya National Examination Council and Statistical Abstracts between 1997-2018. To achieve the first two objectives, the study used fixed-effect models. For objective three, the study combined Data Envelopment Analysis with Two-Stage Least Squares regression. Results from the study showed that government expenditure and school attributes were positive for enrolment and quality of education. Further, technical efficiency had improved in all the regions by 2012. The efficiency levels were influenced by school facilities, school

location, and level of government funding. The study noted the need for the government to increase its overall expenditure allocated on education to serve as a catalyst for enhancing and improving overall school performance in Kenya's public primary schools. Moreover, the bulk of the allocated resources ought to be dedicated to the development and improvement of school facilities and equipment.

SCHOOL OF PUBLIC HEALTH AND HUMAN APPLIED SCIENCES

DETERMINANTS OF PSYCHOSOCIAL WELL-BEING OF CHILDREN (10-17 YEARS) AFFECTED BY HIV AND AIDS IN KIAMBU COUNTY, KENYA

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Children affected by HIV and AIDS (CAHA) are faced with psychological, social and economic challenges among others. HIV and AIDS has compounded the situation posing more suffering to children whose parents have died of the same. Children affected by HIV and AIDS have been supported in various ways by their extended families and many other organizations. While there are a number of programmes that address the material needs of CAHA, there is less emphasis in assisting these children cope with the distress associated with nursing or living with sick members of the family, witnessing deaths of their parents and suffering the consequences thereafter. The psychosocial well-being of CAHA may be affected as a result of illness and death of their parents, exploitation, stigma and separation from siblings as well as lack of adult support. The purpose of this study was to examine the determinants of psychosocial well-being of children affected by HIV and AIDS. This was a cross-sectional survey targeting 3780 children between 10-17 years affected by HIV and AIDS living in foster families from registered CBOs in Kiambu County. Multi-stage cluster sampling was used to select 345 children aged 10-17 years. First, Thika Sub County was purposively selected, in the second stage systematic random sampling was done for supporting families with CAHA and the third stage simple random sampling was carried out in foster families with more than one CAHA to select the participant for the study. Key informant interview guides, questionnaires, observation checklist and child drawings were used to collect data. Both quantitative and qualitative data were organized and categorized for analysis. Using Statistical Package for Social Sciences (SPSS) Version 20, quantitative data was analyzed using descriptive statistics; frequencies, means and percentages. Chi-square and factor analysis were used to test the formulated hypotheses. Qualitative data was transcribed, coded and categorized into themes and words to allow for analysis and presentation. Results of the study established that there was a significant relationship between care provided by foster families and psychosocial well-being of CAHA based on results of factor analysis at 61.4% and chi-square results ($\chi^2= 4.6607$; $df= 4$; $p=0.001$). This study showed that there existed a significant relationship between the types of support available in the community and

psychosocial well-being of children affected by HIV and AIDS ($\chi^2=7.8207$; $df =6$; $p=0.012$). In addition, this study identified a significant relationship between coping strategies adopted by children affected by HIV and AIDS and their psychosocial well-being ($\chi^2 = 6.4420$; $df= 6$; $p=0.003$). This study concluded that there were established relationships between care provided by foster families, type of support available by the community and coping strategies adopted by children affected by HIV and AIDS and their psychosocial well-being. The study recommended that the Kenya government should commit resources to promote the psychosocial well-being of CAHA at various levels through government mandated departments. Parents can be guided to develop permanency plans for their children and finally stakeholders; County governments, schools and non-governmental organizations can work together to ensure sustainability of families and communities so that children are retained in responsive environments.

USE OF COUNSELING TO MITIGATE PSYCHOLOGICAL MORBIDITY AFTER STILLBIRTH AMONG WOMEN IN KITUI AND MACHAKOS COUNTIES, KENYA

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Stillbirth is a baby born without any signs of life weighing at least 1000grams or with at least 28 weeks gestation. There is no burden affecting families is big and yet invisible in society and global arena as stillbirth. Stillbirth is a traumatizing experience for most women and a risk factor to development of psychological morbidity. The kind of care women receive during this critical period influences exhibition of psychological morbidity such as depression, anxiety and post traumatic stress disorder which can be mitigated by counseling. Supporting psychological consequences of women enable them to take care of the present and subsequent children. The main aim of this study was to determine the use of counseling in mitigating psychological morbidity after stillbirth among women in Kitui and Machakos Counties. Specifically the study aimed to determine care offered to women after stillbirth, to evaluate psychological morbidity exhibited by women after stillbirth, to determine the effect of counseling on psychological morbidity after stillbirth, determine factors that influence psychological morbidity exhibited by women who deliver stillbirth after counseling and to determine the coping strategies employed by women after stillbirth. This was a quasi experimental study (non randomized controlled trial) with an interventional (Machakos County) and control group (Kitui County). Edinburgh Postnatal Depression Scale 1, Hopkins Symptom Checklist 25 (first 10 for assessing anxiety) and Impact of Events Scale-revised measured Depression, anxiety and post traumatic stress disorder respectively. Women in the interventional group were counseled while those in the control group received routine care offered by midwives in the ward. Descriptive and inferential statistics were used to analyze the data. Fishers exact test with significant $p <0.05$ was used to determine factors influencing psychological morbidity exhibited by women who delivered stillbirth after counseling. Student t test for unpaired and paired data determined the effect of the intervention between and within the study groups respectively. Significant variables were further subjected to multi-variable logistic analysis to measure the strength of

the association and control for confounding factors. The study findings revealed that women received minimal psychological support on grief reaction, memories creation and need to ascertain the cause of death. Women who delivered stillbirth experienced depression, anxiety and post traumatic stress disorder. Counseling was found to mitigate the selected psychological morbidity in this study (all P values < 0.01). Various factors influenced psychological morbidity after stillbirth (p values: age = 0.05, education < 0.01, occupation = 0.04, years of marriage = 0.019, partners' education = 0.017, viewing the baby = 0.04, timing of death = 0.039, informed on the cause of death < 0.0108 and myths < 0.01). Key informants expressed need for professional and psychological support since they are also affected by the stillbirth experience to avoid compromising care offered to the women. The study concluded that counseling can mitigate psychological morbidity after stillbirth and women need holistic care from health care providers, families and communities where they live. The study recommends that the county governments need to integrate counseling into care of women after stillbirth, engage stakeholders to discuss stillbirth as a public health concern to address misconceptions and offer support to health care providers to offer proper care to women to mitigate the psychological morbidity.

EFFECTIVENESS OF BABY-FRIENDLY COMMUNITY INITIATIVE IN PROMOTING EXCLUSIVE BREASTFEEDING AMONG HIV NEGATIVE AND POSITIVE MOTHERS: RANDOMIZED CONTROLLED TRIAL, BARINGO COUNTY, KENYA

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The Baby-Friendly-Community-Initiative (BFICI) has been proposed as a community level approach that would be scaled to improve infant and young child feeding practices. However, little evidence on its effectiveness and how this differs by HIV status exists. The study was conducted to determine the effectiveness of BFICI in changing knowledge, attitudes and increasing the rate of exclusive breastfeeding (EBF) among women of mixed HIV status in rural Kenya. A community-based cluster-randomized controlled trial was conducted in Baringo, Kenya from August 2014 to July 2017. A total of 823 women were enrolled across 12 clusters with 445 in the control and 378 in the intervention groups. The HIV status of the mother was determined at the antenatal clinic. The intervention groups received a minimum of 12 personalized home-based counselling sessions on infant and young child feeding by trained community health volunteers starting at first or second trimester of pregnancy until six months postpartum. Other interventions included scheduled education sessions at the maternal-child health clinics, mother to mother support group meetings and bi-monthly baby-friendly gatherings targeting mothers and community influencers. The control group received standard health education at the maternal child health clinics where infant and young child feeding

topics were included within the schedule of many general topics offered weekly. They also received monthly routine home visits by untrained community health volunteers. Interview administered questionnaire was used to collect data on knowledge. Information on attitude was collected using Likert scale with 5 levels. FGD, KII and IDI were conducted to collect qualitative data. The primary outcome measure was the rates of exclusive breastfeeding at 1 week, 2, 4 and 6 months. The secondary outcome was knowledge and attitude regarding exclusive and continued breastfeeding for HIV exposed infants, facilitators and barriers to breastfeeding for HIV positive mothers. Statistical methods included analysis of covariance and logistic regression. At 6 months, EBF rates among HIV negative mothers were significantly higher in BFCI intervention arm as compared to control arm (81.7% versus 41.9% $p=0.01$). HIV positive mothers in the intervention arm also had higher EBF rates at 6 months than the control but the difference was not statistically significant (81.8% versus 56.8%; $p=0.152$). In HIV negative group, there was greater knowledge regarding EBF for HIV exposed infants in the BFCI intervention arm than in the control (92.1% versus 60.7% $p=0.001$). Among HIV positive mothers, such knowledge was high among both the intervention and control groups (95.6% versus 100%, $p=0.309$). Mothers in HIV negative and HIV positive groups in the intervention arm were more positive regarding EBF for HIV exposed infants than the control (84.5% versus 62%, $p=0.001$) and (94.6% versus 52.2% to $p=0.005$) respectively. Facilitators to EBF included counselling at the health facility, desire to have a healthy baby, use of antiretroviral drugs and health benefits associated with breastmilk. Barriers to EBF included poor dissemination of policies, knowledge gap, misinterpretation of EBF, inadequate counselling, attitude of mother and health workers due to fear of vertical HIV transmission, stigma related misconception and misinformation that EBF is only compulsory for HIV positive mothers, stigma related to HIV and disclosure, social pressure, lack of male involvement, cultural practices and traditions, employment, food insecurity. BFCI community-based interventions can complement facility-based interventions to improve exclusive and continued breastfeeding knowledge, attitudes, and practices among HIV negative and HIV negative women.

EFFECT OF UMBILICAL CORD CLAMPING TIME ON NUTRITION STATUS OF INFANTS: A RANDOMIZED-CONTROLLED TRIAL IN LONGISA HOSPITAL, BOMET COUNTY, KENYA

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Although most studies document the benefit of delaying umbilical cord clamping in relation to improved haemoglobin levels, few of those studies have been done in low resource settings. Standard routine practice in most facilities is generally clamping umbilical cord in less than 60 seconds. This study therefore sought to establish the effects of umbilical cord clamping time on infant nutritional status at 6 months at Longisa County Referral Hospital through randomized controlled trial design. Sample size of n=204 of mother-infant pair was enrolled in both control and experimental group of the study. The experimental group involved clamping the umbilical cord between 3-5 minutes after delivery while the control group was clamped as per the standard routine practice in the facility. Infant's blood sample was drawn and haemoglobin was assessed at birth, 6 weeks and 6 months. Ballard maturity assessment score was used to assess infant gestational age at birth. Weight was measured using SECA 354 and length was assessed using SECA 210 length Matt. Mother -infant socio demographic characteristics collected using a validated questionnaire. A standard Pre-test questionnaire based on WHO 2014 guidelines was used to measure health workers knowledge on the umbilical cord clamping time. Data was analysed using Stata version 15.1 and Microsoft Office Excel 2007. Mother-infant socio-demographic characteristics by the study group was compared using Pearson chi-square ($p < 0.05$; 95% CI). Health workers' knowledge was analysed results presented in percentage. Third trimester maternal haemoglobin was collected in mother child booklet and analysed using Pearson chi-square. Infant haemoglobin levels at birth, 6 weeks and 6 months by study group was analysed using Pearson chi-square. The relationship between maternal and infant haemoglobin status was assessed using Pearson correlation coefficient determinant. The effect of umbilical cord clamping on infant nutritional status and haemoglobin was tested using student t-test. Predictors of infant Nutritional status at six (6) months were established using binary logistic regression model. The results are based on two-tailed tests at 95% confidence interval and a p-value $p < 0.05$ was used as the criterion for significance. Results were: Mean age of mothers of infants enrolled into the study was (22.73 ± 1.9 ; $p < 0.05$); about 50% of health workers knew that delaying umbilical cord clamping is beneficial to the infant. Approximately 69% of health workers believe that delaying umbilical cord clamping increases the HIV infection. Control group: Mean weight: at birth 2.89kgs (95% CI, 2.81-2.97), 4.81 (95% CI (4.68-4.94) at 6 weeks and 7.41kgs (95% CI, 7.28-7.54) at 6 months. Mean haemoglobin at birth was 18.72g/dl (95% CI, 18.19-19.25), 10.85g/dl (95% CI (10.58-11.12) at 6 weeks and 11.10g/dl (95% CI, 14.26-15.52) at 6 months. Experimental group: Mean weight at birth 2.93kgs, 5.22 (95% CI, 4.99-5.22) and 8.51 at 6 months ((95% CI, 8.40-8.60; $p < 0.05$). Mean haemoglobin: Birth 19.67g/dl, (95% CI, 19.25-20.09), 11.72(95% CI, 11.45-11.99) and 12.22g/dl (11.95-12.49 at 6 months ((95% CI, 8.40-8.60; $p < 0.05$). Predictor of infant nutritional status at 6 months were weight (OR14.90, $p < 0.05$; 95% CI: 7.25-30.00) and infant haemoglobin (OR1.64, $p < 0.05$; 95% CI: 1.3-2.07). The study concluded that delaying the umbilical cord clamping improved infant Nutritional status and haemoglobin. Setting optimal time to clamp the umbilical cord is important for Kenyan health facilities.

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SCHOOL OF EDUCATION

INFLUENCE OF TEXTILE TEACHERS' PEDAGOGICAL CONTENT KNOWLEDGE ON SENIOR HIGH SCHOOL GRADUATES PARTICIPATION IN MODERNISATION OF INDIGENOUS GHANAIAN TEXTILE INDUSTRY

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The purpose of this study was to investigate the influence of textile teachers' pedagogical content knowledge on senior high school graduates' participation in the modernisation of the indigenous textile industry. Textile training institutions in Ghana are designed to train the skills needed for the modernisation of the large-scale and indigenous textile industries. There have been numerous criticisms that the pedagogical content knowledge of textile teachers/lecturers do not equip the school graduates with the skills required to modernise the textile industries. Many studies have been done on the influence of pedagogical content knowledge of Ghana tertiary textile lecturers on the modernisation of the largescale textile industry. However, many studies have not been done on the influence of pedagogical content knowledge of Ghana senior high school textile teachers on the modernisation of the indigenous textile industry hence the need for this study. The study was guided by the following five (5) specific objectives: to establish the influence of demographic characteristics of Ghana senior high schools textile teachers on school graduates participation in modernisation of the indigenous textile industry; to establish the influence of pedagogical content knowledge of Ghana senior high textile teachers on the skills acquisition of school graduates; to determine the nature of pedagogical strategies used by Ghana senior high school textile teachers in training their students; to determine the influence of challenges facing Ghana senior high schools textile training on the operations of indigenous textile industry; to develop a pedagogical model for modernisation of the indigenous Ghanaian textile industry based on the findings of the study. The study employed system theory. Purposive sampling was used to select senior high schools offering textiles, simple random sampling was used to randomly select textile teachers and snowball sampling was used to trace senior high school textile graduates working in the indigenous textile industry. The study design employed was a cross-sectional survey. The total sample size was 243 (225 textile teachers, 12 textile graduates and 6 HoDs). The research instruments used for data collection were a questionnaire, interview guide and non-participant observation. Inferential statistics such as a one-way-analysis of variance (ANOVA) and point-biserial

correlation were used to test the null hypotheses formulated. The study found that the pedagogical content knowledge competencies of Ghana senior high schools textile teachers cannot equip school graduates with the skills needed to modernise the indigenous textile industry. The study also found that textile teachers used lecture and discussion methods of teaching than skill acquisition instructional strategies such as field trips, demonstration and work-based. The study recommended that the ministry of education should periodically sponsor textile teachers to have industrial attachments in both local and international renowned textile industries to learn modern skills of textile manufacturing. The study also recommended that workbased (industrial attachment) should be introduced into Ghana senior high schools textile training system.

PERSONALITY, INTERVENING VARIABLES AND ACADEMIC ACHIEVEMENT AS PRECURSORS OF CAREER ASPIRATIONS AMONG FORM THREE SECONDARY SCHOOL STUDENTS IN KIAMBU COUNTY, KENYA

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Secondary school students' career aspirations have important implications as they are related to the students' further training in the aspired areas, entering the job market and making progress in the world of work. Individuals who enter career fields they are not suited for end up facing challenges and difficulties. The purpose of the study was on personality, academic achievement as predictors of career aspirations as moderated by educational background of parents, school type and sex among form three secondary school students in Kiambu County, Kenya. There is very limited research on The Big Five personality traits in Kenya. There has not been a distinction on how the educational background of the mother and the father individually influence career aspirations of students. The study was informed by the Big Five Traits theory and Holland's Theory of Careers. Kiambu County has 266 schools, stratified as National, Extra County, County and Sub-County with a student population of 95, 859 students. The accessible population was 23,965, (51.8% males and 48.18% Females). Pilot study consisted of 60 students, (30 boys and 30 girls). The two pilot schools were selected from two different sub counties from where the main study was conducted. Stratified random sampling was used to select 10 schools, two from each stratum. The sample size comprised 400 students randomly selected from the sampled schools. Data was collected through a student's self-report questionnaires: the Big Five Inventory (BFI), Career Choice Inventory (CCI) and focus group discussions. Data collected was both qualitative and quantitative. Quantitative data was coded and entered into SPSS program for analysis. Chi-square (χ^2) and Pearson's Product Moment were used to analyse data. The findings obtained from the (Chi-Square value; $\chi^2 = 99.074=96$,

$p > 0.05$) revealed that there was no significant relationship between the Big Five personality traits and career aspirations. Moreover, the findings revealed that there was no significant relationship between mother's education background and students' career aspirations, (Chi-Square; $\chi^2 = 21.35$, $df=15$, $p > 0.05$). Further, the findings revealed that there was significant relationship between father's educational background and students career aspirations (Chi-Square value; $\chi^2 = 26.00$, $df=15$, $p < 0.05$). Moreover, there was significant relationship between academic achievement and students' career aspirations (Chi-Square value; $\chi^2 = 57.86$, $df = 6$, $p < 0.05$). On the school type, the findings revealed that there was significant relationship between school type and career aspirations of the students (Chi-Square value; $\chi^2 = 208.64$, $df=120$, $p=0.05$). The findings revealed that there was significant relationship between sex and career aspirations of the students (Chi-Square; $\chi^2=71.262$, $df =24$, $p=0.05$). Career guidance should be enhanced in schools and in colleges. Admission to colleges, universities and choice of fields of study and career choice for employment should embrace personality traits as a prerequisite for success. Causes of disparities in school type should be addressed as they have lifelong implications on career aspirations of students.

EFFICACIES OF KENYA EDUCATION MANAGEMENT INSTITUTE INDUCTION COURSE ON MANAGEMENT PRACTICES FOR PUBLIC PRIMARY SCHOOLS IN NAIROBI CITY COUNTY, KENYA

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To address gaps in management of public primary schools and provision of quality education, the Ministry of Education periodically supports head teachers of public primary schools to undertake induction courses in education management in order to improve management practices at school level. One of the many induction courses supported by the Ministry of Education and organised by Kenya Education Management Institute is the Induction Course in Educational Management. This course targets all education managers in public schools with the aim of improving management practices. Despite Kenya Education Management Institute conducting the induction course targeting school managers, poor management practices still are witnessed in many public primary schools. The purpose of this study was to examine the efficacies of the induction course on management practices of public primary schools. The objectives of the study were to examine the procedures used in preparation for the induction course, assess perceptions of the effectiveness of the induction course on the management of public primary schools, determine if the induction course had influence on the management practices and finally to investigate the efficacies of the induction course on the management of public primary schools. Total Quality Management was used as the theoretical framework of

this study. The study employed a descriptive survey research design. The target population for the study were ninety-six public primary schools head teachers, chairpersons of boards of management, senior teachers, support staff members, school prefects and staff trainers from Kenya Education Management Institute. Simple random sampling was used to select the sample for this study. Data for the study was collected using structured questionnaires and analysed using descriptive statistics with the aid of the Statistical package for Social Sciences (SPSS) computer software. The main findings of the study were that a vast majority of the head teachers were not knowledgeable on the policy guidelines regarding preparation for in-service training, there existed no clear policy guidelines on preparation of head teachers for in-service training and there were no follow-up mechanisms after the in-service training. Another major finding was that a vast majority of the head teachers perceived the training to be highly effective as the training had given participants important requisite skills in management. It was found out that the induction course had highly influenced head teachers' finance and human resources management. The chairpersons of the boards of management, senior teachers, support staff and prefects found the head teachers who had attended the induction course to be highly effective. The study recommends development of clear policies and guidelines on preparation of head teachers for in-service training. Kenya Education Management Institute should support the induction course as it had clear benefits for the targeted school managers and to put in place evaluation mechanisms of all its in-service training programmes targeting school managers.

ADOPTION OF KNOWLEDGE MANAGEMENT PRACTICES FOR SERVICE DELIVERY IN SELECTED NORTH-WEST NIGERIA FEDERAL UNIVERSITY LIBRARIES

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Knowledge management practices entail generation, acquisition, organization, sharing, preservation, applying and re-use of knowledge. In libraries, the practice aims at improving services and administration. Evidence indicates that university libraries in Nigeria are facing a series of challenges ranging from lack of mentorship, reluctant to share knowledge, lack of research collaboration, inadequate training, seminars among others and the cause of these challenges is not known. The purpose of this study was to establish whether North-West Nigeria Federal university libraries have adopted knowledge management practices (KMP) in acquisition, organization, and sharing and also evaluate the role of information and communication technology (ICT) in the whole process. The objectives of the study were to assess the knowledge acquisition, to determine the knowledge organization, to establish the

knowledge sharing and assess the role of ICT in enhancing KM practices. This study reviewed literature in the area of knowledge acquisition, organization, sharing and ICT application. It applied descriptive research design and had a target population of three hundred and ninety-three (393) respondents from the selected north-west Nigeria university libraries. The sample size of the study was 191 which was calculated using Krejcie and Morgan. Questionnaires and interview schedules were used for data collection from different categories of librarians in university libraries. A pilot study was conducted in Gusau University Library and data analyzed to ensure the validity and reliability of the instruments. Descriptive statistic methods were used in analyzing the data into tables, frequencies, percentages, and charts were used for tabulation and presentation. Among the key findings, were practices amenable to knowledge management were in place in all the selected university libraries. The acquisition of knowledge was in place, though a lot were still inclined to explicit knowledge while tacit knowledge was limited. Knowledge organization was mostly done using classification scheme while expert based knowledge was not adequately used. A variety of methods were used for knowledge sharing. Information and communication technology (ICT) were available and used to support library services. Lack of mentorship service, lack of management support and research collaboration were major challenges in knowledge sharing. The study concludes that the adoption of knowledge management practices in the selected university libraries would not be a challenge as practices amenable to knowledge management are in place. The study also recommends the acquisition of tacit knowledge among librarians, the use of expert-based knowledge to organize knowledge in the library and to improve knowledge sharing through mentoring services and research collaboration as methods of sharing knowledge.

INCLUSIVE EDUCATION AND PROVISION OF QUALITY EDUCATION FOR CHILDREN WITH SPECIAL EDUCATIONAL NEEDS IN PUBLIC PRIMARY SCHOOLS IN BAUCHI, NIGERIA

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The purpose of the study was to investigate the status of inclusive education and provision of quality education in public primary schools in Bauchi state. The study was conducted in eight public primary schools in Bauchi. The study was based on the Social Model of Disability Theory as discussed by Mike Oliver (1983). This study adopted the mixed method approach. The study targeted the population of general education teachers in all the 8 public primary schools, children with special educational needs, parents of children with special needs and school heads. 40 teachers, 80 children with special educational needs, 80 parents and 7 head teachers were purposively sampled for the study. Questionnaires, an interview schedule, focus group

schedule and an observation checklist were the instruments employed for the study. Content validity was used to gauge the dependability of the instruments, their relevance to the subject matter, appropriateness of language used and clarity of purpose. Test re-test method was used to determine the reliability of the research instruments. Pearson Product Moment Formula was applied to compute the correlation coefficient. The quantitative data obtained was analyzed using the Statistical Package for Social Science (SPSS) programme. Descriptive statistics, that is frequency distribution and percentages, were used to describe and summarize data. Data from interview and FGDs was coded, categorized and analyzed following the themes derived from the research objectives. The findings established that regular schools were not equipped with adequate teaching and learning resources to support an inclusive education programme; classrooms were overcrowded; school buildings were not barrier free; most teachers were not trained in special needs education and the current curriculum is not modified for the benefits of children with special needs. The study also revealed that parents' socio-economic status affect the education of children with special educational needs, making it very difficult for the parents to send all their children to school. Moreover, the study identified the provision of transportation for CWSNs, free education and community involvement as strategies that can bolster and enhance the inclusive education programme. Other strategies identified include the involvement of parents of children with special needs education in school decision making regarding the education of their children and the enlightenment campaign on the benefits of inclusive education. Based on these findings, the study recommends that governments should formulate and implement sound policies and corresponding delivery mechanisms to ensure the effective implementation of the inclusive education programme, guaranteeing compliance with apposite periodic audit following ups.

PEDAGOGICAL TECHNIQUES THAT BOLSTER LEARNERS' ACQUISITION OF EXTENSIVE READING HABITS IN SECONDARY SCHOOLS IN LAIKIPIA COUNTY, KENYA

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This study addresses the issue of pedagogical techniques for extensive reading in secondary schools in Kenya at a time when concern is being expressed about declining reading habits in schools. Effective use of pedagogical techniques of reading can greatly improve learners' achievement in English and also enhance their reading habits. The study was prompted by poor reading in English among secondary school students in Laikipia County. The study was guided by the following objectives: To establish the pedagogical techniques that promote and sustain extensive reading habits, to examine factors that influence learners' extensive reading habits,

to establish the resources available that support extensive reading, to establish non-classroom interventions put in place to promote reading habits and to establish the influence of extensive reading habits in English language learners" composition writing performance. Guided by the Social Cognitive Theory and The Schema Theory the study adopted the descriptive survey research design to establish the state of extensive reading in schools. Proportional stratified, purposive and random sampling techniques were used in the study. The study sample consisted of 30 English language teachers and 327 students in form 2 and 3. The research instruments used for data collection included: questionnaire for students, interview guides for teachers, documents analysis guide and composition writing test. The instruments were pilot tested to ensure validity and reliability. Both qualitative as well as quantitative data were generated. Qualitative data were organized according to the study themes and presented descriptively on the basis of the study objectives and research questions. Descriptive statistics was used to analyze quantitative data. T-test and Analysis of Variance (ANOVA) were used to test for association between independent and dependent variables. The Statistical Package for the Social Sciences (SPSS) version 17 was used to process the data. The key findings of this study were that English language teachers possessed adequate knowledge and skills to teach extensive reading. Acute shortage of reading resources was a major hindrance to engagement in extensive reading in schools. Collaboration with the Kenya National Library Services, parental involvement and holding reading conferences were some of the non-classroom reading interventions the study established should be applied in schools to promote extensive reading. The study concludes that despite the English language teachers possessing pedagogic knowledge on reading, the learners still encountered reading difficulties as their reading was never monitored or evaluated. This study recommends that the Kenya Institute of Curriculum Development (KICD) in collaboration with schools should come up with a strong extensive reading policy to promote independent lifelong reading habits.

DETERMINANTS OF INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN INSTRUCTION IN EARLY CHILDHOOD EDUCATION PROGRAMMES IN SELECTED UNIVERSITIES IN KENYA

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Dr. Maureen Mweru

The purpose of the study was to establish the extent to which lecturers integrate Information and Communication Technologies (ICTs) in instruction and to determine how specific factors influence such integration in selected universities in Kenya. The study objectives were; firstly to establish the extent to which lecturers integrate ICT in instruction in ECE programmes.

Secondly, to find out relationship between lecturers' perceived ICT abilities and ICT integration in instruction in ECE programmes. Thirdly, to explore relationship between lecturers' perceived ICT usefulness and ICT integration in instruction in ECE programmes and finally to find out relationship between availability of ICT leadership support and ICT integration in instruction in ECE programmes. Significant of the study was that university management may use the study findings to determine the scope to which lecturers integrate ICT in instruction and factors influencing it. Results of the study could assist ECE administration to identify and establish ways of encouraging and motivating lecturers to integrate ICT in instruction. In addition, the study findings may help lecturers appreciate the benefits of ICT integration in instruction and seek ways to improve the integration. Diffusion of Innovations (DOI) theory and Technology Acceptance Model (TAM) were used to guide the study. Correlational research design was used. The independent variables were: lecturers' perceived ICT abilities, lecturers' perceived ICT usefulness, and availability of ICT leadership support, while the dependent variable was ICT integration in instruction. The target population was all lecturers teaching ECE programmes in public and private universities. Purposive and stratified sampling techniques were used in selecting a sample of 88 lecturers. Pilot study was done using 20 lecturers from two universities; one public and the other private. Questionnaire, observation checklist, and document analysis were the data collection methods used. Content validity of the research instruments was established by the researcher and confirmed by two experts from the department of Educational Communication and Technology of Kenyatta University. Cronbach's Alpha reliability coefficient of test retest for all the research instruments was calculated and ranged between 0.88 and 0.92. Data was analysed using descriptive and inferential statistics. Frequencies, means, standard deviations and percentages were calculated and presented on tables and figures while t-test for independent samples and Pearson's Correlation Coefficient were calculated to test the null hypotheses at alpha value 0.05. The relationship between lecturers' perceived ICT abilities and ICT integration in instruction and between availability of ICT leadership support and ICT integration in instruction were found statistically significant. The best predictor variable for ICT integration in instruction in ECE programmes was lecturers' perceived ICT abilities. It was concluded that most lecturers who perceived their ICT abilities to be adequate integrated ICT in instruction. Lecturers who perceived ICT to be useful did not translate that to ICT integration in instruction and availability of ICT leadership support positively influenced ICT integration in instruction. Based on the results, it was recommended that lecturers need to constantly train in ICT integration in instruction to enhance their confidence in ICT use and learn to integrate advanced ICT tools in instruction.

EFFECT OF TEACHER PROFESSIONAL DEVELOPMENT ON ACHIEVEMENT IN KENYA CERTIFICATE OF PRIMARY EXAMINATION IN KIRINYAGA COUNTY, KENYA

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Dr. Florence Itegi

Teacher professional development is a critical component of educational reforms and school improvement that is focused on enhancing learning outcomes for all children. Continuing Professional Development plays a key role in teacher improvement geared towards classroom improvement. Investments have therefore been put into teacher professional development but its effect on achievement in Kenya Certificate of Primary Examination in Kirinyaga County is not established despite the glaring performance disparities. The purpose of this study was to assess the effect of teacher professional development on Kenya Certificate of Primary Education (KCPE) achievement. The objectives of the study were to determine the effect of teacher perceptions of professional development on KCPE achievement in Kirinyaga County, to establish the effect of teacher participation in formal training programs on KCPE achievement, to determine the effect of teacher participation in collaborative activities on KCPE achievement, to establish the effect of head teacher support for teacher professional development on KCPE achievement. The study was guided by Desimone (2009) core conceptual framework for studying effectiveness of teacher professional development as well as Deci and Ryan (2000) self-determination theory. Convergent parallel mixed methods design was used. The target population was 1705 class eight teachers and 341 head teachers. Stratified random sampling and purposive sampling was used to obtain 68 schools, a sample of 194 public and private primary school and 20 head teachers for the study. Instruments for data collection were teacher questionnaires, teacher focus group discussion guide and head teacher semi structured interview guide. Descriptive (mean, frequency, standard deviation) and inferential (t-test, regression analysis) statistics were used to analyze quantitative data while qualitative data were analyzed thematically. The study established that teachers had a positive perception toward their professional development but this did not have a significant effect on KCPE achievement. Majority of the teachers engaged in professional development so as to obtain salary increment and promotion. The study also found that teachers had improved their academic qualifications and also attended in service trainings, however, this had no statistically significant effect on KCPE achievement. The major form of in service training was workshops. The study found out that teachers participated in collaborative activities like sharing and assisting one another, lesson observation and team teaching. These collaborative activities had a statistically significant effect on KCPE achievement. The study also established that head teachers supported teacher professional development by providing information, teaching/learning resources and releasing teachers. The areas in which they offered least support were financial support and invitation of resource persons to the schools. Head teacher support for teacher professional development had a statistically significant effect on KCPE achievement. The study recommends that the Teachers' Service Commission, Ministry of Education and school management enhance collaborative professional development activities at the school level and empower head teachers to provide support for such interventions in order to improve learner outcomes.

INTERNATIONALISATION PRACTICES AND THEIR IMPLICATIONS ON PROVISION OF QUALITY ACADEMIC PROGRAMMES IN PUBLIC AND PRIVATE UNIVERSITIES IN KENYA

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Research on the role of internationalisation to the growth and development of higher education has steadily grown over the past decades. However, there is limited knowledge on the understanding of the process of internationalisation particularly in African higher education. To fill the gap, this study

explored the key stakeholders understanding of the process of internationalisation in Kenyan Universities. The study was guided by four objectives: 1) To explore how role-players in Kenyan Universities understand and perceive internationalisation of higher education; 2) To analyze policies of internationalisation in the target Universities in Kenya and assess their implications on provision of quality academic programmes; 3) To establish practices of internationalisation in the target Universities in Kenya and assess their implications on quality of academic programmes and; 4) To determine the role played by academic staff in internationalisation of higher education. The study was conducted in four Universities, namely: Moi University; University of Nairobi; United States International University- Africa; and Mount Kenya University. It used mixed method design adopting a convergent parallel sequential approach that allowed interpretation and analysis of ideologically different sources of data from documents, questionnaires and interviews to report on the internationalisation practices in the target Universities in Kenya. For quantitative data, there was use of frequencies and means to give statistical trends on internationalisation. Qualitative data was coded, themes developed and analyzed to give meanings to the statistical patterns that emerged. The study found out that the target Universities did not have a comprehensive understanding of the process of internationalisation of higher education. On rationales, the target Universities identified academic rationales as the main reason for supporting internationalisation. On policies, the study found out that the target Universities identified internationalisation as a remedy to poor academic programming. On internationalisation practices, it established that student and staff exchange programmes, partnerships and aspects of internationalisation of the curriculum were available. However, these practices had not been integrated into University structures, thus limiting the impact of their implementation on academic programmes. On the role played by academic staff in internationalisation, the study found out that the academics had minimal role particularly in deciding percentage of the University budget set aside for internationalisation, integrating international students into their University culture and setting the agenda for international research. The lack of a comprehensive understanding of the concept of internationalisation, inadequate involvement of academic staff, poor established practices in the target Universities had compromised the use of internationalisation as a strategy of improving their academic programmes. The study recommends that Universities in Kenya should invest in trainings on internationalisation to ensure that there is clarity on the concept, its rationale and underlying values within the unique context of their Universities.

INFLUENCE OF RESOURCES, KNOWLEDGE, CAPACITY BUILDING AND COOPERATION ON DELIVERY OF QUALITY SERVICES BY EARLY CHILDHOOD EDUCATION OFFICERS IN KWALE COUNTY, KENYA

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The quality of Early Childhood Development and Education (ECDE) services given to children in their early years is essential for proper growth and development. Provision of these services begins with the parents i.e. mother and father and at pre-school level teachers and other stakeholders in education get

involved. The specific objectives of the study were to; determine whether availability of resources influence delivery of quality ECDE services, establish whether ECDE officers' knowledge influence delivery of quality ECDE services, find out whether capacity building of parents influence delivery of quality ECDE services, examine the influence of cooperation between ECDE officers and parents and determine whether parents' knowledge on importance of play materials influences delivery of quality ECDE services. The study was guided by the Social Systems and Performance Management theories. Descriptive Survey Design was adopted targeting parents from ECDE centres and ECDE officers in Kwale County. The independent variables were availability of resources, knowledge in ECDE, capacity building, cooperation and knowledge on importance of play materials while the dependent variable was quality ECDE services. The study population comprised of nine hundred and fifteen parents (915) from all ECDE centres and twelve (12) ECDE officers in the county. Purposive sampling was used to select the county while stratified random sampling technique was used to select the parents from the sampled ECDE centres. A sample size of 120 parents was therefore selected from the sampled ECDE centres while all twelve (12) ECDE officers were selected. Questionnaires and interview schedules were used to collect data from the ECDE officers and parents respectively. A pilot study was conducted in Kwale County for the parents and in Mombasa County for the ECDE officers. The test-retest method was used to test the validity and reliability of the instruments. Descriptive statistics were used to analyze quantitative data. The analysis was aided by the Statistical Package for Social Sciences (SPSS) software. The quantitative data was presented in percentages, tables and graphs while qualitative data was categorized in themes then reported in prose form alongside the quantitative data. The study results showed that majority of the parents (90.8%) were aware of the importance of ECDE and use of play materials. Further, it was established that resources for ECDE officers were inadequate, there was no cooperation between ECDE officers and parents and that there was no capacity building for the parents. This had a negative impact on delivery of quality services. The study concluded that delivery of ECDE services was wanting and below par. The study recommended that the county government should provide adequate resources to ECDE officers, provide enough funds for capacity building and for further research. Support and cooperation between ECDE officers and parents/other ECDE stakeholders should be strengthened at both the County and National level.

INSTITUTIONAL CAPACITY AND ITS EFFECTS ON SKILLS DEVELOPMENT IN YOUTH POLYTECHNICS IN MURANG'A, KIRINYAGA AND NAIROBI CITY COUNTIES, KENYA

Peter Kirika-PHD

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The lack of appropriate skills for the job market among the youth is a major hindrance to the achievement of the aspiration of the Kenya Vision 2030. The purpose of this study was to investigate and assess the institutional capacity and its effects on skills development in public youth polytechnics in Murang'a, Kirinyaga and Nairobi counties. The objectives of the study were to assess the youth polytechnics' capacity including the various institutional structures and infrastructure and

their effects on skills development. The Cross-sectional survey design was used in this study. The study targeted all the 61 Public Youth Polytechnics in Murang'a, Kirinyaga and Nairobi counties. The stratified sampling method was used to select the sample from each county. From the 61 youth polytechnics in the counties, 18 formed the study sample. From each selected youth polytechnic, the Manager and 3 Heads of Department were sampled for the study. The 6 Sub county Youth Training Officers and 36 primary school head teachers were also part of the study sample. This formed a study sample of 114 respondents. The Managers, Youth Training Officers and the Primary School Head Teachers were purposively selected as a rich information source. The simple random method was used to select the Heads of department. The instruments for data collection were Questionnaires for the Heads of Department and Interview Schedule Guides for the Sub County Youth Training Officers, the Managers and the Primary School Head Teachers. The instruments were piloted in two youth polytechnics not included in the actual study. The test retest method was used to test the reliability of the instrument. Validity of the instruments was determined by a panel of three judges competent in the area being investigated. The data was analysed by use of descriptive statistics such as means, percentages and frequencies. The analyzed data was presented using both tabular and graphical formats. The study established various capacity gaps that hinder the development of appropriate skills in YPs. These included inadequate policy framework, inadequate and obsolete equipment and facilities, deficient academic and professional qualifications among the instructors and inadequate structures. These capacity gaps led to low enrolment and inadequate training in youth polytechnics. The study recommends legal and policy measures including review of existing laws to enhance institutional capacity of youth polytechnics for appropriate skills development. The findings of the study are expected to assist policy makers in the Ministry of Education Science and Technology, the county governments and the Youth Polytechnics' management to develop appropriate strategies to address the identified capacity gaps.

SCHOOL OF HOSPITALITY, TOURISM AND LEISURE STUDIES

SUSTAINABLE WASTE MANAGEMENT: AWARENESS AND PRACTICES AMONG CLASSIFIED HOTELS IN BAUCHI STATE, NIGERIA

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Waste generation and unsustainable waste management practices are among the reasons for environmental degradation with all of its attendant negative implications. Hotels are responding to the global challenge of mitigating the effects of environmental degradation by innovatively moving away

from the traditional methods of waste management such as wastefulness, waste land filling and waste burning to more sustainable methods such as waste avoidance, reduce, reuse, recycle and more recently, waste to energy techniques. Minimum study have been done on how environmental awareness relates with sustainable waste management practices among hotels in Bauchi State, Nigeria. Based on five relevant theories, the objectives of the study determined the levels of hotels operators' awareness of SWM methods, possible impacts of unmanaged waste, waste related environmental regulations and how these influence SWM practices among the hotels, and in addition, the mediating effect of perceived benefits of SWM on the relationship between awareness and practices of SWM. The study used cross-sectional descriptive survey design which involved both quantitative and qualitative approaches. The study area was Bauchi State and target population was made up of the 49 classified hotels from where 245 respondents were drawn. Purposive sampling was used to select the 158 managers and departmental heads from available 42 hotels. A structured questionnaire, interview schedule and observation checklist were used to collect data. Descriptive statistics was used to determine variable characteristics of the study while Pearson correlation was used to establish patterns of relationships and associations of the study variables. Multiple regression analysis was used to determine significant variable predictors and test hypotheses of the study. Results revealed: that hotels operators in Bauchi State are aware of SWM methods to a moderate extent with greater level of awareness existing among the higher classes of hotels; that hotels' levels of awareness does not correspond to the extent of practice which was to a small extent; that there is a significant relationship between awareness of possible impacts of waste and practices but no significant relationship between awareness of waste related environmental regulations and SWM practices. The Pearson correlation matrix results indicated: awareness of SWM ($r=0.258$, $p=0.001$), awareness of possible impacts of unmanaged waste ($r=0.301$, $p=0.000$) and awareness of waste related environmental regulations ($r=0.123$, $p=0.125$) collectively had positive significant relationship and association with SWM practices. The regression analysis coefficient of $R=0.370$ and adjusted squared coefficient of $R^2= 0.120$ were established implying that the study variables explained 12.0% of the variations of SWM practices. Perceived benefits of SWM with 0.172 point has partial mediating effect on the relationship between awareness and practices of SWM among the hotels. The study revealed that awareness of SWM methods and awareness of possible impacts of unmanaged waste were the significant positive variable predictors of SWM practices among the hotels and concluded that an improvement in these two predictors will cause positive significant improvements in SWM practices. The study therefore, recommends for reinforcement in the levels of awareness of these significant variable predictors for improvement in SWM practices among classified hotels in Bauchi State, Nigeria. The study also recommended for further research on the factors which determine guests' environmental behaviors in Bauchi State in particular and in Nigeria in general.

SUCCESS FACTORS FOR VIABLE TOURISM PLANNING, A CASE OF NAIROBI CITY COUNTY, KENYA

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Planning is a very crucial process by which tourism is managed by governments at the national and local levels. With all the expected benefits from tourism, planning is core to achieving any tangible results especially in the long term. There is minimal attention given to tourism research to-date especially on policy regulation and planning models. In Kenya, several policy and planning documents have been developed by expert consultation. Evaluation of Kenyan planning and policy development journey opens up crucial knowledge on tourism planning in the developing countries. Information on challenges to planning and policy development and implementation is rare from literature in the earlier studies done in Kenya hence this study sought to close that knowledge gap. This study assessed stakeholder participation and tourism planning process; interrogated planners' areas of concern in tourism planning; investigated the elements of tourism plans, evaluated the planning / policy environment in Kenya and assessed the aspects of spatial planning. The study took a diverse of tourism managers of different facilities, tour and travel agencies and attractions as the study population, while government tourist officers, county officers and Non-governmental organizations dealing with tourism were key informants for qualitative data segment. A sample of 275 respondents was drawn from the stakeholders of tourism for quantitative survey and 7 interviews were conducted. The study found out that tourism planning at the institutional and national level lacks stakeholder participation which is a crucial component in planning and policy development and implementation. Because of that, tourism planning in Kenya is haphazard and an ad hoc affair and lacks consistency, planners of tourism of Nairobi in various degrees lacked on crucial objectives of: reducing negative impacts of tourism (social, economic, cultural and natural environmental sustainability); spatial planning objectives for tourist mobility and had not been concerned with reduction of threats to tourism including terrorism and other disasters. There were 4 main predictor variables for plan viability: Tourism planning stakeholder involvement, planners' main areas of concern, elements of tourism planning and tourism planning environment. Out of the four, the regression model gave tourism planning stakeholder involvement as the highest predictor β value of 0.756 which was very significant at 0.000, and elements of tourism planning a predictor β value of 0.436 with 0.000 significance. The spatial analysis from remote sensed data showed that Nairobi has developed infrastructure between 62.5% and 430% between 1975 to 2017 and reduced its green areas and forests between -3.7% to -25.7% in the same period. The study concludes that tourism planning environment is currently not conducive for viable planning due to political and economic reasons. To ensure proper environment for planning, the planners need to ensure they develop the capacity of tourism planners at the organizational and national levels that will reduce the employment of foreign consultants in planning process. It henceforth recommends that planners of tourism should encourage tourism stakeholders to get organized into stakeholder groups to gain meaningful input. Another recommendation is that the concerns of tourism planners should be mainly to ensure sustainability if tourism development has to be achieved in any destination. Therefore the plans have to objectively deal with disasters and their cycles at the destinations. For future studies, a study on Geographical Information System (GIS)-based spatial planning will help understand how tourist circuits can be developed for cities like Nairobi and Mombasa and the country as a whole.

SCHOOL OF AGRICULTURE

PERFORMANCE OF AMARANTH ACCESSIONS AGAINST MOISTURE STRESS AND KEY INSECT PESTS AND THEIR INDIGENOUS PARASITOIDS IN ARUSHA, TANZANIA

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Amaranths are African indigenous vegetables (AIVs) that have recently gained importance as a food source in Africa owing to the high nutritional value of their leaves and grains. Production of this crop is, however, limited by arthropod pests especially the lepidopteran leaf-webbers, leaf-worms and stem weevils. The use of insecticides for their management is uneconomical and also present health and environmental concerns. Host plant resistance (HPR) to insects is an effective, economical and environmentally friendly alternative that is poorly understood and unexploited among AIVs. The aim of this study was to assess *Amaranthus* accessions for resistance to leaf-webbers and stem weevils, their tolerance to water stress conditions and the performance of indigenous parasitoids on selected accessions. Field and laboratory experiments were conducted at the World Vegetable Centre (WorldVeg) in Arusha Tanzania with 36 accessions and lines of amaranth. Accessions VI036227, RVI00027, VI054569, VI033487, VI044432, VI048076, VI049639, VI049530 and VI049698 had high levels of pest resistance with significantly lower infestations ($\leq 11.11 \pm 2.14\%$) and damage ($\leq 68.06 \pm 3.90\%$) by leaf-webbers and leaf-worms. The accession VI036227 was found to be highly resistant against *Spoladea recurvalis*, exhibiting exemplary antibiosis by causing 100% larval mortality despite not being deterrent for oviposition. The accessions VI048076, VI056563 and VI047555-B demonstrated moderate resistance against the pest for specific parameters including low oviposition, moderate early stage larval mortality and reduced adult longevity. The relative growth rate (RGR) of accessions VI033479, VI049698 and VI056563 were not significantly affected by the three soil water levels (40%, 60% and 90% water holding capacity (WHC)). *Apanteles hemara* performed well on all the other moderately resistant accessions except VI056563 that recorded lower parasitism rates compared to the susceptible accession. The longevity of the parasitoid was significantly extended on the resistant accessions compared to the susceptible one. The functional response curve exhibited by *A. hemara* corresponded to type II functional response with an asymptote at the density of 30 larvae. *Apanteles hemara* parasitism was significantly higher in 1-2-day-old compared to 3-4-day-old larvae ($P=0.04$). Thus, accessions VI036227 and VI049698 were identified to be highly resistant to leaf-webbers in addition to 24 moderately resistant ones while VI047517-B, VI036227 and VI056563 had low levels of resistance against stem weevils. Accessions VI033479, VI049698 and VI056563 were also tolerant to moisture stress. The identified pest resistant and water stress-tolerant amaranth accessions from this study are recommended for multiplication and release to farmers to alleviate the effects of pests and drought.

These can also be used in breeding programs to improve locally cultivated varieties. The identified parasitoids can also be reared and released into farmer fields to synergize host plant resistance.

ANALYSIS OF OPOPONAX AND MYRRH CONTRIBUTION TO THE LIVELIHOOD OF RURAL COMMUNITIES IN WAJIR COUNTY, KENYA

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This study targeted gum Opoponax (Hagar) and Myrrh (Malmal) that are naturally harvested from *Commiphora holtziana* and *C. myrrha* respectively in northern Kenya. The two tree species grow naturally in Wajir County, Kenya. However, contribution of the two products to rural livelihood improvement and commerce is constrained by information gap on resource distribution, supply potential, socio-economic characteristics of the local communities and prevailing market dynamics. Therefore, this study sought to determine the spread and supply potential of *C. holtziana* and *C. myrrha* in their natural habitats; determine the socio-economic factors influencing harvesting of gum opoponax and myrrh from their natural habitats; and assess the market dynamics. Primary data was collected through carrying out vegetation resource mapping and inventory and using structured questionnaire on gum resin harvesters and market surveys. Secondary information was accessed from the county agricultural offices located in Wajir. A multi stage sampling technique was adopted for this study. A total of 187 gum resin harvesters, 74 traders and 30 key informants were sampled. The collected data was analysed using descriptive statistics; exponential logarithmic function and structure conduct performance (SCP) approaches. The findings reveal that *C. holtziana* and *C. myrrha* covered an area of 254,493 ha and 61,279 ha, respectively. This translated to an annual gum resin supply potential of 2.2 million kg valued at Ksh. 1 billion shillings. Each collector harvested an average of 3 kg/day of Hagar and 4 kg/day of Malmal during the peak harvesting season between June and September every year. Gum resins contribute Ksh. 12,400 (60%) of the household income. The quantity of Hagar harvested per day was significantly influenced by age of collectors, distance to the market, time taken in harvesting; season, prevailing market prices for malmal and Hagar. On the other hand, the quantity of malmal collected per day was influenced by distance to the market, number of trees harvested and the main purpose of harvesting. Therefore, Hagar and malmal market structure can be described as oligopoly. In an effort to manage this resource as an agribusiness, it was recommended that the county and national governments empower the youth through provision of technical, marketing, financial and policy incentives. Secondly, there is need to streamline gum opoponax and myrrh marketing system through new entrant of wholesalers for enhanced competition and benefits to harvesters, the national and county government to ensure that gum resin resource is managed under tree pasture or tree-crop land use system to boost tree population and gum resin supply.

WASTE-WATER UTILIZATION AND ITS EFFECT ON GROWTH AND QUALITY OF KALE AND INDIGENOUS LEAFY VEGETABLES IN KITUI COUNTY, KENYA

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Low quality water partially treated and non-treated waste water is used for irrigation and production of crops, particularly leafy vegetables in developing countries. The water contains crucial plant nutrients but in addition have toxic substances, including increased levels of heavy metals such as Cadmium, lead, Copper, Zinc and Iron (the latter three are nutrients and only toxic beyond permissible levels) which are often overlooked by vegetable producers. By consuming plants grown with waste water containing elevated metal concentrations, human life is put at risk. The aim of this study was to: map vegetable abundance and distribution in Kitui, assess growth and determine levels of heavy metals in waste water, soil as well as in tissues of *Brassica oleraceae* var. *acephala* (Kale) and indigenous leafy vegetables grown with waste water within Kitui County. A descriptive survey was carried out to assess the vegetable preference, irrigation practices and samples picked to determine plant tissue and soil heavy metal accumulation and vegetables uptake of heavy metals in the study area. Four vegetable species were selected to be grown in open field and greenhouse conditions for a controlled experiment. To test the performance of the leafy vegetables, treatments were laid in a Randomized Complete Block Design (RCBD) with eight treatments (2 water treatments \times 4 vegetable types) subjected to two irrigation systems. The treatments were replicated three times. Plants were harvested upon attaining their horticultural maturity. The vegetables, soil and water samples were analyzed for heavy metal concentrations using AAS and the plant growth responses to waste water were also determined. Statistical analyses were conducted with Genstat 15th Edition with the means compared at $P \leq 0.05$ and where there were significance differences, LSD using Tukey's test. Results revealed that waste water contained heavy metals to be above WHO permissible limits. The study further revealed that some of the areas in the study site were more polluted by a particular heavy metal with the concentrations as follows: Nickel (72 mg/kg to 0.7 mg/kg), copper (81.7 mg/kg to 1.4 mg/kg) and Zinc (187.37 mg/kg to 117 mg/kg) higher than the Maximum permissible limits while those of Zinc and Iron were within the recommended concentration for agricultural soils. Following the experimental irrigation treatments, the vegetables differed in yield and heavy metal accumulation with some of them exceeding the permissible limits of lead and cadmium. The leaf area was greatest for black nightshade (1528 cm² and 3096 cm²) in the greenhouse experiment during the 6th and 12th WAP. Use of waste water as opposed to tap water led to significantly higher ($P \leq 0.05$) heavy metal accumulation in *Brassica oleraceae* var. *acephala*, *Vigna unguiculata*, *Solanum nigrum* and *Amaranthus hybridus* in 8th and 10th WAP. The root irrigation was superior in Cd concentration uptake compared to shoot irrigation in both seasons and the greenhouse experiments as it recorded 3.09 mg/kg, 0.71 mg/kg and 0.23 mg/kg. The results indicated that, *Brassica oleraceae* var. *acephala* had higher tissue heavy metals, hence is a hyperaccumulator. This

study recommends consistent monitoring of heavy metal concentrations in agricultural soil and water used for irrigation to avoid excessive accumulation in vegetables.

SCHOOL OF CREATIVE AND PERFORMING ARTS, FILM AND MEDIA

SUBSTANCE AND STRUCTURE OF ANIMATION FILMS IN KENYA: A STUDY OF SELECTED FILMS

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This study investigates the substance and structure of animation films in Kenya. Specifically it focuses on thematic analysis of Kenyan animation films narratives representations through artistic styles, using techniques like mise-en-scene, montage, narrative styles, non-diegesis, and diegesis. The analysis focused on communicative artistic form and dominant themes of social, political and cultural issues addressed by Kenyan animators, writers, and producers. The analysis of animation films from Kenya include: The legends of Ngong hills film (Bunitv 2011), films sampled from Tinga Tinga tales series: why lion roars, why chicken pecks the ground and why lizard hides under the rocks (Homeboyz Animation-first episode 2011), Greedy lords of the Jungle, Africa's next top poet, Shadowboxing, Driving test, Miss match, Lunchtime woes, Savannah drama, Two olds (RECON-Digital 2009-2012), and Wageuzi Battle 2012 (Afrikana Digital 2011). This study also analysed advertisements about FAIBA Episode 2 caveman series, and Safaricom Sambaza (Fat boy Animations). The study addresses four key issues; the stylistic features employed by animators, animators' use of particular communicative forms as opposed to others in addressing specific social, political, economic, and cultural issues in Kenya, audiences' interpretation of the sampled Kenyan animation films, and themes of social and cultural issues addressed by Kenyan animators/ writers/producers through animation films. The study employs mixed research method; however, the qualitative design is the dominant approach used. The design comprises library research, thematic content analysis of selected films, focus group discussions, and in-depth interviews with selected primary school pupils, parents and filmmakers. Three theoretical perspectives, Social Cognitive Theory, the Conventionalist theory of pictorial representation, and the Neo-representation theory guided the analysis of this study. The study findings show that the Kenyan filmmakers create short experimental animation films, which focus on advertising because of its good financial returns. Kenyan animation filmmakers' stylistic features employed, varies from animator to animator, however, the 3D animation technique is the most popular among them. Foreign animations influence children positively and negatively. The main thesis is that Kenyan animation filmmakers create film narratives on issues about the Kenyan society at large. Film animators in Kenya use both deliberate and envisaged efforts as an avenue of addressing as an avenue of addressing Greed, selfishness, Deception, and political power; Confidence in life's challenges; Bravery, betrayal, and love; Persuasion,

success and enjoyment, among others. There are popular animation characters that appeal to children, in terms of artistic character representation and storylines. This is dependent on showing animation film character's ability to cope with social challenges and his or her physical attractiveness, and as a result, an establishment of parasocial relationship. Hence animation films serve as a platform which the Kenyan filmmaker can express themselves about issues in the Kenyan society. The study is significant in that it provides an applicable model in studies of animation films and the many socio-cultural situations of national importance.

DETERMINANTS OF COMPUTER-AIDED DESIGN TECHNOLOGY INTEGRATION IN FASHION AND APPAREL DESIGN TRAINING IN KENYAN UNIVERSITIES: DEVELOPING A MODEL FOR IMPLEMENTATION

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Computer Aided Design (CAD) technology for textile and apparel industry has been developed for effective and efficient manufacture of quality products. CAD technology training is crucial in ensuring skilled manpower is available to utilise CAD systems in designing and manufacturing processes in the textile and apparel industry. However, fashion and apparel industries in Kenya still employ expatriates to undertake CAD-related jobs. This is an indication that CAD technology taught in fashion and apparel design courses in Kenyan universities has not adequately addressed skill needs of the apparel industry. The study objectives of this research were therefore to; identify CAD teaching units in fashion and apparel design training; examine teacher, institutional, apparel industry and classroom-level factors as well as to establish the status of CAD training in order to develop a model for CAD technology implementation. The study employed cross-sectional survey research design to gather data from 234 respondents from five universities offering fashion and apparel design training as well as fashion houses and apparel firms. Data collection tools included structured questionnaires for teachers, heads of departments, students, fashion houses and apparel firms as well as semi-structured interview schedules for technical staff. Analysis was conducted using descriptive statistics where data were grouped and summarized using frequencies, percentages, means and standard deviation. The data was presented in form of prose, tables, pie-charts and graphs. Descriptive analysis showed the ICT policies in place did not effectively address CAD technology integration whereas CAD curriculum was deficient. Poor provision of CAD teaching/learning resources affected CAD selection, teaching methodologies and CAD use. Teachers were not adequately trained in ICT and CAD technology and this impacted on their effectiveness in integrating CAD. Inferential statistics, namely the Kruskal-Wallis test, showed there was variation in CAD units taught in five universities whereas multiple linear regression established the determinants of CAD technology integration. A model for CAD technology integration was developed where institutional factors, ICT policy, CAD curriculum, and CAD teaching/learning resources as well as CAD selection, teaching methodologies and CAD use were found to contribute significantly as they explained 93.1% of variance in CAD technology integration. Similarly, teacher factors including ICT and CAD competence, self-efficacy, perceived implication of CAD technology to students' training, were found to be significant

and explained 73.1% of the variance, whereas only CAD training was significant among apparel industry factors and explained 56.1% of variation in CAD technology integration. However, classroom-level factors had minimal contribution as variables, namely, CAD learning resources, computer utilisation and students' perception on the implication of CAD technology to their learning could only explain 31.0% of the variance in CAD technology integration. Study findings indicate teachers, students and apparel industry respondents recognized importance of CAD technology to students training which university management and departmental heads need to take into consideration when integrating CAD technology. Hence, the university management should ensure policies are in place, appropriate curriculum is developed and sufficient resources are provided as well as effective collaboration with apparel industry to enhance CAD technology integration. Teachers should also be trained in CAD technology as this will increase their confidence in integrating CAD technology in training.

SCHOOL OF BUSINESS

EFFECTS OF ENTREPRENEURIAL AND FIRM CHARACTERISTICS ON ACCESS TO VENTURE CAPITAL BY SMALL AND MEDIUM ENTERPRISES IN NAIROBI CITY COUNTY, KENYA

Wawira Muchira-PHD

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Dr. Eddie Simiyu

Small and medium Enterprises are vital for economic growth especially in the developing countries. However, empirical evidence shows that most of these enterprises fail due to poor/lack of access to finance. Access to venture capital by the small and medium enterprises could be a plausible alternative but unfortunately research has pointed out that majority of the enterprises do not access venture capital financing, which is considered an important option for small and medium enterprises trying to grow. This study therefore sought to investigate the effect of entrepreneurial and firm characteristics on access to venture capital by small and medium enterprises in Kenya. The study was guided by the following specific objectives; To determine the effect of entrepreneur's innovativeness on access to venture capital, to establish the effect of entrepreneur's managerial competency on access to venture capital, to determine the effect of firm's age on access to venture capital, to establish the effect of firm's sector of operation on access to venture capital, to determine the mediating effect of firms performance on the relationship between entrepreneurial and firm characteristic and access to venture capital and lastly to determine the moderating effect of risk reduction strategies on the relationship between entrepreneurial and firm characteristics on access to venture capital by Small and medium size enterprises in Kenya. Agency theory underpinned the study. The study adopted the explanatory non experimental research design and positivism philosophy guided the study. Target population of the study was 334 Small and medium size enterprises ranked by KPMG between 2008 and 2017 in their annual survey. Proportionate random sampling technique was used to select the firms. Primary data was

collected by semi structured questionnaire, using drop and pick method. Both descriptive statistics and inferential statistics were used to analyze the data. Nested multinomial logit model was used to establish the effect of entrepreneurial and firm characteristic on access to venture capital financing. The results reveal that; the influence of an entrepreneur's innovativeness on access to venture capital financing is statistically significant. Secondly, managerial competency had positive influence and was statistically significant to access to venture capital financing among SMEs. Third, the results show that SMEs in the service industry benefits more from venture capital as opposed to those in the non-service industry. Fourthly, the results show that a firm's age has a positive though statistically insignificant influence on access to venture capital financing. Fifth, there is no mediating relationship between a firm's performance on the relationship between entrepreneurial and firm characteristic and access to venture capital financing. Finally, there exists a moderating relationship between entrepreneurial and firm characteristic on access to venture capital financing. From the findings, a number of recommendations can be made. First, SMEs should continue investing in enhancing entrepreneurial innovativeness as it increases the propensity of their enterprises from accessing venture capital financing. Secondly, given that managerial competency positively affects SMEs access of venture capital financing, firms should invest in human capital of their management through various strategies. For instance, investing in training gives employees the opportunity to develop new skills and accumulate the knowledge they need in order to achieve specific organizational and personal goals with the priority being to train managers so that they can be able to cope with the challenges which hinder business success.

FINANCIAL STRUCTURE AND FINANCIAL PERFORMANCE OF SELECTED FIRMS LISTED AT NAIROBI SECURITIES EXCHANGE, KENYA

Gathara Mwangi Zachary-PHD

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A high number of quoted firms have registered declining financial performance in the recent years resulting to financial difficulties contrary to stakeholders' expectations and adversely affecting the economic growth of the Kenyan economy. Financial structure choice and its impact on financial performance remains a great dilemma to all stakeholders. This study investigated the effect of financial structure on financial performance of selected firms listed at Nairobi Securities Exchange, Kenya. Specifically, the study investigated the effect of leverage, liquidity and equity on financial performance. In addition, the study evaluated the moderating effect of firm size on the relationship between financial structure and financial performance of selected firms listed at NSE, Kenya. The study adopted positivist philosophy as it focused on objectivity and fits a quantitative study with the objective of testing hypotheses. Explanatory research design was employed in this study due to the nature of the problem and available quantitative data. Multivariate tests using panel data model examined the effects of independent variables on firm's financial performance. The target population of the study comprised of all 30 firms listed on the NSE, between years 2007 to 2015 drawn from seven selected sectors of the

economy which met the selection criteria. A census of the 30 firms was done and data collected for the 30 companies for the period 2007 - 2015. The study utilised secondary panel data contained in the annual reports and financial statements of selected companies. Various diagnostic tests including Auto-correlation test, Normality test, Heteroscedasticity test, Unit root test and Test for pooling were carried out. Breach-Pagan Lagrange multiplier (LM) test was used showing that there were no panel effects (implying that ordinary least square should be used (pooling)). Therefore, the data was pooled. The study used descriptive statistics, correlation analysis and panel linear multiple regression analysis. Regression coefficients were used to test for significance using t-statistic at 5% level of significance and conclusions drawn. The coefficient of determination (R²) was used to rank explanatory variables' contribution to the response variable. The study found that Leverage, Liquidity and Owners Equity had significant positive effect on financial performance of selected companies listed at NSE, Kenya, while firm size had positive and significant moderating effect on the relationship between financial structure and financial performance. The overall moderating effect of firm size on the relationship between financial structure and financial performance increased by 7.7% after incorporating the moderator which explained 91.6% of changes in financial performance compared with 83.9% without the moderator. The study concluded that leverage, liquidity and owners' equity had positive and significant effect on financial performance and that the use of various components of financial structure jointly enhanced the financial structure's power to explain the variations in financial performance. The study contributed to the financial structure literature by providing evidence of the effect of Leverage, Owners' Equity and Liquidity on financial performance of firms listed in NSE, Kenya for the period 2007-2015. The study recommended that managers of the selected firms listed at NSE, Kenya could utilize the various sources of finance since financial structure has a positive effect on the financial performance of the listed firms with leverage making the highest contribution to financial performance.

WORKFORCE DIVERSITY AND PERFORMANCE OF ACADEMIC STAFF IN SELECTED PUBLIC UNIVERSITIES IN KENYA

Laura Gakii Munene:PHD

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Dr. Muli Jedidah

Performance of academic staff in public university has been of interest to various stakeholders in the recent past. There have been concerns of the diminishing levels of performance and the need to improve this. Employee diversity necessitates organizations to undertake various strategies to ensure that different unique individuals have a favorable environment to produce optimally. Firm's wishing to remain viable in the competitive environment need to attract and retain diverse employees from whom they can tap different talents, capabilities, experiences and skills for optimal employee performance. Workforce diversity and workforce diversity initiatives have become one of the key drivers of employee performance. This study focused on investigating the effect of workforce diversity on performance of academic staff in selected public universities in Kenya. It was guided by the specific objectives; to determine the effect of internal dimension, external dimension and organizational dimension on

performance of academic staff in selected public universities in Kenya, to examine the mediating effect of diversity initiatives and moderating effect of internal institution factors on the relationship between workforce diversity and performance of academic staff in selected public universities in Kenya. The study was anchored on role theory, expectancy theory, individual level performance model and social categorization theory as its foundations for theoretical link between the variables. Positivist research philosophy guided this research. Descriptive cross sectional research design was used to obtain data concerning the current status of performance of academic staff and the workforce diversity variables. The target population constituted 7143 academic staff from six purposefully selected public universities (University of Nairobi, Moi, Kenyatta, Egerton, Jomo Kenyatta university of Agriculture and Technology and Maseno university) from where the sample size of 379 academic staff were randomly selected using proportionate random and systematic sampling. A semi-structured questionnaire was used to collect data. The questionnaire was administered using the Survey Monkey format. The questionnaires' had a reliability of 0.708 Cronbach Alpha coefficients. Descriptive statistics were used to describe the variables while inferential statistics were used to establish the relationships between the independent and dependent variable. Meaning from quantitative data was derived through numerical values while that from quantitative data was derived through inferences. The study hypotheses were tested at 95% confidence level. The results indicate that internal dimension had no significant effect on performance of academic staff while external dimension and organizational dimension have a positive significant effect on performance of academic staff. Diversity initiatives were also found to be a partial mediator in the relationship between workforce diversity and performance of academic staff while internal institution factors were an explanatory variable in the relationship between workforce diversity and performance of academic staff. The study concluded that workforce diversity has mixed effect on academic staff performance. Moreover, the study confirmed that diversity initiatives are valuable human resource practices that can lead to superior performance. Policy makers can use the findings of this study to evaluate how well higher education sector can be leveraged through external and internal dimensions of diversity in order to contribute to increased growth in the sector. The study suggests that future research should focus on broadening work force diversity study to other industries for further generalization of findings to broad sectors.

CORPORATE GROWTH STRATEGIES AND PERFORMANCE OF LARGE MANUFACTURING FIRMS IN NAIROBI CITY COUNTY, KENYA

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Dr. Jane W. Kinyua-Njuguna

The manufacturing firms have been restructuring or closing down their production plants despite the government focus on infrastructure and policy frameworks to support the sector. Empirical studies have shown that corporate growth strategies directly affect performance of specific industries in Kenya. However, little attention has been put to the combined effect of corporate growth strategies, competitive advantage and external operating environment on performance across different industries.

For these reasons, this study aimed to investigate the effect of corporate growth strategies on performance of large manufacturing firms across various industries. Specifically, the study sought to; establish the effect of market development strategy, find out the effect of product development strategy and determine the effect of market diversification strategy on performance of manufacturing firms in Nairobi City County, Kenya. It also assessed the moderating effect of external operating environment and examined the mediating effect of competitive advantage on the relationship between corporate growth strategies and performance of manufacturing firms in Nairobi City County, Kenya. This study was anchored on resource based theory, institutional theory and resource dependence theory. The study adopted a positivism research philosophy. The study used a mixture of descriptive and explanatory research designs. The study targeted 373 large manufacturing firms located in Nairobi City County, Kenya. Multi stage sampling was used to determine a sample of 184 firms, which was proportionately selected from thirteen manufacturing sub-sectors. The study collected primary data using self-administered questionnaire and secondary data using document review guide. Descriptive statistics was used to describe the characteristics of the surveyed firms and the respondents, whereas multiple regression analyses were used to evaluate the effect between study variables. Diagnostic tests of sample adequacy, confirmatory factor analysis, normality, linearity, multicollinearity and homoscedasticity were conducted before the inferential statistics. Qualitative analysis was done using content analysis. All the three corporate growth strategies; market development strategy, product development strategy and diversification strategy had positive and significant effect on firm performance. External operating environment had a significant moderating effect on the relationship between corporate growth strategies and firm performance. Competitive advantage had a significant mediating effect on the relationship between corporate growth strategies and firm performance. The study concluded that manufacturing firms which practice market development, product development and diversification strategies are likely to perform better than those firms that does not practice them. The study concludes that firms that have measures of managing their external operating environment when formulating and executing corporate strategies are more likely to perform better than the ones that does not. Moreover, the study concludes that firms with activities and practices of competitive advantage are likely to perform better than the firms without competitive advantage activities and practices. The study recommends that policy makers develop and execute corporate growth strategies based on the firm competitive advantage and external operating environment.

INFORMATION AND COMMUNICATION TECHNOLOGY CAPACITY AND ORGANIZATIONAL PERFORMANCE OF PUBLIC SECONDARY SCHOOLS IN KISII COUNTY, KENYA

Cyprian M. O. Nyambane-PHD

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Dr. Julius Korir

Kenya Vision 2030 places great emphasis on the link between education and the labour market through education and training for a knowledge-based economy. Therefore the government acknowledges that integration of ICT public schools presents an opportunity for improving efficiency and effectiveness in

school administration, teaching and learning. Despite of government concerted efforts on integration of ICT in public schools, public secondary schools in Kisii County are still faced with operational inefficiencies, traditional teaching and learning methods and declining educational outcomes. While integration of ICT in schools is expected transform school processes and improve organizational performance, the ICT capacity requirements that are needed for the successful implementation of ICT integration are still a challenge in most public secondary schools in the county and therefore affecting the effective utilization of ICT to realize its full potential. The study therefore examined ICT capacity and organizational performance of public secondary schools funded through the Economic Stimulus Programme (ESP) in Kisii County. The specific objectives of the study were to examine the influence of human resource ICT capacity, school ICT infrastructure and institutional ICT environment on organizational performance while controlling for teacher characteristics and ICT use as moderating and mediating variables respectively. The study adopted pragmatism philosophy which advocates for the use of mixed-methods in research to combine the strengths of qualitative and quantitative approaches. The study used primary data which was collected using structured questionnaires administered to all teachers and principals in 54 public secondary schools that were sampled from a target population of 62 public secondary within the county. Descriptive statistics was used to summarize data while inferential statistics applied multiple regression analysis to test hypothesized relationships. Content analysis was also used for qualitative data. Adjusted R² was used to measure the amount of variation in the dependent variable explained by the independent variables. The research findings indicated that human resource ICT capacity, school ICT infrastructure and institutional ICT environment had a positive and significant effect on organizational performance of public secondary schools in Kisii County. The results further showed that ICT use in public secondary schools in Kisii County had a mediating effect on the relationship between ICT capacity and organizational performance however the effect was partial. The study however did not find teacher characteristics to have any moderating effect on the relationship between ICT capacity and organizational performance of public secondary schools in the county. The study concludes that ICT capacity has a positive effect on organizational performance of public secondary schools in Kisii County. The study outcome is a valuable feedback to schools' management, government and education sector players on the role of ICT in enhancing organizational performance of public secondary schools and therefore recommends that the stakeholders in the education sector should beef up ICT capacity building in learning institutions for effective utilization of ICT in order to realize its full potential in enhancing quality of teaching, learning and effective management in learning institutions. The study further suggests that a similar study may be conducted using longitudinal research design to further examine the causal links between ICT capacity and organizational performance of public secondary school in Kisii County.

SCHOOL OF PURE AND APPLIED SCIENCES

ANTI-OBESITY, COGNITIVE ENHANCING, NEUROBEHAVIORAL, ANTIOXIDANT EFFECTS AND PHYTOCHEMICAL PROFILE OF DICHLOROMETHANE LEAF EXTRACT OF GNIDIA GLAUCA (FRESEN)

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Obesity is a chronic metabolic disorder characterized by increased adipose tissue mass due to positive energy balance. The epidemic of obesity is currently on the rise probably due to increasingly sedentary lifestyles combined with easy availability of palatable, high-fat foods. It presents modifiable risk factor for cognitive impairments, anxiety and motor deficits. Globally, its prevalence has shown a startling increase in all age groups and have been associated with increased morbidity and mortality. Prescription of anti-obesity drugs can be useful adjuncts to diet and exercise for obese patients who have failed to achieve weight loss. However, these drugs are ineffective, not readily available, unaffordable and have been associated with adverse effects. Therefore, medicinal plants have drawn a sharp focus in recent times as complementary and alternative medicines owing to their biocompatibility, affordability and are assumed to be safe due to their long-term clinical application. Hereby, determination of therapeutic activities and identification of active principles from herbal prescriptions have become the prime focus in the validation of their folkloric usage and in drug discovery programs. The present study aimed to determine the anti-obesity effects, cognitive enhancing, neurobehavioral, antioxidant effects and phytochemical profile of dichloromethane leaf extract of *Gnidia glauca*. Obesity was experimentally induced by feeding the rats with prepared high-fat-diet (HFD) and water ad libitum for a period of 6 weeks. The in-vivo anti-obesity effects were determined by oral administration of the extract at dosage levels of 200, 250 and 300mg/kg body weight in HFD-induced obese rats from the 6th to 12th week along with HFD. Cognitive-enhancing effects of the extract in HFD-induced obese rats were determined using the Morris Water Maze experiment. The effects of the extract on neurobehaviors (locomotor activity, anxiety and exploration-like behaviors) in HFD-induced obese rats were tested using the Open Field Test. The in vitro antioxidant properties of the extract were determined using non-enzymatic assays. The phytochemical profile of the extract was determined using GC-MS. The results indicated that the extract exhibited potent anti-obesity effects in HFD-induced obese rats. It significantly reduced the body weight, organ weights, organo-somatic indices, anthropometric indices, the total fat content, adiposity index, atherogenic index as well as the lipid profiles (Triglycerides, Total Cholesterol, Low-Density Lipoproteins, and Very Low-Density Lipoproteins). However, it significantly increased levels of High-Density Lipoproteins. The extract increased levels of white blood cells, differential leukocyte counts, platelet count as well as red blood cells and related parameters. The extract improved hippocampal-dependent spatial learning and memory retention in HFD-induced obese rats. Moreover, it showed anxiolytic effects, increased spontaneous locomotor activity and exploration-like behaviors in

HFD-induced obese rats. The extract also indicated in vitro antioxidant effects. The phytochemical analysis revealed the presence of 28 bioactive compounds in the extract. The anti-obesity effects, antioxidants activities, cognitive-enhancing effects and the improved locomotor and exploration-like behaviors could be attributed to the phytochemical compounds present in the plant extract. The present study, therefore, scientifically validated the traditional use of this plant and generated data that can serve as guide in the recruitment of the extract as a potential candidate for the synthesis of a new effective drug against obesity and associated complications. However, there is a need for bioassay-guided fractionation of bioactive compounds in *Gnidia glauca*. Besides, it is recommended to conduct comprehensive toxicity studies to establish the safety profiles of *Gnidia glauca*.

CIRCULATORY CYTOKINES AND HEMATOLOGICAL PROFILES AS BIOMARKERS OF HIV AND AIDS PROGRESSION

Mugwe Jane Nyambura-PHD

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Dr. Joseph Mwatha

Cytokines are polypeptides that have a fundamental role in communication within the immune system and in allowing the immune system and host tissue cells to exchange information. They play a central role in the pathogenesis of many diseases including Acquired Immunodeficiency Deficiency Syndrome (AIDS). Cytokines reflect the local or systemic inflammatory milieu, and could serve as predictive biomarkers in Human Immunodeficiency Virus (HIV) infection. Hematological abnormalities are among the most common complications caused by HIV infection and seem to be dependent on the level of virus replication. The aim of this study was to identify circulatory cytokine biomarkers and hematological profiles measurable in blood that could predict the progression of HIV disease in the course of infection. This study was done at the Nakuru Provincial General Hospital (PGH). Eighty individuals were recruited for this study that comprised of forty individuals newly diagnosed with HIV-1 (treatment naïve), twenty HIV negative individuals and twenty HIV positive individuals that were on treatment with highly active antiretroviral therapy (HAART). Hematological parameters were analyzed using hematology auto analyzer system; cytokine types and concentrations were determined by flowcytometry using multiplex cytokine immunoassay and CD4 T cell counts were measured by flowcytometry using Becton and Dickinson Fluorescence Activated Cell Sorter (BD FACS) count. Statistical analysis were done using SPSS version 17. Descriptive statistics were applied; analyses of variance was used to determine the differences in mean circulatory cytokine levels, mean hematological profiles and mean CD4 T cell counts between the subgroups forming the study population. The associations between immunological and hematological profiles were determined. The study found significant differences in the mean Interleukin12p70 ($p < 0.001$), Tumor Necrosis Factor ($p < 0.05$), Interleukin 10 ($p < 0.05$), Interleukin 6 ($p < 0.005$) and Interleukin 1- β ($p < 0.05$) between treatment naïve HIV patients, HIV patients on HAART and HIV negative patients. No significant differences were found between the mean White Blood Cell counts and Red Blood Cell counts ($p > 0.05$) between the treatment naïve HIV patients, HIV negative patients and HIV patients on HAART but there were significant differences between the mean

hematocrit (HCT) ($p < 0.05$); hemoglobin (HGB) ($p < 0.05$) and platelets (PLT) ($p < 0.05$). This study also found significant differences in the mean volume of erythrocytes (MCV) ($p < 0.05$), mean content of hemoglobin (MCH) ($p < 0.05$), mean concentration of hemoglobin (MCHC) ($p < 0.05$), mean platelet volume (MPV) ($p < 0.001$), relative width of the distribution of platelets (PDW) ($p < 0.001$) and the absolute content of the mixture of monocytes, basophils and eosinophils (Mid#) ($p < 0.05$). Significant differences in the mean CD4 T cell counts ($p < 0.001$) were observed between the treatments naïve HIV patients, HIV negative patients and HIV patients on HAART. The study found several identical associations between immunological and hematological profiles among the study groups. The study showed that early period of HIV infection is characterized by varying circulatory cytokine levels and could be useful biomarkers and indicators of early immune activation of HIV disease. The results from this study also show that acute HIV infection affects hematological profiles, involving all the blood parameters, some of which may act as indicators of HIV disease progression. The study recommends the use of low cost hematologic tests as biomarkers of disease progression in resource limited settings and also a holistic treatment of HIV infected patients that include supplements to monitor and improve blood parameters and indices in addition to antiretroviral therapy.

FABRICATION OF RAPID DIAGNOSTIC KIT CASING USING MODIFIED BIODEGRADABLE PAPER MATERIALS AS AN ALTERNATIVE TO PLASTIC

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The high population growth rate, emerging diseases and high cost of health care in developing countries has led to the high demand of rapid diagnostic test (RDT) kits. Rapid diagnostic test kits are medical devices used in early detection of diseases among the population living in areas with limited medical facilities. The portability and reliability of kits reduces medical cost incurred by inaccurate disease diagnosis. To meet this demand plastics are enormously produced as basic raw material in production of the kits. Plastics are often preferred because they are cheaper than their corresponding biopolymer. The most devastating menace from plastic is its high solid waste accumulation due to slow biodegradation. The study sought to modify selected paper materials and tree barks to mimic plastic properties to replace plastic in rapid diagnostic test kits. The selected papers were purchased from Nairobi County (Kenya) shops while selected tree barks were collected from farms within Kiambu County (Kenya). On modification with trichloro (1H, 1H, 2H, 2H perfluorooctyl) silane at different reaction times insitu, the paper and polished tree barks surfaces displayed water contact angles between 90.14° to 144.60° , which indicated they were hydrophobic. The tree barks were however discontinued for further analysis due the limitation of cutting tools available. The modified

paper did not attain superhydrophobicity since the water droplets placed on its tilted surface remained sticky rather than rolling as expected with superhydrophobic surfaces. The surface energy of modified paper materials displayed low critical surface energy values ranging from 27.9 to 40.0 dynes/cm. The tensile strength of the unmodified and modified selected paper did not show any significant difference at $P < 0.05$ and it was within a range of 331.5 vs 323.9 (MPa) for classical method (CM) and 310.8 vs 299.8 (MPa) for dynamic mechanical analyzer (DMA). The moisture content of modified selected paper samples was 4.41% which was significantly lower at $p < 0.05$ than 5.42% of unmodified material. The organic matter content of the unmodified paper was 68.77% and 67.41% for modified paper with no significant difference at $p < 0.05$. The calorific value of unmodified paper materials was 13.92Kj/g and 15.86Kj/g for modified paper which differed significantly at $p < 0.05$. Scanning electron microscope (SEM) analysis on modified samples showed growth of nano particles on surface. Focused ion beam (FIB) confirmed the solid nature of the nano particles. X-ray diffraction (XRD) spectra for modified and unmodified selected paper were similar, indicating that the bulk structure was not interfered by modification. Coupled thermal gravimetric analyser, Fourier transform infrared and mass spectrometer (TGA-FTIR-MS), displayed CO₂, H₂O with traces of byproduct CO as the combustion products of modified paper; however, no harmful HF was detected. Energy dispersive X-ray Spectroscopy (EDX) and X-ray photoelectron spectroscopy (XPS) confirmed the presence silicon and fluorine on the surface of modified paper. The rapid diagnostic test kit casing was fabricated using modified blotting paper (P51) with established optimum chemical and mechanical properties. The biodegradation of fabricated casing was complete within 12 months; however, there was no observable biodegradation on plastic controls within the same period. The findings of this study will be disseminated to relevant authorities for sensitizing the public on the use of cellulosic materials over plastic in rapid diagnostic test kits (RDTs).

SCHOOL OF HUMANITIES

PRESENTATION OF MASCULINITIES IN SELECTED KENYAN FEMALE-AUTHORED NOVELS

Edward Mooka-PHD

Department: Literature, Linguistics and Foreign Languages

Supervisors: Dr. Mbugua Mungai

Dr. Paul Mukundi

This study examines the representation of masculinities in selected Kenyan female-authored novels. The novels studied include *The Promised Land* by Grace Ogot, *Coming to Birth* by Marjorie Oludhe Macgoye, *Crucible for Silver and Furnace for Gold* by Moraa Gitaa, and *Dust* by Yvonne Adhiambo Owuor. The four novels were selected using purposive sampling as they bring out varied masculinities. As its objectives, the study investigates the masculine identities in varied contexts; the gender stereotypes depicted in the selected texts; and the stylistic choices used by the female authors to depict the masculinities. This qualitative study analyzes the novels through a close textual reading of the selected primary texts and related studies that have been done in this field. Examples from the selected texts are analyzed in light of the concepts of theorists, critics and reviewers. The study draws on Robert Connell's concept of hegemonic masculinity, which argues that there are varied masculinities; Judith Butler's theory of performativity; and John Beynon's theory of new man-ism to determine how masculinities are represented. The conceptual framework underpins the argument that men exude varied and complex masculinities under different circumstances and contexts. At other times men have been portrayed stereotypically, thus conforming to traditional and oppressive male behavior. Men have also been presented as aberrant. In other words, masculinities are mutable and complex. This thesis is divided into five chapters. Chapter one covers the background, brief synopses of the selected texts, the problem statement, justification, scope of the study, conceptual framework and methodology. Chapter two discusses circumstances and experiences that help forge varied and complex masculinities. Chapter three explores the stereotypic portrayal of men and the aberrant men who reject traditional forms of masculinity. Chapter four examines the literary devices that female authors have used to highlight the masculinities in their novels. Chapter five summarizes the findings and insights of this study. The study noted that men's identities are mutable; they change depending on the fluctuating economic, political and social contexts. There are celebrated men who are portrayed positively as exercising desirable masculinities, while others are depicted in negative light, especially as they relate with women and fellow men. Moreover, while some men are depicted stereotypically, others are portrayed as feminized or emasculated. Yet other men are presented as embracing traits of the "new man."

THE ANGLICAN THEOLOGY OF SEXUALITY: ITS TEACHING AND PRACTICE AMONG STUDENTS IN ANGLICAN CHURCH FOUNDED SCHOOLS IN JINJA DISTRICT, BUSOGA REGION, UGANDA

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Dr. Margaret G. Gecaga

There is growing concern over teenage sexual behaviour given the high level of teenage pregnancy and an increase in sexually transmitted diseases. Christianity has always provided standards by which behaviour is regulated. The study examined the teachings and practice of the Anglican Theology of sexuality by students in Anglican Church founded schools, Jinja District. The Anglican Church formulated the Provincial Education Policy to ensure that the core values of the Anglican Church are promoted in Anglican Church Founded schools. These include Godliness, faithfulness to the scriptures and upholding Biblical family values. The Christian activities through which the Anglican Theology of sexuality is transmitted to students in these schools include Bible studies, prayer meetings, fellowship meetings, evangelism drives and holiday camps. The objectives of the study were: To explore the Anglican Theology of sexuality, and To investigate the role played by school management committees, administrators and religious leaders in promoting the practice of the Anglican Theology of Sexuality among students in Anglican Church founded schools. The effect of the Anglican Theology of sexuality on students' behaviour was assessed. Also challenges faced by the Anglican Church founded schools in the dissemination of the Anglican Theology of sexuality to students were explored. Lastly, strategies that can be used by the Anglican Church to effectively disseminate their Theology of sexuality among students in the Church founded schools were explored. Literature was reviewed regarding the teachings of the Anglican Theology of sexuality, the role played by administrators and religious leaders in teaching Religious values to students, effect of Religious teachings on the sexual behaviour of young people and the challenges faced in teaching religious values to young people. The study employed a descriptive research survey. The study was conducted among nine Anglican Church Founded Schools in Jinja district, Busoga region. The targeted age bracket was 13-18 years an age that is mostly affected by sexual challenges. Uganda. Primary data were collected mainly through oral interviews, questionnaires, participant observation and focus group discussions. Secondary data were collected from both published and unpublished books, journals, Newsletters and internet sites. Data collected from these libraries helped establish the research problem and the rationale for the research. The respondents included students and the target group was between 13-19 years. In addition, head teachers of Anglican Church Founded Schools, chaplains, counselors and the Diocesan Education Coordinator were also involved in the study. Non probability and purposive sampling was used to sample the respondents. The study employed a descriptive research survey. The overall data was synthesized, analyzed, interpreted and discussed in light of Smith's (2003) Theory of Religious Effect on the Sexuality of Young People. This theory identified the following paradigms as necessary for religion to have a positive impact on the behaviour and attitudes of young people: moral directives, spiritual experiences, role models, coping skills and extra community links. Collected data were presented in chapters basing on the research objectives. From the research findings, conclusions and recommendations were made.

AMALI NA MAADILI YA KISIASA KATIKA RIWAYA ZA KISASA ZA KISWAHILI ZA SAID AHMED MOHAMED NA KEN WALIBORA

Justus Kyalo Muusya-PHD

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Utafiti huu unahusu amali na maadili ya kisiasa katika riwaya za kisasa za Kiswahili kwa kutumia mtazamo linganishi. Utafiti ulishughulikia maudhui yafuatayo: amali za kisiasa, maadili na uongozi wa jamii kama yalivyoshughulikiwa katika riwaya zilizoandikwa na Said Mohamed na Ken Walibora. Katika jamii ya sasa, viongozi wemekuwa wakielekezewa kidole cha lawama katika maeneo yao ya utawala. Wanalaumiwa kuwa wao ndio chanzo cha matatizo yanayokumba jamiikutokana na kupotoka kwao kimaadili katika uongozi. Kwa sababu hii utafiti ulinua kuchunguza ikiwa uhusiano kati ya amali, maadili na uongozi wa jamii limesawiriwa na wanariwaya wa Kiswahili. Kufikia sasa, hakuna utafiti wa kina uliofanywa kuhusu maadili ya kisiasa na namna ambavyo suala hili huathiri uongozi wa jamii. Mbinu kusudio ilitumiwa katika kuteua maandishi, pamoja na riwaya zao. Riwaya zilizoteuliwa ni zile ambazo zimesawiri maudhui ya maadili ya kisiasa na uongozi. Riwaya tatu za kila mwandishi zilitumiwa katika utafiti. Riwaya za Mohamed zilizotumiwa ni: Babu Alipofufuka (2001), Dunia Yao (2006) na Mhanga Nafsi Yangu (2012) huku nazo zilizoandikwa na Walibora zikiwa ni: Kufa Kuzikana (2003), Ndoto ya Almasi (2006) na Kidagaa Kimemwozea (2012). Utafiti ulichunguza vilevile mazingira ya kisiasa yaliyoathiri maandishi wa riwaya hizi. Huku tukizingatia suala hili la mazingira ya kisiasa na tajriba ya mwandishi, tulilinganisha ili kubainisha ni kwa kiwango gani maandishi hawa wamelingana au kutofautiana katika kusawiri maudhui ya maadili ya kisiasa katika riwaya zao. Utafiti wetu uliongozwa na nadharia mbili ambazo ni; Nadharia ya Daindamano na ile ya Uchanganuzi Hakiki wa Usemi. Nadharia ya kwanza ilitumiwa kuchunguza matendo ya viongozi na wanasiasa ambayo yanakubalika kimaadili na yale ambayo hayakubaliki. Upande mwingine, Nadharia ya Uchanganuzi Hakiki wa Usemi ilitumiwa katika kuchunguza namna ambavyo viongozi hutumia mamlaka katika kuongoza jamii. Data katika utafiti huu ilikusanywa maktabani na nyanjani. Maktabani, mtafiti alisoma riwaya teule na machapisho mengine kama vile vitabu, majarida na tasnifu zingine muhimu kwa utafiti huu. Vilevile, alitumia mtandao ili kupanua uelewa wake wa masuala ibuka yanayohusiana na utafiti huu. Nyanjani, mtafiti aliwahoji maandishi wa riwaya hizi ili kubainisha mazingira ya kisiasa, kijamii na tajriba ya maandishi iliyoathiri maandishi wa kila riwaya. Kwa vile data iliyokusanywa ilikuwa ya kimaelezo, ilichanganuliwa na kuwasilishwa kwa njia ya maelezo. Utafiti uliweza kubainisha kuwa wanariwaya hawa wawili wamesawiri maadili ya kisiasa, amali na uongozi wa jamii kwa njia tofauti. Hii ni kwa sababu mazingira ya kisiasa ya Kenya na Tanzania na tajriba ya maandishi hawa ni tofauti pia. Hata hivyo, utafiti uliweza kubainisha ulinganifu katika kusawiri suala hili unaotokana na kwamba mataifa haya mawili ni ya ukanda mmoja wa Afrika Mashariki unaolingana kihistoria, kitamaduni na kitajiriba ya kisiasa.

This research evaluated political ethics and morals in the contemporary Kiswahili novel using a comparative approach. The research revolved around the following themes: political morality, ethics, and governance as depicted in the novels authored by Said Mohamed and Ken Walibora. In the contemporary society, leaders have been blamed for the woes affecting their areas of jurisdiction. They are held responsible for being the source of such woes due to their unethical behaviour in leadership. The study used this background to establish whether the relationship between morality, ethics and societal governance as has been portrayed by Kiswahili novelists. Hitherto, there has been no in depth research concerning the relationship between political ethics and the way it determines how the society is governed. The study utilized purposive sampling to select writers as well as their novels which were

used in the research. The novels which were selected were those which had political ethics and governance themes. Three novels from each author were used in this research. Mohamed's novels were: Babu Alipofufuka (2001), Dunia Yao (2006) and Mhanga Nafsi Yangu (2012) while those authored by Walibora included: Kufa Kuzikana (2003), Ndoto ya Almasi (2006) and Kidagaa Kimemwozea (2012). The research also interrogated the political environment within which the authors wrote these novels. With the political environment and the experience of the authors in mind, a comparison was done to determine the extent to which the authors demonstrated similarities or differences in dealing with the theme of political ethics in their novels. The study was guided by two theories, namely; Deontology-Consequentialism Theory as well as Critical Discourse Analysis Theory. The first theory was used to determine the actions of political leaders which are ethical and those which are unethical. On the other hand, Critical Discourse Analysis Theory was used to evaluate how leaders apply powers in the societal governance. Data for the study was collected from both the library and the field. In the library, the researcher read the said novels as well as other materials relevant to the study which included theses, books, and journals. He also used internet to broaden his understanding on the current issues related to this research. In the field, he interviewed the authors of these novels to establish various political and social environments as well as personal experience that influenced the writing of each novel. Since the data collected was qualitative in nature, it was analysed and presented by use of descriptive method. The study established that the two novelists depicted political ethics, morals, and societal governance in a different manner. This is because the political environments of Kenya and Tanzania as well as the experience of the two authors in the field of authorship are different. However, the research showed some similarities in the sense that both are East African Countries that share largely similar historical, cultural and political experiences.

TASWIRA ZA ULEMAMU KAMA MTINDO KATIKA RIWAYA TEULE ZA SAID AHMED MOHAMED NA EUPHRASE KEZILAHABI

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Lengo la utafiti huu lilikuwa kuchunguza matumizi ya taswira za ulemavu kama mtindo wa kuwasilisha maudhui katika riwaya teule za Said Ahmed Mohamed na Euphrase Kezilahabi. Riwaya hizi ni: Dunia Mti Mkavu (1980), Utengano (1980), Tata za Asumini (1990); za Said Ahmed Mohamed na Kichwamaji (1974), Dunia Uwanjawa Fujo (1975) na Rosa Mistika (1976) zilizoandikwa na Euphrase Kezilahabi. Kwa kuwa matumizi ya ulemavu kama mtindo hayajachanganuliwa katika utanzu wariwaya ya Kiswahili, utafiti huu ulinua kuliziba pengo hili. Taswira za ulemavu zilizozingatiwa ni za ulemavu wa akili, ulemavu wa tabia na ulemavu wa viungo. Utafiti huu uliongozwa na nadharia ya mtindo na nadharia ya semiotiki. Nadharia ya mtindo ilimwezesha mtafiti kutambua taswira za ulemavu zilizotumika katika riwaya teule. Nadharia ya semiotiki inajikita kwenye mtazamo kuwa kiashiria kinaweza kuzua maana tofauti kulingana na muktadha wa matumizi yake. Kwa hivyo, nadharia hii iliongoza utafiti huu katika kutambua maudhui yaliyowasilishwa kupitia kwa aina mbalimbali za ulemavu. Utafiti huu ulijikita kwenye misingi kwamba

ulemavu unapotumiwa katika kazi ya fasihi, huwa ni kwa lengo mahsusi ambalo ni kuwasilisha maudhui fulani kwa njia ya kipekee. Data ilikusanywa kwa kusoma na kuzichambua riwaya teule kwa kuzingatia wahusika wenye ulemavu na jinsi walivyotumiwa kama mtindo. Data iliyokusanywa ilichanganuliwa kwa kutumia mbinu ya kimaelezo. Utafiti huu umebainisha kuwa taswira za ulemavu wa akili, ulemavu wa tabia na ulemavu wa viungo zimetumika na Said Ahmed Mohamed na Euphrase Kezilahabi kama mtindo wa kuwasilisha maudhui mbalimbali kwa njia ya kipekee. Matumizi ya mtindo huu yameiathiri hadhira lengwa ili itafakari zaidi kuhusu maswala ambayo hayajitokezi waziwazi. Maudhui yanayojitokeza ni ya kisiasa, kijamii na kiuchumi. Ingawa jumbe zinazowasilishwa ni za kawaida zinabeba uzito zaidi na kuiathiri hadhira zaidi zinapopotishwa kwa kutumia taswira za ulemavu. Aidha, waandishi wanafanikiwa katika lengo lao la kupitisha ujumbe wao kwa namna ya kipekee. Kwa hivyo, utafiti huu unadhihirisha kuwa mwandishi anapotumia taswira za ulemavu katika kazi yake, anafanya hivyo kwa lengo la kuwasilisha ujumbe mahsusi. Utafiti huu unatoa mapendekezo kuwa tafiti zaidi zifanywe ili kuchunguza matumizi ya ulemavu kama mtindo katika tanzu zingine za fasihi na kazi zingine zilizoandikwa na waandishi wengine wa fasihi ya Kiswahili. Aidha, inapendekezwa kuwa aina zingine za ulemavu ambazo hazijashughulikiwa katika utafiti huu zichunguzwe kwa kuzingatia matumizi yake kama mtindo. Utafiti huu utawafaidi waandishi, wahakiki, walimu na wanafunzi wa fasihi ya Kiswahili kwa kuwa unaangazia mtazamo mpya kuhusu matumizi ya ulemavu kama mtindo katika fasihi.

ABSTRACT

The research set out to investigate how disability images have been used as an element of style in selected novels written by Said Ahmed Mohamed and Euphrase Kezilahabi. These novels are: *Dunia Mti Mkavu* (1980), *Utengano* (1980), *Tata za Asumini* (1990); by Said Ahmed Mohamed; *Kichwamaji* (1974), *Dunia Uwanja wa Fujo* (1975) and *Rosa Mistika* (1976) by Euphrase Kezilahabi. Disability images that were investigated are mental, behavioral and physical. The use of disability images has not been investigated in Kiswahili novels; therefore this research aimed at filling this gap. This research was guided by two theories: stylistics and semiotics. Stylistics theory guided the researcher in identifying disability images used in the selected novels. Semiotics theory has its basis on the relationship between a sign, an object and its meaning and argues that a signifier can have several meanings depending on its contextual usage. Therefore, this theory guided this study in identifying the various messages that were conveyed through disability images. The study also sought to analyze disability from a literary perspective by looking at how disability images have been used as literary tools in delivering author's messages. The study was based on the assumption that when disability images are used, they foreground meaning. Consequently the message is delivered to the intended audience in a unique way and the effect is more profound. Data was collected by reading the selected novels and identifying characters who were depicted as having various disabilities. This study is qualitative in nature. Therefore, data was presented and analyzed through descriptive method. This study analysed three disability images: mental, behavioral and physical. Through these images, various themes were identified. These themes were based on political, social and economic issues affecting the society. Although these are seemingly common themes in many literary works, the use of disability images makes them affect the audience in a profound way. The study underscores the fact that the selected authors were able to deliver their intended messages successfully and in a more effective manner. This study recommends that more research be done to investigate how disability images have been used as style by other Kiswahili literary authors and also in other literary genres. The use of other types of

disability images could also be investigated. This research is relevant to authors, critics, teachers and students of Kiswahili literature because it provides a new perspective on the use of disability as style.

GENDER GAPS IN TRANSFER OF IMPROVED BEE KEEPING: A CASE OF THE MAASAI COMMUNITY IN TRANS MARA, NAROK COUNTY, KENYA

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In Kenya, beekeeping is well established and can be successfully carried out in about 80% of the country. The improved enterprise has many advantages and can be practiced favourably by resource poor men, women, and youth. However, the bee sector remains largely underdeveloped due to the fact that in many parts of the country, it is still carried out traditionally and passed through inheritance. Consequently, since it is a male domain, men mostly inherit it leaving women and youth who are new in the enterprise vulnerable. This study sought to explore gender gaps in the transfer of improved bee keeping among the Maasai community in Trans Mara, Narok County. This was achieved through identifying the levels of participation of men and women in Improved Bee Keeping, decision making power among bee keeping households (HHs), and the challenges they face. Investigative survey design was used with both quantitative and qualitative approaches. The target population included men and women in improved bee keeping groups. The study used Blumberg (1984) gender stratification theory which argues that gender inequalities are intertwined at various levels from households to local communities. Stratified random sampling was used for HH surveys. A total of 372 respondents were interviewed. Structured and semi-structured questionnaires were used for Household (HH) surveys. Data collected was analysed using SPSS and Stata computer software. The study found that while women are actively involved in bee keeping, their participation in accessing improved equipment, trainings and better marketing channels is low in comparison to men's. This is due to capital constraint, gender related factors such as mobility and time, and cultural perceptions, factors that challenge them more than men. Consequently, their level of participation remains low in parts of the chain where value is high. In male headed households (MHHs), men make most or all decisions concerning purchase and sale of productive assets including land and cattle. They also control most productive resources including income from bee products. Most women make decisions concerning purchase and sale of chicken while none own land or cattle. The major challenges in improved bee keeping are lack of access to; capital, trainings, ready markets, and domination by middlemen (brokers). Consequently, women are more vulnerable which continues to widen the gender gap in the bee keeping value chain. The study recommends that improved bee keeping projects should collaborate with other stakeholders such as extension officers, research institutions and county governments in order to adopt gender responsive strategies that can enhance participation, equity in access to trainings and benefits accrued from bee products and access to ready and better markets. Household and neighbourhood empowerment, for instance, sharing improved equipment, construction of training cum collection centres within localities, formation of marketing associations to minimize middlemen, are some of the strategies suggested.

RHETORICAL STRATEGIES OF SELECTED KENYAN PARLIAMENTARY COMMITTEE REPORTS: A GENRE BASED APPROACH

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Numerous studies have been carried out on genre analysis, however, scarcely any studies have been done on parliamentary discourse in Kenya, especially on structural and rhetorical organization of parliamentary committee reports. A research gap therefore exists. Consequently, this study sought to analyse the rhetorical strategies of selected Kenyan Parliamentary Committee Reports (PCRs) using a genre based approach. Without a clear rhetorical strategy, parliamentary committee reports would hardly unfold their deliberative and communicative purpose. This study uncovers the rhetorical strategies used in parliamentary reports in order to achieve their communicative purpose. The analysis involves a survey of rhetorical conventions and strategies including overall schematic move structure of PCRs, the analysis of rhetorical modes, appeals, metadiscourse and generic structure potential. The study is premised on Genre theory and its different approaches such as Systemic Functional Linguistics (SFL) approach, English for Specific Purposes (ESP) as well as Rhetoric Genre Studies (RGS) approach. Descriptive research design which involved qualitative corpus studies, the analysis of text patterning and frequency of different strategies within different moves was adopted in the study. The corpora was generated from fifteen parliamentary committee reports sampled five each from selected County Assemblies, the National Assembly and the Senate. To collect and analyze data both qualitative and quantitative methods were used where corpora was categorized, coded and analyzed based on each objective while the results were presented using tables, frequencies, percentage, charts, themes and descriptions. Findings from the study indicate that delivery of arguments in PCRs employs a rhetorical strategy combining rhetorical moves, modes of discourse, persuasive appeals and rhetorical metadiscourse to establish the rhetorical structure of PCRs and achieve the genre's communicative purpose which involves informing, convincing and persuading. The study has identified a distinctive rhetorical realization of moves in PCRs which include Preface, Introduction, Method, Results and Recommendation (PIMRaR) and established the Generic Structure Potential of PCRs as: $[TP^{(AB).P.(AC)}]^{[I^{(M)^{RES}^{REC.}^{(C)}}]^{(RL)^{AP}]}$ that is used to embed and develop different rhetorical strategies to achieve communicative goals within the context of parliamentary discourse. Indubitably, this study offers insights on the interplay between parliamentary procedures, political discourse styles, rhetorical conventions and contributes to the existing pool of knowledge on genre and rhetorical analysis.

UMAHULUTI WA MIUNDO KATIKA TAMTHILIA ZA EBRAHIM HUSSEIN

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Utafiti huu umeshughulikia umahuluti wa miundo katika tamthilia za Ebrahim Hussein. Matumizi ya miundo anuwai katika tamthilia za Hussein ndilo suala lililochochea utafiti huu. Tamthilia zilizochanganuliwa ni tano ambazo ni Kinjeketile (1969), Mashetani (1971), Jogoo Kijijini (1976), Ngao ya Jadi (1976) na Arusi (1980). Utafiti huu uliongozwa na malengo yafuatayo: Kuchunguza iwapo maisha na elimu ya Ebrahim Hussein yaliweza kuathiri utunzi wake. Kuchunguza sifa za kimahuluti zinazopatikana katika tamthilia ya Kinjeketile. Kubainisha miundo ya kimahuluti inayojitokeza katika tamthilia za Mashetani na Arusi. Kutathmini vipengele vya kimahuluti katika tamthilia za Jogoo Kijijini na Ngao ya jadi. Utafiti huu uliongozwa na nadharia tatu changamano ambazo ni nadharia ya ki-Hegel ya mwaka wa 1882 ambayo iliasisiwa na Georg Friedrich Hegel inayojadili masuala ya kipembuzi. Nadharia ya ki-Brecht iliyoasisiwa na Bertolt Brecht mwaka wa 1924 ambayo inaangazia masuala ya ukengeushi. Nadharia ya ki-Propp ya Fomyula ya Kisimulizi ambayo iliasisiwa na Vladimir Propp mwaka 1939 inashughulikia masimulizi ya Kiafrika. Nadharia hizi zilifaa utafiti huu hasa ikizingatiwa kwamba Hussein ametumia miundo anuwai katika tamthilia zake. Mbinu kusudio na mbinu ya utabakishaji zilitumika katika kuteua sampuli lengwa ambayo ni tamthilia tano teule. Nyanjani, waliohojiwa waliteuliwa kimakusudi na kila kundi liliwakilishwa na watu watatu yaani, wahakiki watatu na waandishi wa tamthilia watatu. Vifaa vya aina mbili vilitumika: maswali ya mwongozo wa mahojiano na mjadala. Matokeo ya utafiti yalidhihirisha kwamba, kuna chembechembe za umahuluti katika tamthilia za Ebrahim Hussein. Uchanganuzi ulionyesha kwamba, mwingiliano wa Ebrahim Hussein na tamaduni mbalimbali ulimfanya kushirikisha miundo tofauti tofauti katika kazi zake. Waaidha, kuishi kwake na kuingiliana na tamaduni tofauti, kumemfanya kuchukua vipengele vya tamaduni hizo na kuvifanya kuwa vipengele muhimu katika maisha yake na katika kazi zake za kiubunifu. Hivyo, Hussein anashirikisha miundo ya kidrama ambayo ilichimbuka kutokana na usomaji wa maandishi tofauti tofauti. Utafiti huu umechangia katika kufahamu upekee wa kazi za Ebrahim Hussein kwamba, hakuna fasihi halisi yaani, fasihi ya Kiswahili ni mahuluti katika vipengele vyake vyote. Pia, utafiti ulichangia katika kufafanua baadhi ya sifa za fasihi ya Kiafrika, Kimagharibi na ya kisasa, jambo ambalo huonyesha jinsi watu huingiliana na mwingiliano huu huwaathiri kiasi cha kuzalisha fasihi mahuluti. Kadhalika, utafiti ulikuwa wa manufaa zaidi katika uwanja wa fasihi kwa sababu uliwanufaisha wahadhiri pamoja na wanafunzi wa vyuo vikuu katika kuhakiki kazi zao.

The study investigates hybridity in Ebrahim Hussein's plays. This research was necessitated by the usage of different structures from in Hussein's plays. The five specific plays which have been analyzed are Kinjeketile (1969), Mashetani (1971), Jogoo Kijijini (1976), Ngao ya Jadi (1976) and Arusi (1980). The study is guided by the following objectives: To investigate if Hussein's life and education affected the writing of his plays. To analyse hybridity aspects in Kinjeketile. To show hybrid structures in Mashetani and Arusi. To evaluate aspects of hybridity in Jogoo Kijijini and Ngao ya Jadi. The study employed three different theories that is, the Hegelian theory which was initiated by Georg Friedrich Hegel (1822) and which focused on the use of dialectics in Ebrahim Hussein's plays. The Brechtian theory initiated by Bertolt Brecht (1924) which investigated the alienation effect in Hussein's plays. The oral formulaic theory initiated by Milman Parry (1939) which helped to analyse usage of oral narrative formulas in Hussein's plays. The theories blended well since Ebrahim Hussein has employed different structures in his plays. Purposive and stratified sampling techniques were used in selecting the five specific plays. Also

the purposive sampling method was employed in selecting those who were interviewed. Three people from each category were represented that is; three critics and three writers. The study used two types of research instruments; questionnaire and face to face interviews. The research findings show that, there is an element of hybridity in Ebrahim Hussein's plays. The study has proved that, Ebrahim Hussein's interaction with different cultures has made him to use different structures in his plays. The research has contributed in understanding the peculiarity in Ebrahim Hussein's works which has helped us to understand that every aspect in literature is hybrid. That there is no pure literature; literature is hybrid in all aspects which is of great assistance in the literature field since hybridity is very key in understanding the modern world. It also assists in explaining some of the issues that are there in African, Western and contemporary literature which shows how human beings relate to one another. This study shows that the world is polarized and this goes along to explain that, in literature there is nothing like purity.

CONTINUITY AND CHANGE IN INDIGENOUS BEER ENTREPRENEURIAL ACTIVITY OF WOMEN IN JOS METROPOLIS, NIGERIA: 1909-1995

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Studies on women entrepreneurship in Jos focused on women in tomatoes enterprise and on the challenges of women entrepreneurs. Therefore, there is little knowledge on women in indigenous beer enterprise. This study examined the continuity and change that occurred in indigenous beer enterprise of women in Jos metropolis from 1909 to 1995. The study discussed the factors that led to the entry of women in burkutu enterprise and its transformation during the colonial period. It also focused on how developments like Nigeria's independence, Biafra war, United Nations Women Conference of 1975 and Structural Adjustment Programme, influenced continuity and change in burkutu enterprise during the post-independence period. The changes that happened in the process of brewing and marketing burkutu by women in Jos were examined. The theories used in this study were the Women Agency and Social Capital theory. Qualitative design based on historical approach was adopted for this study. The data was collected from primary and secondary sources. The primary sources included archival materials and oral-interviews. Secondary sources comprised articles, books, and theses. The data was analysed qualitatively. It was presented based on themes and chronology according to the objectives of the study. This study revealed that burkutu was an indigenous beer that was brewed by women mainly for socio-cultural purposes during the pre-colonial period. However, during the colonial era, it was transformed to an article of trade due to monetization of the economy. Burkutu which was used for religious rite became a source of relaxation for tin labourers. Restriction on the consumption of burkutu diminished. This was because burkutu consumption was tied to purchasing power. In the post-independence period, it continued to thrive because it was a source of employment and income for women that participated in it. It also provided inexpensive alcohol for the urban low income earner particularly during the

Structural Adjustment Programme era in Nigeria. The traditional brewing tools were replaced by grinding machine and aluminum pots for efficiency.

**AFRICAN PERSPECTIVE OF PERSONALITY AND ITS IMPLICATIONS ON MULTI-CULTURAL COUNSELLING:
A CASE OF KENYAN UNIVERSITIES.**

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Genetic and environmental factors shape personality. Culture, is the most important of the environmental influences. It is a key determinant of what it means to be a person because it influences personality throughout its life span. In an attempt to understand personality, different Euro-American theorists have come up with ways of describing, explaining, predicting and controlling it. However, these theorists have been found by some scholars to have derived their constructs and principles from the personalities they tested and handled in their culture. Despite this, they have been generalized to world populations and in the field of psychology and psychotherapy. From the literature review, the outcome of this generalization has not been very effective in meeting the needs of those who are culturally different. This study sought to find out the Kenyans' of African descent perspective of personality and its implication on multicultural counselling. Six objectives were set to establish these perspectives of: causes of motivation to behavior, development of a healthy and unhealthy personality/psychopathology, mature/healthy personality, and the implication of these perspectives on multicultural counselling. Symbolic interactionism and cultural relativism theories shed light into the study. This was a cross-sectional and ethnographic survey which applied both qualitative and quantitative techniques. From 2 public and 2 private universities, data was collected using multi-stage sampling techniques among a sample N= 360 which comprised teaching staff n=32, students n=320 and counselling psychologists n=8. Three data collection tools comprised: Questionnaires for teaching staff, students and counselling psychologists, Interviews for teaching staff and Focus Group Discussions for students. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 23 for the quantitative data and content phenomenological analysis for the qualitative data. The quantitative data was analyzed and summarized into tables. The qualitative data was analyzed by organizing the data into themes, before it was summarized and interpreted. The results showed that the Kenyans of African descent personality was influenced by culture whose worldview embedded with cultural moral values and practices, norms and beliefs shaped personality in its motivation and development to become pro-social and more communal than individualistic. This personality's subjective culture may be implicit or explicit in therapy and that is why the study recommends conceptualization of a client's concern/problem in therapy to be done within the cultural context pertinent to its development. This study also recommended further research to be done using purely qualitative methods. The findings are crucial in planning for health needs of Kenyans of African descent and increasing knowledge and repertoire of skills in the field of psychological counselling. The findings could also contribute to the

formulation of an African theory of personality since it also addresses the main building blocks of personality theory.

DYNAMICS OF WOMEN PARTICIPATION IN PARLIAMENTARY ELECTIVE POLITICS IN KENYA: A CASE OF DAGORETTI IN NAIROBI COUNTY BY 2013

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In Kenya, women have been side-lined in elective politics through discriminatory and exclusionary practices. Most scholarly work on women's participation in elective politics covers the quantitative aspect, without much focus on quality, especially at the grassroots. This study looks at engagement of women in parliamentary elective politics in Kenya by 2013, using Dagoretti, a cosmopolitan area in Nairobi County as a case study. The research made use of three objectives viz: It examined how colonial policies affected participation of women in politics in Kenya by 1963; interrogated influencing factors of post-independence government policies on participation of women in elective parliamentary politics in Dagoretti between 1963 – 2013 and analyzed the participation of women in elective politics in Dagoretti from the women conferences to multi-party politics (1985 – 2013). The research scope was mainly Dagoretti. Dagoretti was historically part of Kiambu District and is now part of Nairobi County as Dagoretti South Constituency. The study employed a descriptive research design; primary and secondary data were used to analyze relevant issues with regard to representation of women in elective parliamentary politics in Dagoretti and Kenya. The findings were arranged according to relevant themes to match the research objectives and premises. The research utilized Empowerment, Feminist and Patriarchy as theoretical approaches. Conclusions were drawn from the examination of the results obtained from the field. It ended with recommendations and suggested topics for further research. The research confirmed its hypothesis that women in Dagoretti were discriminated against in elective politics. Their experiences, talents, and perspectives were shut out of policy decisions. Though there were hindrances to women's inclusion in elective politics in Dagoretti generally, women related to the ruling family stood a better chance. Analyzing the stories of selected women politicians and activists, as cases in point, it concludes by highlighting how the country loses from low representation of women in elective politics. Some of the recommendations it proffers include: enhancing the participation of women in elective politics by fully executing the Constitution of Kenya 2010. A key strategy would be to provide female aspirants with financial and technical support. The study noted the important role that political parties play as game changers. Women, on their part need to pull together across party lines, network and mentor young women and women in marginalized groups, as well as work with men to ensure higher representation of women in elective parliamentary politics in Dagoretti and Kenya.

SCHOOL OF ENVIRONMENTAL

CHALLENGES AND PROSPECTS OF CIVIL SOCIETY ORGANIZATIONS IN ENHANCEMENT OF SUSTAINABLE LIVELIHOODS AND ENVIRONMENTAL CONSERVATION IN HOMA BAY COUNTY, KENYA

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Attainment of sustainable development among communities affected by persistent environmental degradation, poverty and food insecurity remain a global, regional and national challenge. Suba sub-County is endowed with diverse natural resources. The resources are under progressive degradation. Poor socio-economic situation manifested in high poverty level of 52% and 78% food deficiency persists despite the presence of several CSOs working with GoK and IDAs. In the light of this, the study examined challenges and prospects of Civil Society Organizations (CSOs) in enhancing sustainable livelihoods and environmental conservation in Suba sub-County. Specifically, the study investigated main causes of socio-economic and environmental problems in Suba sub-County; examined the main activities of CSOs, Government of Kenya (GoK) and International Development Agencies (IDAs) in environmental conservation and enhancement of sustainable livelihoods; determined the main challenges of CSOs in environmental conservation in collaboration with other development agencies; explored main prospects of CSOs in environmental conservation in collaboration with other development agencies; and designed integrated environmental management system that fosters collaboration among development agencies for enhancement of sustainable livelihoods. Mixed methods design was employed to collect qualitative and quantitative data. Questionnaires, focus group discussions (FGDs) and individual interviews were used to collect data from CSOs, GoK, IDAs and community members. Secondary data was collected through literature review. Questionnaire data was analyzed using SPSS and presented using descriptive statistics. Qualitative data was analyzed qualitatively and presented in narrative form. The study revealed that persistent poverty (90.1%), Poor health (78.4%), Cultural practices (62.0%) and Food insecurity (54.3%) were leading socio-economic problems. Environmental degradation (88%), traditional lifestyle (77.9%), HIV/AIDS, overdependence on fishing and sex for fish were causes to socio-economic problems. Environmental problems included pollution (88.0%), deforestation (70.7%), soil erosion (66.8%) and water hyacinth. Massive clearing of forests (93.8%) and economic/domestic activities (89.4%) were major causes. Environmental and socio-economic problems and their causes were intricately linked. CSOs were widespread, with skills and networks for implementing environmental (98.1%), afforestation (96.2%) and livelihood (90.4%) interventions. GoK supported environmental conservation (87.02%) and promoted policies and plans. CSOs depended on IDAs and GoK on resources, which were unpredictable (78.4%). Intra and inter agency collaboration provided chances for CSOs to access resources (79.3%) and implement sustainable projects (70.2%). Respondents (99%) preferred central planning and coordination in harmonizing operations of the three agencies. The study recommended and provided principles for establishment of coordinated environmental and sustainable livelihoods framework for all stakeholders from County,

sub-County to community levels. The framework embraced a multifaceted approach of stakeholder engagement through consultations, discussions and consensus in realizing its intended goals, which are; harmonized CSO, GoK and IDA activities resulting to sustainable environmental management and enhanced livelihoods.

INTEGRATION OF MOTORCYCLE TRANSPORT IN SELECTED URBAN AREAS AND ITS IMPLICATION ON SAFETY AND LIVELIHOODS IN KENYA

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Urban centres in Kenya have experienced rapid uptake of motorcycles for commercial transportation to fill the gap between transport service supply and demand. This rapid increase is due to zero rating of motorcycle imports and relatively more efficient and affordable motorized transport offered by this mode. Motorcycle transport presents road safety challenges and opportunities in employment. A review of literature reveals that there is relatively less focus on motorcycle transport services in medium sized urban centres in Kenya considering their vital role as growth centres in devolved governance system. The impact of government's initiative to promote integration of motorcycles in urban transport systems through Integrated National Transport Policy remains unknown. This study examines integration of motorcycle transport and its implication on safety and livelihoods in Busia, Kakamega and Thika towns in Kenya. It examines integration of motorcycle transport in transport systems in these towns, evaluates the effects of motorcycle transport towards employment generation and assesses safety of motorcycle transport in the respective towns. The study uses descriptive survey design in which random samples of 1093 commercial motorcycle operators are obtained from members in registered motorcycle associations existing in the towns. Questionnaires are designed to obtain information from respondents regarding variables derived from the objectives. Further, key informants are interviewed and focus group discussions are undertaken using a set of items in an interview schedule. Other relevant information are sourced from electronic and non-electronic depositories. Data is statistically analyzed, discussed and displayed in tables and figures. Findings indicate lack of integration of motorcyclists safety needs in design, operation and maintenance of roads and its respective infrastructure in the three towns. Motorcycle transport offers reliable services to key destinations in the towns. Monthly incomes of commercial motorcycle operators increased significantly compared to their monthly earnings before venturing in commercial motorcycle transportation. Their mean daily incomes are above poverty line in Kenya. The number of operators earning below the poverty line decreased by 56%, 40% and 75% in Busia, Kakamega and Thika towns respectively after venturing in motorcycle transport. Ownership of motorcycle is statistically significant determinant of incomes of commercial motorcycle operators in the three towns while hours worked per day is statistically significant determinant of incomes in Busia and Thika town, $p < 0.05$. Possession of license is a significant determinant of operators' monthly earnings in Kakamega town, $p < 0.05$. Motorcycle accidents are high in Kakamega and low in Busia. Accident incidents are under reported in all the towns. Rider experience and training are not significant predictors

of accident involvement among commercial motorcycle operator. Ownership of motorcycle is statistically significant predictor of accident involvement in all the towns while hours at work per day is not statistically significant predictor of accident involvement among operators in all towns. The study concludes that motorcycle transport has improved incomes and reduced poverty among the youths in Busia, Kakamega and Thika. Lack of integration of motorcycle safety needs in road designs and risky rider behaviour leads to unsafe motorcycle transport operation which erodes this gain. The study recommends review of road design manual to incorporate motorcyclist's safety needs, formulation and implementation of strategies that promote motorcycle ownership to enhance safety and improve livelihoods in urban areas.

ENVIRONMENTAL EFFECTS OF FARM CHEMICALS ON HEALTH OF SMALL SCALE FARMERS IN MIGORI COUNTY, KENYA

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The exposure to hazardous farm chemicals has become an issue of concern globally for the last two decades. Data available from Public Health office in Migori county, Kenya over a period of five years from 2011 to 2016 showed increasing disease burden in the population suspected to be as a result of unsafe use of farm chemicals. The problem is exacerbated by weak policy interventions as well as prevailing agricultural extension knowledge transfer strategies. The aim of the study was to find out environmental and health risks that arise due to handling of farm chemicals in the long term. The objectives were: to determine the frequency and levels of exposure to farm chemicals by small scale farmers; to evaluate handling practices of selected farm chemicals; to assess knowledge, attitudes and practices of Agricultural Extension Service Providers with respect to handling and use of selected farm chemicals; and to examine the reasons for current farm chemicals handling practices. Information was obtained on common ill-health symptoms associated with farm chemicals (such as eye, skin, and stomach, respiratory irritation and mental condition) from literature review and public health officers. Questionnaires with items focusing on handling and use of farm chemicals were administered to target sample of 429 household heads within a population of 7,500 farming households. A study sample of household heads was obtained by randomized stratified sampling based on sub-counties and wards derived from the study population. The research design was descriptive survey. Observation schedules were also used to determine current farm chemical handling practices, application and disposal by farmers. Another set of questionnaires was administered to extension service providers intended to measure their knowledge, attitude and practices with regard to selected farm chemicals. Attitude was measured using a Likert scale. Triangulations by use of Focus Group Discussions were used and content analyzed to ensure validity and reliability of data gathered. The instruments were piloted in sample agro-ecological zones within Migori County where the environmental conditions were similar but not where the study sample was drawn and a reliability coefficient by split half was computed as $\alpha=0.79$. Data analysis was by descriptive statistics, frequencies, percentages, means and standard deviations.

Hypothesis testing was done using Chi-square and one way ANOVA at 0.05 level of confidence. The results indicated that 97% of the farmers used farm chemicals in their farms in 2016. On ill-health symptoms, 33% of the respondents were affected by eye irritation, 29% by skin irritation and 24% by respiratory irritation in 2016, with the most affected being above 40 years of age. There was a weak positive ($r=0.055$) between levels of farm chemicals used and farmer perception on the dangers of agrochemicals. Majority of the farmers (79.5%) showed unsafe pesticide handling practices before application. Only 9.3% of the extension providers in Migori County were knowledgeable on the side effects of selected pesticides ($p(\chi^2=43.701, df 16) = 0.004$ at $\alpha 0.05$). The extension providers agreed on need for sustainable agriculture but inferential statistics showed that their attitude, knowledge and practice were not significant for χ^2 ($p(\chi^2=72.137, df 16) = 0.124$ at $\alpha 0.05$). The major finding was that farmers in Migori County introduced large amounts of farm chemicals to the environment thereby posing health risks to their families in the long term. The study recommended that environmental regulatory agencies within the county should sensitize farmers and extension officers on environmental risks of improper handling of farm chemicals and enforce National Environmental Management Act of 2019.

GENDER PERSPECTIVE ON THE IMPACTS OF CLIMATE VARIABILITY ON RURAL LIVELIHOODS IN MAKUENI COUNTY, KENYA.

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Makueni County is among semi-arid counties in Kenya whose residents survive through small scale rain-fed agriculture involving food crop farming and marginal livestock keeping. Majority of farmers depend on rainfall for their crop production and for the regeneration of forage for their livestock. The county has however been repeatedly affected by harsh climate conditions with repeated incidences of drought, occurrences that have greatly impacted on livelihoods by disrupting agricultural livelihood systems in the county. Effects of climate variability 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. There is however insufficient knowledge of how gender disparities have affected the way women and men in Makueni County have perceived, prepared, or responded to the impacts of climate variability. The study addressed this gap by use of mixed-method research design, applying the use of multiple methods of data collection (household surveys, interviews and focused group discussions) and analysis. Multi-stage stratified sampling technique was used to select 420 households from three livelihood zone in the county. Households were then stratified into two depending on the intended gender of the respondent from each household. Coefficient of Variation method was used to analyse rainfall variability whose results indicated significant variation in amounts of annual rainfall in the three sub-counties ($CV = 0.41$ for Makueni, $CV =$

0.36 for Kibwezi East and CV = 0.34 for Mbooni). Binary regression analysis results indicated insignificant relationship between perception of rainfall variability and gender; delayed onset ($\beta = -0.175$, $p = 0.420$), reduced amounts ($\beta = 0.023$, $p = 0.914$), early cessation ($\beta = -0.256$, $p = 0.236$), unpredictability ($\beta = -0.462$, $p = 0.086$) and shortened rainy seasons ($\beta = -0.458$, $p = 0.116$). Mann Whitney U test result indicated that women significantly perceived the impacts of climate variability on livelihood activities more than men as follows; 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 ($z = -3.027$, $p < 0.001$). Men were more significantly able to adapt to climate variability than women by accumulating livestock ($\beta = 1.388$, $p < 0.001$), planting trees ($\beta = 0.657$, $p = 0.002$), securing permanent jobs ($\beta = 1.1506$, $p < 0.001$), and adoption of improved varieties and breeds ($\beta = 0.627$, $p < 0.001$), whereas women adapted more significantly by joining social organisations ($\beta = -1.919$, $p < 0.001$), and storing food ($\beta = -0.687$, $p < 0.001$). Women were significantly more vulnerable to impacts of climate variability since they had limited coping and adaptive capacities. In view of these findings the study recommends that development actors formulate innovative approaches to enhance legal ownership of resources and decision making by women and information dissemination to men and women. The government should formulate gender analysis and mainstreaming frameworks before implementing policies and programmes on climate interventions.

MASTERS

SCHOOL OF BUSINESS

HUMAN RESOURCE MANAGEMENT PRACTICES AND PERFORMANCE OF DEVOLVED HEALTHCARE FACILITIES IN NAIROBI CITY COUNTY, KENYA.

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Performance is a function of how well managers use human resource practices to improve the efficiency, effectiveness service provision. In today's global environment, organizations are constantly looking for ways to expand and improve their businesses in terms of efficiency, effectiveness and service delivery to enhance performance. Despite the use of Human Resource Management Practices (HRMP) worldwide over the past years, the application of Human Resource Management Practices in Kenya and especially in the devolved County governments is still very low, thereby posing a threat to the performance of organizations. The general objective of this study was to investigate the effect of HRMP on the performance of devolved healthcare facilities in Nairobi City County, Kenya. Its specific objectives was to determine influence of employment security on performance of the devolved healthcare facilities in Nairobi City, Kenya, to establish the effect of employee resourcing on performance of the devolved healthcare facilities in Nairobi City, Kenya, to analyse the effect of employee training on performance of the devolved healthcare facilities in Nairobi City, Kenya, to analyse influence of Employee compensation on performance of the devolved healthcare facilities in Nairobi City, Kenya and to determine moderating effect of political factors on the relationship between HRMP and performance of devolved healthcare facilities. The study was underpinned by three theories namely goal setting theory, human capital theory and resource-based view theory. A descriptive research design specifically cross-sectional research study was used to gather quantitative and qualitative data from employees of the 78 healthcare facilities in Nairobi City County, Kenya with a target population of 3052. The simple random sampling design was used to select a sample size of 354 respondents at 95% confidence level. Primary data was collected using self-administered structured questionnaires both qualitative & quantitative data was collected. Quantitative data were analysed using both descriptive and inferential statistics. Descriptive statistics data was summarised using percentages, mean and standard deviation while in inferential statistics, multiple regression analysis was used. All the analysis was done aided by the statistical package for social sciences (SPSS version 21). Qualitative data was analysed using content analysis. Results were presented by the use of Tables & charts. Null hypothesis was rejected when the P value was less or equal to 0.05 and accepted when it's greater than 0.05. The findings indicate that there is a significant positive relationship between employment security performance of devolved healthcare facilities in Nairobi city County employment resourcing had a significant positive relationship with performance of devolved healthcare facilities in Nairobi city County, employee training had a significant positive relationship with performance of devolved healthcare facilities in Nairobi city county, while employee

compensation had significant positive relationship with performance. Political factor was found to be an explanatory variable in explaining the relationship between healthcare performance and human resource management practices. The findings supported the theoretical foundation of the resource-based view theory that performance comes from the internal resources that are owned by a firm. The recommendations are; human resource managers should offer adequate employee trainings, compensation and resourcing to their staff, policy makers should create an environment on employment security that will effectively link to an overall performance of healthcare facilities in Nairobi City County, Kenya.

TAX COMPLIANCE AND LEVEL OF TAX COLLECTION AMONG SMALL AND MEDIUM SIZE ENTERPRISES IN KIKUYU SUB COUNTY OF KIAMBU COUNTY, KENYA

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Dr. Mungai J.N.

Tax collection by governments is critical for raising the much needed revenue for development and operations. The law in Kenya requires both individuals and businesses to remit their taxes irrespective of the size of their income. However, the current position is that the Kenyan Government is not collecting adequate revenue leading to both internal and external borrowings, which could be attributable to low tax compliance. The current research looked into the relationship between tax compliance and level of tax collection among small and medium size enterprises in Kikuyu Sub County of Kiambu County, Kenya. More so the research sought to establish the effect of tax registration, declaration of income, prompt payment of tax due and timely filing of returns on the level of tax collection among small and medium size enterprises in Kikuyu Sub County of Kiambu County, Kenya. A descriptive cross-sectional research design was used for the study. The study was limited to SMEs operating in Kikuyu Sub County of Kiambu as the study units. Secondary data was collected for the SMEs from the annual fiscal records of Kenya Revenue Authority for a period of 5 years between 2013 and 2017. In analyzing the quantitative data, the study used descriptive statistics that included percentages and frequencies. The analysis of the data was made with the help of Statistical Package for Social Sciences (SPSS version 23.0). Multiple regression analysis was used to establish the relationship among the study variables. The results of the study indicated that there existed a positive and significant relationship between tax registration and the level of tax collection among SMEs in Kikuyu Sub County ($\beta=0.681$, $p\text{-value}=0.007$); a positive and significant relationship between declaration of income and the level of tax collection among SMEs in Kikuyu Sub County ($\beta=0.707$, $p\text{-value}=0.001$); a positive and significant relationship between prompt payment of tax due and the level of tax collection among SMEs in Kikuyu Sub County ($\beta=0.782$, $p\text{-value}=0.000$) and a positive and significant relationship between timely filing of returns and the level of tax collection among SMEs in Kikuyu Sub County ($\beta=0.729$, $p\text{-value}=0.000$). Inflation was found to have a positive moderating effect on the relationship between tax registration, declaration of income, prompt payment of tax due as well as timely filing of returns and the level of tax collection among SMEs in Kikuyu Sub County. The study thus concluded that tax registration, declaration of income, prompt payment of tax

due and timely filing of returns were predictors of the level of tax collection among SMEs in devolved units in Kenya. To enhance the level of tax collection among SMEs, the study recommends that the Kenya Revenue Authority should encourage tax registration, declaration of income, prompt settlement of tax due and timely filing of returns in this category of businesses.

MACROECONOMIC VARIABLES AND LOAN DELINQUENCY OF TEA MANUFACTURING COMPANIES MANAGED BY KENYA TEA GROWERS ASSOCIATION

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Delinquent loans are on the rise both globally and locally leading to closures, receiverships and even collapse of institutions receiving and offering loans. Delinquent loans in the agriculture sector stood at 4% in the USA, 40% in India in 2015, 51% in Nigeria in 2012, 29,3% in South Africa in 2016. This rose from 5.45 Billion in 2009 to KSh8.383 Billion by 2015 in Kenya and at 22% specifically in the tea sector by June, 2017. The agricultural sector plays a very critical role in economic development, employment and wealth creation and as a source of revenue. Loan delinquency is becoming a major problem in the tea sector. This study therefore sought to determine the effects of macroeconomic variables considered as key macroeconomic variables, namely, lending interest, inflation, foreign exchange rates on delinquency of loans in the tea manufacturing companies managed by Kenya Tea Growers Association (KTGA) for the period Quarter 1, 2008 to Quarter 4, 2017; employing Central Bank Rate as the moderating variable. The research adopted explanatory research design approach and the population of study was 16 tea manufacturing companies managed by KTGA. Secondary data on macro-economic variables and Central bank rate as the moderating variable were obtained from the KNBS and CBK. Secondary data on delinquency of loans was collected from the Chief Executives or the Deputies of the tea manufacturing companies under study using a document review schedule. Before data was analyzed, a number of diagnostic tests were which included unit root, cointegration, multicollinearity, determination of optimal lag, normality test, heteroscedasticity, autocorrelation and stability tests. The data collected was analyzed with the use Microsoft Excel and E-Views software. The results of the study were presented in form of tables and figures. The significance of the results was tested at 95% level of confidence. Correlation analysis concluded that all the independent variables have no relationship amongst themselves since the correlation coefficients were all less than $r=0.5$. There existed correlation between lending interest rate and Central Bank Rate with a coefficient of 0.74, and, therefore, the CBR was dropped from the model to avoid multicollinearity. In the short-run, Error Correction Model depicts a significant effect of foreign exchange on loan delinquency ($p=0.0044$) for the period under study. Regression analyses depicts negative effect of lending interest rate ($\beta = -6.25$) on loan delinquency. This applies to foreign exchange rate ($\beta = -0.22$) with loan delinquency in the tea sector. Inflation rate reflected a positive effect ($\beta = 0.26$) on the dependent variable. The results of Autoregressive Distributed Lag Model (ARDL) revealed sufficient evidence of insignificant effects of the selected macroeconomic variables and loan delinquency in the long run (lending interest rate $p=0.51$, inflation

rate $p=0.99$, foreign exchange $p=0.76$). The macro economic environment should therefore, be monitored by the regulators and they should take fiscal and monetary measures to ensure management of loan delinquency in the tea sector, and the economy as a whole. Besides macroeconomic forces, there are other factors piling up on loan delinquency in the tea sector, which can be ascertained in future research such as regulatory weaknesses, internal factors, corruption, mergers and acquisitions and institutional stability.

BUSINESS PROCESS RE-ENGINEERING AND FINANCIAL PERFORMANCE OF TIER ONE COMMERCIAL BANKS IN KENYA

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Financial performance of commercial banks dwells entirely on generated returns of assets from operations whereas loan portfolio falls as a critically valuable asset that unfortunately exposes the institution to financial risks. Business Process Reengineering is a management practice that aims to improve the efficiency in the business processes. Commercial banks seem to have slowed down in Re-engineering making business processes still to be costly and slow. Commercial banks across the world have always embraced business process reengineering as a strategy to change on their business processes and procedures hence improving on their financial performance. Commercial banks in Kenya are faced by intense competition from money transfer platforms such as Mpesa. Therefore this study sought to examine BPR on financial performance of tier one commercial banks in Kenya. The specific objectives were., to establish the effect of internet banking, agency banking, mobile banking and deposit taking automated teller machine on financial performance of tier one Commercial banks in Kenya. The study adopted descriptive research design. The target population for this study were staff in Tier one Banks, focussing on 51 business development managers within their headquarters in Nairobi. Census technique was used to incorporate the entire target population. The study used primary data which data was collected by use of structured and semi-structured questionnaires. The questionnaire's reliability was statistically measured by measuring the internal consistency while the validity was enhanced by supervisors who acted as experts in assessing the questionnaire's content. The data collection process began by getting a formal letter from the university which helped the researcher to get NACOSTI approval of data collection. The letter together with the consent statement was then presented to the management of the banks as a means of seeking authority to gather data from their institution. The quantitative data was analyzed using the descriptive and inferential statistics using SPSS Version 24 software. The study indicated that there is a positive significant relationship between internet banking and financial performance of tier one Commercial banks with a regression coefficient of 0.241. The relationship between agency banking and financial performance of tier one Commercial banks was established to be positive, and statistically significant ($r = 0.518$; $p=0.011$). The study also found that there existed a positive, moderate statistically significant relationship between mobile banking and financial performance of tier one Commercial banks ($r = 0.563$; $p = 0.014$). The study established that a

positive, strong and statistically significant relationship existed between adoption of ATM and financial performance of tier one commercial banks in Kenya ($r = 0.449$; $p = 0.021$). The researcher recommended that commercial banks need to emphasize the use of internet banking as this will enhance banks growth and customers saving on much time which they could have wasted on queues to be attended the traditional way. The study further recommends that customers should be enlightened on the operation of agency banking in order to enhance their confidentiality. The researcher further recommended that there should be frequent interaction among between top management team members this will enable them to achieve timely information with regards to organizational business, thus to plan and deployment IT to align with business process. The researcher suggested that further studies should be conducted on business process re-engineering on financial performance of other financial institutions such as Microfinance institutions and Saccos in Kenya.

CREDIT RISK MANAGEMENT POLICIES AND DEBT COLLECTION PERFORMANCE BY REGISTERED SECURITY COMPANIES IN KENYA

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Security has been and continues to be priority for both life and property world over. Due to the limitations of public security services the private sector has supplemented provision of security services. Overtime the registered security firms have come to rely more on establishments that acquire services purely on credit which often lead to due debts. This has led to large uncollected debts putting registered security firms into liquidity challenges. If such debts are not efficiently collected, the company's operations are adversely affected. Hence, their sustainability and levels of development basically depend on high cash collections and recovery levels of their bad debts which have not been the case in this industry. A look in to a number of players in the registered security industry shows that debt collection management has not been efficient (KSIA, 2015). Therefore, various policies in credit management and implementation of the debt collection actions have unquestionable importance. This must be carried out constantly and with the consistency required. This study sought to assess the effect of credit risk management policies on debt collection performance by registered security companies in Kenya, in pursuit of offering solution to these challenges. The specific objectives of the study were to establish the effect of credit limit, credit approval, credit scoring, credit documentation and credit review policies on debt collection performance by registered security companies in Kenya. The study was grounded on the motive theory of credit, credit risk theory and anticipated income theory. The study used descriptive research design. A census of 38 registered security companies in Kenya was taken. The study used primary data obtained using structured questionnaires and secondary data collected using a secondary data template for complimentary purposes. The study employed multivariate regression model to determine the effect of credit risk management policies on debt collection performance by registered security companies in Kenya. The mediating effect of inflation rate was tested using the stepwise regression technique by employing the logic of Baron and Kenny (1986). The regression results indicated that the credit limit policy had a statistically insignificant positive association with Days Sales Outstanding (DSO), a measure of debt collection performance. The study revealed that credit documentation and review policies improve debt collection performance by

registered security companies in Kenya. The study however found that of credit approval and scoring policies decreases debt collection performance. The study established that credit limit policy is insignificant to debt collection performance of the registered security companies in Kenya. The results of Sobel – Goodman mediation test indicated that inflation had no mediating effect on the relationship between credit risk management policies and debt collection performance by registered security companies in Kenya. The study recommends that managers of registered security companies should review their credit approval and scoring policies in order to improve debt collection performance. Further it recommended that the Government through recently established Private Security Regulatory Authority (PSRA) should come up with minimum documentation requirement for security services acquisition to help improve debt collection performance through complete documentation of credit transactions in the industry.

WORKING CAPITAL MANAGEMENT AND FINANCIAL PERFORMANCE OF LISTED MANUFACTURING COMPANIES IN KENYA

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Dr. Mwangi Lucy Wamugo

Manufacturing sector is one of the most important sectors in Kenyan economy. It is third after Agriculture and Industrial sectors in terms of contribution to Gross Domestic Product. It also contributes in a great way to foreign exchange and employment. The sector has been experiencing poor performance forcing some key manufacturing firms to close down their operations while others shifting to other markets outside the country. The source of this poor performance could be the firms' inability to identify the importance of each working capital component. The purpose of this study was to determine the relationship between the working capital management and the financial performance of the listed manufacturing firms in Kenya. The specific objectives of the study were to determine the effect of inventory turnover days, debtors' collection period, creditors' payment period and cash flow ratio on the financial performance of listed manufacturing companies in Kenya. In addition, the study sought to establish the moderating effect of annual GDP growth rate on the relationship between the working capital management and financial performance listed manufacturing companies in Kenya. The study was guided by agency, corporate risk management and Miller-Orr theories. Descriptive, correlational and quantitative research designs were used in the study. Secondary panel data was collected from annual financial reports and financial statements of listed companies in Nairobi Securities Exchange using record survey sheets. The study adopted census of the twenty listed manufacturing companies in the NSE for the last the last eight years from 2010 to 2017. The study adopted panel data models and ANOVA analyses in analyzing the data collected. The study found that debtor's collection period has a negative effect on financial performance of manufacturing firms. The study reveals that creditor's payment period positively affects the financial performance. From the regression, the study found that operating cashflow ratio had a statistically significant positive relationship with financial performance of manufacturing firms based on ROA, however there was insignificant positive was established as measured by EVA. Inventory turnover days had a significant positive relationship with ROA but a negative insignificant relationship with EVA of manufacturing firms in Kenya. Gross domestic product moderates the relationship between working capital and financial performance of listed manufacturing firms in Kenya. The study recommends that manufacturing manage their working capital effectively taking consideration of the GDP in order to enhance the financial performance of manufacturing firms in Kenya. A similar study with a longer period and more variables is recommended.

BANK SPECIFIC CHARACTERISTICS, PRUDENTIAL REGULATIONS AND NON PERFORMING LOANS OF COMMERCIAL BANKS LISTED AT NAIROBI SECURITIES EXCHANGE, KENYA

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Dr. Farida Abdul,

The Banking industry in Kenya comprises of forty-three commercial banks and one mortgage institution. The central Bank of Kenya regulates operations of commercial banks and deposit taking microfinances. Although the sector has realized a rise in the total assets, the quality of the assets held by the bank faces a significant credit risk arising from a high loan default level. The level of non-performing loans between the year 2012 and the year 2017 had grown by a comparatively higher levels than the growth in credit size. During the last six years, the banking industry had realized regulatory changes on its operations with the enactment of prudential banking guidelines and an amendment in the banking Act 2015 that had an impact on the lending rates being the key highlights marking this review period. The study sought to assess the relationship between bank specific characteristics, prudential regulations and Non-Performing loans among commercial banks listed at NSE, Kenya. The specific objectives of the study were: to determine the relationship between bank size, credit size, lending rates, capital adequacy and liquidity and Non-Performing loans. Inflation was used as a moderating variable in assessing the relationship between bank specific characteristics, prudential regulations and non-performing loans. Nine commercial banks that were listed at the NSE on or before the year 2011 were considered for this study. The study used secondary data from the audited and published financial statements of the commercial banks between the period 2012 to 2017. Panel regression analysis was used for analyzing the collected data using fixed effects. The regression results on bank size reported a P-Value of 0.560 that was statistically insignificant at 5% level thereby indicating that bank size had an insignificant relationship with the NPLs. With regards to credit size, a P-Value of 0.04 was reported that was found to be significant at 5% level of significance. The lending rate reported a P-Value of 0.010 that was insignificant at 5% level of significance indicating that the lending rate was not significant in explaining the changes in the volume of NPLs. Capital adequacy ratio reported a P-Value of 0.982 that was insignificant at 5% implying that capital adequacy ratio had an insignificant relationship with NPLs. The regression results on liquidity ratio found a P-Value of 0.045 that was found to be significant at 5% level of significance. The model also reported a P-value of 0.0001 therefore indicating that the model was suitable for explaining the relationship between bank specific characteristics and NPLs. The study further found that inflation had a negative and significant moderating effect on the relationship between the bank specific characteristics and Non-Performing loans with the interaction of inflation and bank specific characteristic reporting a P-Value of 0.049. However, inflation was found to have an insignificant moderating effect on the relationship between the prudential regulations and Non-Performing loans with the interaction of inflation and prudential regulations reporting a P-Value of 0.263. The study recommended that commercial banks should invest in their credit departments with skilled staff and continuous professional development programs to address the dynamic credit environment. Other remedial measures include evaluation of the lending policy, the credit monitoring and recovery tools.

The CBK, in its regulatory role, should enhance its credit department supervision while also advise the commercial banks on the effects of liquidity ratio regulation. The regulator should also sensitize the lenders on the effect of inflation on their internal operations that consequently influence the level of NPLs in the organization. With the collapse of Imperial bank and the eventual placement of Chase bank under receivership, the government and CBK should create a proactive regulatory environment to prevent factors that may lead to hikes in liquidity volume and credit squeeze in the market.

SCHOOL OF AGRICULTURE

PIG MANAGEMENT PRACTICES AND THEIR CONTRIBUTION TO OCURRENCE OF PORCINE CYSTICERCOSIS IN THIKA MUNICIPALITY AND ITS ENVIRONS, KENYA

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The pork tapeworm (*Taenia solium*) is an important parasite that causes disease in humans and pigs where humans host the adult worm in the small intestines and the larval stages are found in the muscles, brain and other tissues in humans and pigs (cysticercosis). Neurocysticercosis (where the larva of *Taenia solium* is in the brain) is a major cause of epilepsy in humans. Humans can get the infection by consumption of infected pig meat while consumption of food and water contaminated with *Taenia solium* eggs can cause infection in both pig and human. Porcine cysticercosis causes loss to farmers through condemnation of carcasses during meat inspection and loss of market when pork eaters shy away due to fear of infection. The study was carried out to evaluate the Prevalence and risk factors in pig production management systems that can contribute to the occurrence of porcine cysticercosis in Thika municipality and its environs, Kenya in 2016. Cluster sampling method was used to randomly select farmers from four wards of Kamenu, Gatwanyaga, Township and Kimorori. Among the selected farmers, 81 pig farms were visited and structured questionnaires were administered to the pig farmers to collect data on management practices and awareness on porcine cysticercosis. A study sample of 1-5 pigs per farm was randomly selected based on the available number of pigs and criteria of selection. The study pigs were examined by lingual palpation for presence of cysts which appears as nodules on the ventral side of the tongue. Data was analysed using SPSS version 20 where means and percentages were calculated as well as logic regression to determine the relationship between prevalence of porcine cysticercosis and management practices. The farm and pig prevalence of cysticercosis was 6.2% and 1.8% respectively. Porcine cysticercosis was significantly associated with feed source: swill ($P=0.001$), neighbour's leftovers ($p=0.001$), home mixed feeds (0.006), and the frequency of de-worming pigs ($p=0.027$). The main risk factor for porcine cysticercosis was the feeding of swill ($P=0.001$). Majority (55.6%) of the respondents were females, the pig stock sizes were ranging from 1 pig to 78 pigs and with an average of 11. Majority (97.5%) of pig farmers in the study area practiced zero grazing system. In order of preference, the farmers reported to feed their pigs on manufactured feeds

(55.6%), home mixed feeds (28.4%), swill from garbage (12.3%), household leftovers or waste (2.5%) and neighbours leftovers (1.2%). The main (71.6) source of water for watering livestock was tap water. Other sources were wells and borehole, reported by 27.2% and 1.2% of the respondents, respectively. On animal health practices, 88.9% of the pig keepers de-wormed their pigs while 97.5% sought veterinary services. There were 69.1% of the respondents who reported that they usually buy replacement pigs. All the respondents kept pigs for commercial purposes. This study showed that cysticercosis was present in Thika with a low prevalence and the main risk factor for the disease was the practice of feeding pigs on swill. The results of this study shows that there is need to create awareness on the occurrence of the disease in the study area, to give advice on improved pig husbandry practices and especially avoid feeding of swill or cook before feeding it to pigs.

DETERMINING POLLINATORS, FLORAL CALENDAR AND THE EFFECT OF POLLINATION DEFICIT OF AVOCADO *Persea Americana* MILL IN KANDARA, MURANG'A COUNTY, KENYA

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Avocado *Persea americana* Mill is an important fruit in Kenya. It is a source of vitamins, oil and income to farmers. However, its optimal production is dependent on insect pollinators. This study was undertaken to determine diversity and abundance of insects visiting avocado flowers, their diurnal visitation counts, the crop floral calendar and the effect of pollination deficit of avocado at Kandara, Murang'a County. The study was carried out in farmers' fields in upper midland 2 agro ecological zone, for three cropping seasons, from August 2015 to March 2017. A total of 60 trees were randomly selected from 12 farms for the study with a minimum distance of 10 m and 200 m between trees and between farms, respectively. Treatments included unlimited access and no access of flowers by pollinators. On each tree, two randomly selected terminal branches with inflorescences of the same age and size were identified, where one was bagged using nylon mosquito nets to deny access by pollinators while the other was left open for unlimited access by pollinators. As soon as flowers wilted, the nets were removed, and fruits on the tagged terminal branches counted. Data collected included identity of the pollinator, number of individuals observed pollinating per species, time of the day, the time (seconds) taken by the pollinator on the flower per visit, the percentage flushing, percentage flower buds, percentage flowering and percentage fruiting. Number of male and female flowers was recorded from 0900 h to 1700 h. Fruit counts were done monthly. At maturity, fruits were harvested and their weight, polar diameter, equatorial diameter, seed weight, ovary polar and equatorial diameters were determined in the laboratory. Pollination deficit data were analyzed using Student's t-test. Findings showed that honey bees *Apis mellifera* were the major flower visitors followed by blow flies *Chrysomya putoria*. Others included hoverflies *Eristalis tenax*, wasps *Polistes* sp., butterflies *Colias electo*, ants *Iridomyrmex reburus* and beetles *Drypta ruficollis*. Opening and maturity of female and male phase flowers overlapped between 1200 h to 1659 h, with the peak overlap from 1300 h to 1359 h. Fruit set was significantly ($P < 0.001$) higher in flowers where terminal branches were allowed unlimited access to

pollinators (19.85 ± 2.00) compared to those denied access (9.38 ± 1.55). Further, a more than two folds increase in final fruit yield was recorded in terminal branches where flowers were exposed to unlimited access (0.46 ± 0.08) by pollinators compared with those denied pollinator access (0.17 ± 0.05). Based on the yield differences, a 64.5% pollination deficit was recorded for avocado. Laboratory results showed existence of significant statistical differences in seed weight ($P=0.001$) with those from terminal branches exposed to unlimited access having 15.41 ± 1.75 g compared with those denied access (7.13 ± 1.07 g). The differences also existed for ovary equatorial diameter ($P=0.001$) and fruit equatorial diameter ($P=0.035$). This study thus confirmed that pollination plays a significant role in avocado production. Farmers are advised to adopt appropriate pollination management plans for their avocado orchards such as provision of honey bee colonies and ensuring presence of diverse community of pollinators, which will enhance pollination provision by honey bees.

SOIL WATER, GROWTH AND YIELD OF YELLOW PASSION FRUIT RESPONSE TO MULCH AND HYDROGEL IN EMBU AND KIAMBU COUNTIES, KENYA

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Decline in yields and frequent failure of major crops in Embu and Kiambu counties, Kenya, is linked to inadequate or unevenly distributed rainfall and poor agronomic practices, among other factors. The main objective of this study was to evaluate the effect of using mulch and hydrogel in production of yellow passion fruit in Embu and Kiambu Counties, Kenya. The study was set up specifically to (i) determine the effect of mulch and hydrogel on soil moisture and nutrients in a yellow passion fruit orchard, (ii) to assess the effect of mulch and hydrogel on growth, yield and quality of yellow passion fruit, and (iii) to evaluate the economic benefits of mulch and hydrogel in production of yellow passion fruit. The study sites were; Ugweri (Embu County), and Kenyatta University. A randomized complete block design (RCBD) with three replicates was adopted. There were six treatments; (1) hydrogel 10 grams + plastic mulch (H10 g + PM), (2) hydrogel 10 grams + grass mulch (H10 g + GM), (3) plastic mulch (PM), (4) grass mulch (GM), (5) hydrogel 20 grams (H20 g), and (6) control. Key variables measured were growth (vine length), yields (fruit weight), soil moisture, soil chemical properties (total N, total C, extractable P, and exchangeable cations (Ca, K and Mg), and economic data. Data was subjected to Analysis of Variance (ANOVA) using SAS version 9.3. Results showed that at Ugweri, H10 g + PM treatment had soil moisture content of 192.14 mm at 215 days after transplanting (DAT), 165.13 mm at 229 DAT, 150.91 mm at 243 DAT, 154.73 mm at 257 DAT, 145.69 mm at 271 DAT and 142.67 mm at 285 DAT, which ranked significantly higher compared to other treatments. The highest average soil moisture of 135.24 mm, 134.29 mm, 122.46 mm, 131.70 mm, 115.20 mm and 111.52 mm at Kenyatta University site during 216, 230, 244, 258, 272 and 286 DAT respectively, was recorded in H10 g + PM. At all sites, treatments did not significantly affect soil nutrients; N, P, K, C, Ca and Mg. At 10 weeks after transplanting (WAT), H10 g + PM treatment had the highest average vine length (248.22 cm) at Ugweri,

and (89.21cm) at Kenyatta University. At Ugweri, the H10 g + PM had the highest average yields; 1.20 t/ha, 1.60 t/ha, 2.30 t/ha, 2.02 t/ha and 1.69 t/ha during 44, 46, 48, 50 and 52 WAT respectively. At Kenyatta University, the highest average fruit weight of 1.10 t/ha at 44 WAT; 1.37 t/ha at 46 WAT; 2.03 t/ha at 48 WAT; 1.59 t/ha at 50 WAT and 1.29 t/ha at 52 WAT were recorded in H10g + PM treatment. At Ugweri, H10 g + PM and H10g + GM treatments provided higher net benefit (NB) of 2599.00 USD/ha and 2455.10 USD/ha; benefit cost ratio (BCR) of 1.54 and 1.59; and return to labor (RL) of 5.00 and 5.21, respectively. At Kenyatta University, the treatment with H10g + PM provided a net benefit of 3390.40 USD/ha, significantly higher compared to other treatments. The treatments; H10g + PM and H10g + GM provided BCR of 2.02 and 1.78; and RL of 6.36 and 5.70 respectively, significantly higher compared to other treatments. Results showed that H10 g + PM and H10 g + GM performed better compared to other treatments in yields and net benefits. The use of hydrogel plus mulching for soil water conservation is therefore recommended for farmers in Embu and Kiambu counties.

EFFECTS OF ACIDULATED ROCK PHOSPHATE ON GROWTH AND YIELD PERFORMANCE OF SELECTED LEAFY VEGETABLES IN KIAMBU COUNTY

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African leafy vegetables are a good source of vitamin A, vitamin C, and foliate among others. They are also a complementing source of other vitamins such as thiamine, niacin and riboflavin, plus some dietary minerals including calcium, iron, potassium, zinc, copper and manganese. Decline in crop yields is mainly caused by loss of soil fertility. Phosphorus (P) is one of the critical elements that limit vegetable production. The situation is aggravated in smallholder agriculture where use of mineral fertilizers is limited or even non-existent, as peasant farmers, due to their low purchasing capacities, cannot afford high costs of these fertilizers. Rock phosphate (PR) provides an alternative to the expensive soluble P. Unfortunately, use of Rock phosphate (PR) to alleviate P deficiency in the soils remains a great challenge due to their low solubility. The current study was therefore conducted to assess growth, yield and quality responses of kales, cowpeas and amaranth to partially solubilised rock phosphate; a cheaper phosphorous source. Laboratory experiments were conducted to investigate phosphate dissolution ability from rock phosphate (RP) in soil as a function of incubation period, through application of organic acids, phosphoric acid and elemental sulphur at different incubation periods (0, 30, 60, and 90 days). Two grams of elemental sulphur and some organic acid solutions containing 0.4 mmolL⁻¹ from each of Oxalic acid and phosphoric acid. The field experiment included four treatments: Triple Superphosphate (TSP); Rock phosphate plus Sulphur; Sole Rock Phosphate; and Control under three vegetable crops: Amaranth; Cowpea and Kales. The experiment was set up in a split plot design, where the 3 vegetables constituted the main plots while the rock phosphate, partially acidulated rock phosphate (RP+sulphur), triple super phosphate and control were sub-plots and replicated three times. Data were collected on the growth parameters and fresh weights of edible yield per plant. The soil pH and phosphorus were analysed before and after growing seasons as well as the phosphorus contents in plant tissues. All the

growth and biochemical data was subjected to analysis of variance (ANOVA) using SAS. Mean separation was done using LSD at 5% probability level. The fresh root weight, leaf area, root dry weight, root length, shoot dry weight and shoot length were significantly responsive to the different phosphorus sources where the TSP treatment was superior to the other treatments while the control had the lowest growth rate as measured in all of the parameters. In the laboratory experiment, the acidulating agents showed significantly different dissolution rates of P from rock phosphate with sulphur showing the highest at 30, 60 and 90 days after incubation (37.5, 1175.3 and 1822.9 ppm respectively). In the field, the TSP treatment elicited the highest fresh weight, number of leaves and leaf area followed by the RP+sulphur treatment; then the rock phosphate treatment. The RP+sulphur treatment led to the highest reduction of soil pH while the highest pH was observed under the sole rock phosphate treatment. Higher and significant responses of the growth and yield parameters of the three crops to the different forms of P applied compared to the control where TSP had the highest then the RP+ elemental sulphur. The soil pH increased significantly on the rock phosphate treatment under the amaranth and kale crops from 5.7 before planting to above 6.0 while on the cowpea, the treatment showed the least change with a slight drop of pH from 5.7 to around 5.6 with the other treatments dropping to much lower units. Application of acidulated rock phosphate is a viable option to the more expensive soluble phosphate fertilizers among smallholder farmers.

IRRIGATION SCHEDULING AND PHOSPHATIC FERTILIZER ON GROWTH, YIELD, AND YIELD COMPONENTS OF NERICA RICE IN KIRINYAGA COUNTY, KENYA

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Rice is an increasingly important cereal crop in Kenya with the major production being done in Mwea, Kirinyaga County. Rice farming faces notable challenges such as; erratic rainfall, water-scarcity, mismanaged irrigation and low soil phosphorus. In that view, therefore, an experiment was conducted at KALRO-Mwea for two seasons to investigate the effect of irrigation scheduling and phosphorus levels on growth, yield and yield yield components of two NERICA rice varieties. The experiment was laid out in RCBD in split-split plot arrangement replicated thrice. Four irrigation schedules (Daily, Every 3 days, Every 5 days and Weekly) formed main plots, two rice varieties (NERICA 4 and NERICA 11) constituted the sub plots and four phosphorus levels (0 kg P ha^{-1} , 25 kg P ha^{-1} , 50 kg P ha^{-1} and 75 kg P ha^{-1}) the sub-sub plots. Data was collected in both seasons on plant height, tiller number, leaf number, leaf fresh weight, leaf dry weight, SPAD readings, panicle length, panicle number, root biomass, shoot biomass, mature panicle number, filled grain number, unfilled grain number, 1000-grain weight, net plot grain weight, grain moisture content and on grain yield. Soils were also sampled for phosphorus determination and effect on the selected soil properties in the plots before planting and at harvest. Shoot biomass samples were also obtained from the plots at harvest, and nitrogen uptake and phosphorus in plant tissues was determined through nitrogen and phosphorus tissue analysis. Data collected were subjected to analysis of variance (ANOVA) using GenStat version 15.1 and means separated using Fischer's Protected LSD

test. Results revealed significant differences ($P \leq 0.05$) amongst irrigation schedules regarding 1000-grain weight in season 1, where highest (55.92g) and least (41.0 g) in Nerica 4 under every 3 days" and weekly schedules in season 1 respectively. Significant effect was also elicited on unproductive tillers in season 2 where highest (1.783 per hill) in Nerica 11 under every 5 days" schedule, and least (1.0 per hill) in Nerica 4 under weekly irrigation schedule was recorded. Phosphorus levels significantly influenced 1000-grain weight, where highest (76.3 g) in Nerica 4 under 50kg P ha⁻¹ in season 1 and least (19.6 g) in Nerica 11 under 25kg P ha⁻¹ / 75 kg P ha⁻¹ in season 2 were recorded. Phosphorus level treatments also significantly influenced number of panicles per hill, where highest and least panicles of 17.3 per hill under 50kg P ha⁻¹ in season 1 and least of 8.7 per hill in Nerica 11 under control in season 2 were recorded. There were no interactions between irrigation schedule and phosphorus level on all the parameters. Phosphorus level led to decreases in soil pH, CEC, Soil Phosphorus and increase in soil nitrogen. Inferentially, the weekly irrigation schedule on growth parameters, yield components and yield of Nerica 4 proved best for water-use efficiency by the crop, at the same time water that would have gone to waste would be saved for more crop production in the expanded land. The 50 Kg P ha⁻¹ level on growth parameters, yield components and yield of Nerica 4 was the most superior in the experiment undertaken. Further, the effect of 50 Kg P ha⁻¹ level acidified the soils more and reduced the soil cation exchange capacity as well. The 75 Kg P ha⁻¹ level led to more accumulation of phosphorus in the soils, and the increase of total soil nitrogen at harvest. Lastly, the 75 Kg P ha⁻¹ level proved to have contributed to the plant-tissue phosphorus and plant-tissue nitrogen on Nerica 4 and Nerica 11 respectively. It is therefore recommended that farmers grow Nerica 4 under irrigation once a week and utilize 50 Kg P ha⁻¹ as these gave the highest rice yields.

PHYSIOLOGICAL AND MORPHOLOGICAL BASIS OF YIELD DIFFERENCE IN UPLAND RICE VARIETIES IN RESPONSE TO LOW NITROGEN IN KIRINYAGA COUNTY, KENYA.

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Rice is the third most important cereal grain in Kenya after maize and wheat. It has been grown by smallholder farmers as a commercial food crop under irrigated and rain fed ecologies. Low soil N fertility, prevalent in smallholder farmers' fields is a major constraint to upland rice production mostly under rain fed ecology. The ever escalating fertilizer prices have made the input to be unaffordable to most smallholder farmers who are resource poor. Efficient use of nitrogen in agricultural practice can increase yields, decrease production costs and reduce the risk of environmental pollution. The response of rice crop to N-fertilizer have been documented, however the effects of low soil N on yield and quality of rice are lacking. The objective of this study was to evaluate growth and yield of upland rice varieties under different nitrogen fertilizer treatments in order to determine the efficiency of nitrogen fertilizer uptake and identify rice varieties adaptable to low soil nitrogen. A field research was carried out at the experimental farm of Kenya Agricultural and Livestock Research Organization (KALRO- Mwea), Kirinyaga County (0°39'S, 37°20'E). The experiment was split-plot in a randomized complete block design (RCBD),

replicated three times. The main plot treatments were five upland rice varieties, MWUR1 (M1), MWUR4 (M4), NERICA4 (N4), NERICA10 (N10) and IRAT 109. Four N rates, 0, 26, 52 and 78 kg N ha⁻¹, were randomly allocated to subplots. Calcium ammonium nitrate (26%N) was top-dressed in two equal splits at 21 and 45 days after sowing, without P and K application. Soil sampling was done before planting for analysis, to establish the soil nutrient status. The growth parameters determined included plant height, tiller numbers, leaf area, leaf chlorophyll content and stomatal conductance. At maturity, grain yield, shoots dry weight, root dry weight, culm length and panicle length were determined. Plant tissue and grain nitrogen content analysis were also determined by Kjeldahl method. Analysis of variance was performed using Statistical Analysis System version 9.00. Mean separation was done using least significance difference at a 5 % level of probability. Associations between variables were determined by polynomial functions in regression analysis. Although results revealed significant variations due to varieties and N treatments, the interaction between varieties and N treatments were not significant ($P \leq 0.05$) on grain yield. NERICA 4, MWUR 1 and MWUR 4 recorded higher plant height, higher filled grain ratio and higher yield components hence may be suitable for soils with low nitrogen. Across all varieties and N treatments, grain yield correlated positively ($P \leq 0.05$) with total plant shoot dry weight ($R^2=0.95$). In addition, root dry weight, culm length, number of tillers and panicle length positively correlated with grain yield. There were significant variations ($P \leq 0.05$) in nitrogen partitioning from the soil to the grains under nitrogen rates, unlike in the varieties. The results from this study revealed lack of interactions between varieties and nitrogen rates meaning that the rice varieties did not have synergetic effects on nitrogen uptake and utilization due to incremental nitrogen. Further studies are recommended on nitrogen use efficiency in upland rice under low soil fertility. In addition, cost benefits analysis of low soil nitrogen upland rice production need to be undertaken.

EFFECT OF NITROGEN FERTILIZER ON MAIZE PERFORMANCE, NITROGEN USE EFFICIENCY AND SOIL AVAILABLE NITROGEN CONCENTRATIONS IN SMALLHOLDER FARMS IN RONGO, KENYA

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Reduced crop productivity among the smallholder farms is the main cause of food insecurity in Sub-Saharan Africa (SSA). Maize is a staple food crop in Kenya and is especially grown in the parts of North Rift and Western Kenya. In the Lake Victoria region and particularly in Rongo sub-county, maize potential production is low ranging between 0.8 to 1.6 tons ha⁻¹. The low soil productivity is due to low soil fertility, low soil nitrogen, inadequate use of inputs such as mineral fertilizers, improved maize seeds, and inadequate agricultural practices to boost production. The purpose of this study was to determine the effect of nitrogen fertilizer on maize yields, nitrogen use efficiency (NUE), its effect on soil properties, and distribution in the soil profile and on soil microbial population. The study was carried out at Kambija and Koderobara in Migori County during the long rainy season from March–July, 2018. The experiment was arranged in a Randomized Complete Block Design with three replications. The

treatments of N fertilizer (CAN) were at four levels (0, 25, 50 and 75 kg N ha⁻¹). Tri-Superphosphate (TSP) at 10 kg P ha⁻¹ was applied as blanket. Maize variety (Sc Duma 43) was used as a test crop. Data were analyzed with the ANOVA procedure using GenStat statistical software (15th edition) and treatment means separated using least significant difference at ($P \leq 0.05$). Results indicated that treatments with nitrogen fertilizer application significantly increased maize yields ($p=0.001$) at Kambija and ($p=0.01$) at Koderobara. Applied N fertilizer at 50 kg N ha⁻¹ exhibited the highest maize yields compared to other treatments at both sites (4.34 t ha⁻¹ for Koderobara and 3.41 t ha⁻¹ at Kambija). High rates of N fertilizer increase soil acidity and decrease maize yields. Highest nitrogen use efficiency (NUE) was recorded at 25 kg N ha⁻¹ with 23.84 at Kambija while at Koderobara was recorded at 50 kg N ha⁻¹ with 22.61, in general NUE decreased with increased applied N rates. At Kambija, 75 kg N ha⁻¹ had the highest N content in plant tissues with 2.07% in the heading stage while at Koderobara, the highest N content of 1.90% was recorded at 50 kg N ha⁻¹. Due to rainfall variability, mineral N fractions (NO₃⁻ and NH₄⁺) were higher in sub-layers (10-20 cm and 20-30 cm depth) at seedling stages but at heading stages, N mineral concentrations were higher in top-layers (0-10 cm depth) in both sites. Plots fertilized at 50 kg N ha⁻¹ recorded highest concentration of available N in the soils in both sites of the experiment. Soil microbial population was slightly increased by N fertilizer application and declined with increased soil depth. Based on the results of this study, application of N fertilizer at 50 kg ha⁻¹ can be recommended among the smallholder farms for improvement of maize yield in Rongo-sub County, Migori County, and the catchment of Lake Victoria.

EFFECT OF SEED PRIMING ON MAIZE YIELDS, NUTRIENT AND WATER USE EFFICIENCIES IN MACHAKOS AND MAKUENI COUNTIES, KENYA

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Farmers in arid and semi-arid (ASAL) areas of Kenya realize very low maize yields due to limited use of requisite inputs, late planting and poor crop establishment. The aim of the study was to determine the effect of seed priming on maize yields, nutrient and water use efficiencies in maize and economic benefits of seed priming. Field experiments were conducted at Katumani in Machakos Sub-County, Machakos County and at Kalii in Makindu Sub-County, Makueni County during the long and short rain seasons in 2011, 2012, 2013 and 2014. The treatments arranged as a split plot in a RCBD include; seed treatment constituting the main plots while fertilizer rates were assigned to the sub-plots. Each treatment was replicated four times. The interaction of Nitrogen fertilizer application and seed priming in a pure maize crop gave the highest grain yields per hectare of 0.728tha⁻¹. Primed maize seeds combined with 20 Kg N in a pure maize crop had the highest N-use efficiency of

0.19. Primed maize seeds combined with manure and 20kg N in a pure maize crop gave the highest water use efficiency of 0.002kgm⁻³. Whereas, dry maize seeds combined with manure and 20kg N in a pure maize crop produced the highest above ground biomass yield of 1.8tha⁻¹. In Katumani primed maize seeds combined with 20 Kg N in a pure maize crop had the highest net benefit of Ksh 12,840 ha⁻¹,

while in Kalii all the treatments had negative economic net benefits. Grain yield, water use and nitrogen use efficiencies were greatly influenced by seed priming. Therefore, seed priming is a viable technology that could increase economic benefit of maize especially for resource poor farmers in the marginal areas of Kenya.

EFFECT OF SELECTED INTEGRATED SOIL FERTILITY MANAGEMENT OPTIONS ON SOIL CHEMICAL PROPERTIES AND CASSAVA YIELD IN SOUTH-KIVU, DEMOCRATIC REPUBLIC OF CONGO

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In Democratic Republic of Congo, cassava is the most important food crop, but declining soil fertility is a major constraint causing low production. Inorganic fertilizers for small-holder farmers are often too expensive to apply at optimal rates and Integrated soil fertility management, involving use of inorganic and organic inputs is one of the options for addressing the decreasing soil fertility. This study was therefore conducted to determine the effects of a combination of inorganic fertilizer with organic input (farmyard manure and *Tithonia diversifolia*) on soil properties, cassava yields and profits. The trial was carried out in Kabamba and Runingu sites of south-Kivu in Democratic Republic of Congo. The trial was laid out in Randomized Complete Block Design (RCBD) with nine replications in each site. The treatments included two organic sources (*Tithonia* and manure) and combinations with mineral fertilizer NPK at three levels. Soil parameters, pH, Organic carbon, and macronutrients were measured at the beginning and end of the experiment. At harvest cassava yields was determined. Labor data and cost of inputs were taken and used in economic analysis. Different treatments did not influence growth parameters of the cassava. The roots of cassava were however significantly different ($p = 0.001$ and $p = 0.034$). The application of 300 kg ha⁻¹ of NPK combined with 5ton ha⁻¹ of *Tithonia* increased cassava root yields by about 193% and 100%, respectively at Kabamba and Runingu sites relative to the control while the application of 150 kg ha⁻¹ increased cassava root yield by only 32.4and 3.1%. The results of the soil indicated that 5ton ha⁻¹ of farmyard manure combined with mineral fertilizer at 300 kg ha⁻¹ of NPK improved soil pH, available P, exchangeable Ca and Mg. The soil total N improved significantly ($p= 0.016$) with the application of 5ton ha⁻¹ *Tithonia* combined with 300 kg ha⁻¹ of NPK at both sites. The organic carbon was not affected by the treatments. The net benefits increased by 811.5% and 315.4% in treatment with5ton ha⁻¹ of *Tithonia* combined with 300 kg ha⁻¹ of NPK, respectively, in Kabamba and Runingu sites compared to the control. This study recommends that farmers should apply 5 ton ha⁻¹ combined with 300 kg ha⁻¹ of NPK to increase cassava yield and improve profitability in Runingu and Kabamba sites and they should apply 5 ton ha⁻¹ of farmyard manure combined with 300 kg ha⁻¹ of NPK to improve soil fertility in the study areas.

TILLAGE METHODS AND INORGANIC FERTILIZERS EFFECTS ON SOIL CHEMICAL PROPERTIES, MAIZE AND BEANS PERFORMANCE IN EMBU COUNTY, KENYA

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The decrease in maize and bean production is a major concern in food security of the majority of small household farmers in Embu County, Kenya. The decrease is attributed to reliance on conventional farming methods and application of fertilizers majorly NPK without attention to essential nutrients like Mg, Ca, Zn, B and S despite their demonstrated benefits. The purpose of this study was to determine the effect of minimum tillage and conventional tillage and fertilizer input on soil pH, total nitrogen and maize and bean crop performance. An on-station trial was conducted for two seasons in Kenya Livestock Research Organization (KALRO) in Embu County. The trial was laid in a randomized complete block design in a split plot arrangement. The tillage systems; Minimum tillage (MT) and conventional tillage (CT) made up the main plots. Each of the main plots was divided into five plots (sub-plot) that were applied with five different fertilizer inputs that include, NK, NP, KP, NPK and NPK+Zn+B+Mg+Ca+S). Data on soil total nitrogen (TN) and pH was collected in the beginning and end of the experiment. Maize and bean performance data collected included days to flowering, days to physiological maturity, days to tasseling, plant height, number of leaves, cobs, biomass and grain weights. Data collected was subjected to analysis of variance (ANOVA) using Statistical Analysis System (SAS). Differences between the treatments means were separated using LSD at 5% level of significance. The results of maize crop showed a significant difference on treatments with NPK+Zn+B+Mg+Ca+S under minimum tillage as it had the highest dry grain weight of 4.01 tons/ha compared to conventional tillage yielded 3.83 tons/ha at $p \leq 0.019$. Treatment with PK under minimum and conventional tillage recorded the lowest yield of 2.77 tons/ha and 2.60 tons/ha respectively. The treatment with NPK under minimum and conventional tillage on maize yields were not significantly different at $p \leq 0.019$. However, the treatment with NK, NP, and PK under minimum and conventional tillage registered lowest yields. For the bean crop, treatment with NPK+Zn+B+Mg+Ca+S under minimum tillage had the highest dry grain weight of 1.98 tons/ha while the same combination under conventional tillage had 1.78 tons/ha at $p \leq 0.04$. Treatment with NPK under minimum and conventional tillage did not have any significance ($p \leq 0.124$) on yields but recorded second highest yield of 1.76 and 1.58 tons/ha respectively. The treatments with NK, NP, PK under the two tillage systems recorded the lowest performance on yields $NP > NK > PK$ both in maize and beans respectively. For soil, there was a significant change in pH, and TN. Both minimum and conventional tillage had a significant change of initial and final N at $p \leq 0.009$ and $p \leq 0.002$, TN $p \leq 0.02$ and $p \leq 0.63$ and pH $p \leq 0.001$ and $p \leq 0.02$ respectively. This study recommends application of NPK+Zn+B+Mg+Ca+S under minimum tillage for increased maize and beans production in Embu County for the farmers.

AN EVALUATION OF MARKETING EFFICIENCY OF TOMATOES IN LOITOKTOK, KAJIADO COUNTY, KENYA

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Tomato crop has potential to yield high returns in a small area and contribute substantially to increased income, create employment and poverty reduction. Despite the economic importance of tomato marketing, producers in the study area are yet to realize its significant benefits. This is depicted by the overall poverty index of 41%; mean monthly food expenditure share of income per adult of 49% and low prices received by producers compared to retail prices in the main terminal market. Consequently, the cause of huge price differential is unknown. The main objective of the study was to evaluate efficiency of tomato marketing in Loitoktok. Specifically, the study aimed to analyze the existing tomato marketing channels and their levels of efficiency, assess the structure, conduct and performance of tomato marketing system and finally determine factors that influence efficiency of tomato marketing. A total of 174 respondents were selected; 126 tomato producers and 48 traders. Multistage sampling technique was used. First, purposive method was used to select Loitoktok Sub-County which is one of the major tomatoes producing areas in Kenya. A systematic random sampling method was used to select the respondents. Semi structured questionnaires were administered to elicit the required information. Data was analyzed using the structure-conduct-performance model to evaluate the existing marketing channels, structure, behaviour and performance of the tomato marketing. Market concentration by use of Herfindahl-Hirschman Index and the Gini Coefficient; product differentiation and conditions for entry in tomato marketing were used to analyze structure. Marketing efficiency indices of Shepherd, Acharya and Agarwal; and Modified Acharya and Agarwal were used to gauge the efficiency of the channels, while marketing margin analysis were used to assess performance. The multiple regression model was used to examine the determinants of marketing efficiency using SPSS version 20 and STATA version 14 programs. The study found out five marketing channels. Channel one comprised of producer-consumer; channel two: producer-local retailer-consumer; channel three: producer-local assembler-regional wholesaler-terminal market retailer-consumer; channel four: producer-regional wholesaler-terminal market retailer-consumer and channel five: producer-regional wholesaler-terminal market wholesaler-retailer-consumer. Herfindahl-Hirschman indices obtained of 0.038, 0.076, and 0.2 at retail, wholesale and producer levels respectively indicated that in terms of market share, wholesale and retail market was competitive, while at producer level it was not competitive. The Gini Coefficients realized of 0.6505, 0.5258, and 0.4524 for producers, wholesalers and retailers indicated there was unequal distribution of sales income at all three levels suggesting that market was inefficient. Retailers and regional wholesalers made supernormal profits. The overall share of producer in consumer price was 39.8%, with a 21% share in the main terminal market. The main sources of market information were market intermediaries, there were weak marketing organizations and transport cost was the most dominant marketing cost. Marketing costs, volume lost; price instability and distance travelled to buy tomato negatively and significantly affected marketing efficiency, while amount of initial capital, volume produced, price at external market and receiving extension services for producers, membership of marketing organization

and credit acquisition positively and significantly influenced marketing efficiency. The initial capital, exploitative middlemen and price fluctuation were the main challenges. It is recommended that government should set up policies that encourage market competition, establish a formal flow of market information and marketers should be encouraged to form strong marketing organizations to increase their bargaining power.

SCHOOL OF HOSPITALITY, TOURISM AND LEISURE STUDIES

THE ROLE OF RECREATIONAL BEHAVIOUR IN INFLUENCING DOMESTIC TOURISM PARTICIPATION IN NASARAWA STATE, NIGERIA

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Dr. Shem Wambugu Maingi

Domestic Tourism has been acknowledged as a pathway to generate economic benefits and to develop the resident population socially and economically. However, tourism requires a lot of participation and support by the resident population to be sustained. Getting participation and acceptance from resident's population is perhaps the greatest challenge for a national government and tourism markets. This challenge seems apparent in Nasarawa State, Nigeria which is characterized with culture, tribal and religious values practices and behaviour. The general objective of this research was to examine recreational behaviour in relation to domestic tourism participating in Nasarawa State, Nigeria. The specific objectives were to profile recreation behaviour of resident, examining antecedent factors influencing residents' recreation behaviour and evaluating residents' perceptions and attitudes towards domestic tourism. Data was collected using qualitative method. The research instrument was structured questionnaire for the public servants with a stratified simple sampling procedure where 388 questionnaires were administered, 371 were filed and returned which were physically checked, coded and entered into computer and analyzed and the response rate was 96%. Descriptive statistics were used to measure intervals and tendencies – test. Ordinary least square model was used to respond to the hypothesis, Pearson correlation was used to measure the relationships between variables while multiple regression analysis was used to reflect all the independent variables. The findings from the study reviewed that the residents' high income means a positive motivation for participation in domestic tourism in Nasarawa State. The findings also revealed that participation in domestic tourism are influenced by hindrances which must be addressed as it is the case in Nasarawa State. In addition, the study provides that residents' perception and attitudes toward domestic tourism were positive and indicate that how a people perceive the concept and activities of domestic tourism has an influence on whither to participate in tourism or not. Moreso, the result shows that the participation of residents in Nasarawa State, Nigeria can bring more positive than negative to the local economy of the state. so also, the findings revealed that public servants in Nasarawa state, Nigeria engage more in business, visit

friends and relatives and wine and dine out during their leisure time and preferred friends, co-workers and family as travel companions when they engage in recreation and tourism activities. Friends and internet media were their sources of information about recreation and tourism activities. Recommendations are given on how government and policy makers in Nasarawa State, Nigeria can make contributions to develop domestic tourism. Finally, the study suggests further studies including conducting same research in Nasarawa State to involve all segment of the population as this focused in the public servants which income can be easily measured. The study concluded that recreation behaviours poses challenges in the rural and urban areas in Nigeria as in the case of Nasarawa State, Nigeria are yet to embrace the values of active recreation participation, despite knowledge of the recreation and tourism. Therefore, the only way to sustain domestic tourism participation is through the assessment of residents behaviours toward domestic tourism.

IMPACT OF ORGANIZATIONAL, INNOVATION AND ENVIRONMENTAL ATTRIBUTES IN ICT UPTAKE FOR KWALE HOTELS, KENYA

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In Kenya, tourism is considered an important industry that contributes to the economy of the nation. As such, the government carries out regular marketing campaigns to publicize the country to the outside world as an important tourist destination. Further, the fast pace of development in Information and communication technology (ICT) have changed the structures of tourism industry regionally and around the world. New technologies have emerged and the trend is likely to continue in future. While Diani Beach (in Kwale County) was rated as the best beach in Africa five years in a row (2014-2018) by World Travel Award, little is known about its ICT uptake. As a result, there is a need for an evaluation of the factors for the Information and Communication Technology (ICT) uptake by Kwale Hotels and how it deploys ICT resources to attain competitive advantage. The study examined factors that affect ICT uptake of hotels in Kwale County. Based on attributes used by various ICT researchers in tourism industry, the researcher sought to identify the impact of organizational, innovation and environmental factors and how it impacts on the use of information and communication technology by Kwale Hotels. The study sought to answer the following research questions: What was the level of usage of ICT by Kwale Hotels? Secondly, what were the effects of organizational factors on the uptake of ICT for Kwale Hotels? Thirdly, what are the effects of environmental factors in the uptake of ICT? Finally, what are the effects of technological innovation factors on the uptake of ICT for Kwale Hotels? The study covered 3-5 star and Boutique hotels in Kwale County. Further, it was delimited to the variables specified. The target population was 32 hotels but only 26 hotels were accessible. Since the accessible population was small, a census of all the 26 hotels was taken and 4 respondents from each hotel were included where the actual respondents of the study totaled to 104. Descriptive research design was adopted by the study while stratified random sampling was used to stratify the 104 respondents into 4 categories which included: Operations, reservations, Marketing and ICT managers. Questionnaires were used to collect primary data while descriptive statistics were used to analyze the data. The results showed that there was significant uptake of ICT in all categories of the hotels. In addition, organizational, environmental and technological innovation factors significantly influenced ICT uptake of Kwale Hotels. Key

recommendations of the study were more engagement in online marketing and diversification of the types of online marketing in order to optimize on visibility, enhance marketing funnel and ultimately increase profitability.

HYGIENIC PRACTICES AMONG VENDORS AND CUSTOMERS' PERCEPTION ON SAFETY OF STREET FOODS IN NASARAWA STATE, NIGERIA

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Street vended foods are proliferating businesses in developed and developing countries. Street food vendors play very important part in ensuring availability and safety of such foods to consumers. There is need for prevention of food borne illnesses because any lack of understanding by the vendors or food handlers on hygienic food handling, will bring a serious challenge to the safety of food and the consumer. Street foods have become a preference to most people due to several factors. There is however minimal information on the level of safety of the foods and the effect this has on the customers. This study sought to assess the hygienic practices among vendors and the customers' perception of safety of street foods in Nasarawa State, Nigeria. The study determined the hygienic practices among vendors and customers' perception on safety of street foods in Nasarawa State, Nigeria. This study used a cross-sectional descriptive survey focusing on both food vendors and customers of street foods in Nasarawa State. The target population was all street food vendors and customers in Nasarawa State and a sample size of three hundred and eight seven (387) food vendors and four hundred (400) customers. Purposive sampling and convenient sampling was employed for sample selection. Questionnaires, observation checklist and interview schedule guide were used for data collection. Statistical packages for social sciences were used to analyze quantitative data and qualitative data which were done by coding, ordering and summarizing for easy analysis. To establish statistical levels of significance, 95% confidence level was used. For the correlation between food vendors' hygiene practices and customers' perception on food safety, Pearson's correlation coefficient test was used. Results showed that there were more women involved in street food vending than men. Additionally, both young and old consume street food. The food vending structures varied, but to note is that 63.8% of street foods are prepared at home then sold on the streets. Although 93.5% of the vendors operate from a clean environment, they lack basic hygienic facilities such as hand washing sinks. Majority of food vendors had license. Most of the vendors admitted to not washing their hands while handling foods while some used aprons during food preparation and cooking. Some vendors did not avoid work when suffering from diarrhea, vomiting, sores and cuts. Majority of vendors admitted adhering to medical check-ups. Only 31% of the respondents had the health certificate. However, some customers indicated satisfaction with the street vended food, although a majority noted some concerns over the hygiene of the food offered in relation to their health. Public health officers on the other hand experience challenges in regulation due to the proliferation of street vendors and their diverse typology. The study recommended that the state should come up with policies to regulate street vending, like having a trading license and a health certificate renewable. The state to indicate the minimum standards for the

vending structure. The vendors need more training on environmental, food and personal hygiene. The customers also need training on food safety.

THE VIABILITY OF SUSTAINABLE TOURISM DEVELOPMENT IN LOW POTENTIAL TOURISM REGIONS IN KENYA: THE CASE OF KAKAMEGA COUNTY

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Tourism is a critical tool for sustainable development across the world. However, there is unequal development of the industry more so in low potential areas. In Kenya, many counties in low potential zones have been left out of decision making regarding tourism development. This research sought to assess the viability of sustainable tourism development in low potential regions in Kakamega County. The study adopted descriptive research survey design to collect primary data using a mixed quantitative and qualitative method. The study targeted a population of 126 who comprised of managers working licenced and registered hotels in Kakamega County Government, Kenya Wildlife Service, Kenya Forest Service, tour guides, hotel owners and community associations' members. Slovin's formula was used to proportionately select a sample size of 90 subjects from a target of 116 (tour guides, hotel owners and community associations' members) who were enrolled in the study. Simple random sampling method using lottery method was used to select 90 respondents from the population of tour guides, hotel owners and community associations' members. Purposive sampling method was used to identify tourism managers working in the County government of Kakamega and Kenya Wildlife Service and Kenya Forest Service as expert respondents. The study used structured questionnaires to collect primary data from tour guides, hotel owners and community associations' members, while interview schedule was used to solicit information from County government of Kakamega, Kenya Wildlife Service and Kenya Forest Service. Data collected from using structures questionnaires cleaned, coded and entered into Statistical Package for Social Sciences for descriptive statistical analysis. Multiple regression analysis was conducted to assess the relationship between independent and dependent variables. The findings of descriptive quantitative analysis were presented in tables and charts. Qualitative primary data solicited from County government of Kakamega and Kenya Wildlife Service and Kenya Forest Service were thematically analysed and presented as key voices and verbatim reporting. The study established that independent variables (tourism products, stakeholders, marketing strategies and stakeholders attitudes contributed to 41.0% to the development of sustainable tourism in Kakamega County. Though the four variables explored contributed little to sustainable tourism development, cultural festivals contributed the most (Beta=0.275) while stakeholders attitudes (Beta=0.028) contributed the least. The study in conclusion established that Kakamega County has great potential for niche tourism including agri-tourism, adventure tourism, food tourism and cultural tourism which are yet to be fully developed. Low involvement by the local residents in tourist activities, poor infrastructure, inadequate tourism development, low stakeholders involvement, lack of adequate tourism marketing and negative stakeholders attitude were noted as the major challenges facing the tourism product development in

Kakamega County. The study also recommends for local and international marketing of Western Kenya tourist circuit. The findings will benefit the Kakamega County and government agencies responsible for tourism and other stakeholders with vital information on the state of tourism in Kakamega County. This vital information will be used to develop policies and programmes for developing sustainable tourism in Kenya. The private sector, Non-Governmental Organisation and other stakeholders may use this document to identify opportunities for investment in tourism industry. Finally the study will benefit the world of academia since it will add to the literature on culture and event tourism.

THE ROLE OF SUPPLY CHAIN MANAGEMENT PRACTICES ON ENVIRONMENTAL MANAGEMENT IN CLASSIFIED HOTELS IN MOMBASA COUNTY, KENYA

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The main objectives of the study was to examine the influence of procurement procedure and establishing the role of hotel operations on environmental management in the classified hotels. It was also to determine the relationship between product design and environmental management in these hotels. Through a cross sectional descriptive study on the sampling units, the targeted data collection was from 224 managerial staff and support staff of the 69 hotels classified by Tourism Regulatory Authority according to the bed ratings in Kenya. Unstructured structured questionnaire was used to collect primary data from 105 respondents out of the 172 chosen through a stratified random sampling process. Data was analyzed quantitatively using descriptive statistics, multiple regression and repeated measures ANOVA. Consequently, the findings indicated that there was a significant relationship between procurement procedures on environmental management, that product design practices were good predictors of environmental management index of the classified hotels and that there was a significant relationship between the hotel operations and environmental management in the classified hotels. The study concluded that procurement procedures influenced environmental management. However, some of the procurement procedures were perceived to have a greater influence than others. From the findings it can be concluded that product design practices had a significant relationship with the environmental management index of the classified hotels. Also the role of hotel operations had a significant role to play on environmental management in the classified hotels. Operations that contributed the highest were; having an efficient water harvesting system while supporting the local community 'green environment' management programme contributed the least. Thus a unit increase in procurement procedures would lead to an increase in environmental management in classified hotels in Mombasa County, Kenya, a unit increase in product design would lead to an increase in environmental management in classified hotels in Mombasa County, Kenya and that a unit increase in hotel operations would lead to an increase in environmental management in classified hotels in Mombasa County, Kenya. Therefore hypothesis that Strategic sourcing plan moderates the relationship between supply chain management practices and environmental management in classified hotels in Mombasa County was

accepted and concluded that Strategic sourcing plan moderates the relationship between supply chain management practices and environmental management in classified hotels in Mombasa County. The study recommends that hotels embrace all the procurement procedures that contribute to environmental management so as to enjoy their benefits. Also the hotels should also embrace hotel operations that contribute positively to environmental management. There is need to bring closer supervision from National Environment Management Authority (NEMA) in order to ensure policies set for environment management are complied with since there were gaps that were identified mostly the hotels located near beaches. All these factors should be considered in ensuring sustainable environmental practices for the hospitality industry.

SCHOOL OF ENVIRONMENT

INFLUENCE OF DISASTER RISK REDUCTION PROJECTS ON ADAPTIVE CAPACITY TO CLIMATE VARIABILITY IN KITUI COUNTY, KENYA

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Disaster risk reduction projects are some of the initiatives undertaken with an aim of addressing climate variability associated disasters such as droughts and floods and loss of agricultural production. The projects are normally aimed at reducing vulnerability and increasing resilience among rural communities towards climate variability and change. Results of adaptation measures undertaken by such projects to increase adaptive capacity of the communities remain largely under researched. By use of a descriptive survey design, this study focused on the influence of Caritas disaster risk reduction projects on the adaptive capacity to climate variability in Kitui County. Specifically, the study sought to analyze rainfall and temperature data (1979-2014) for climate variability in the study area. It also evaluated the effectiveness of adaptation measures to climate variability among project beneficiaries as well as examining the influence of socio-economic factors on the uptake of the adaptation measures. During the study, two sampling techniques were used; purposive sampling that was used to select The Kenya Livelihood Support Project and Arid and Semi-Arid Lands Resilience Project implemented by Caritas-Kitui and also select key informants. Random sampling aided in selection of 106 project beneficiary households who were administered with questionnaires. Data obtained was analyzed through Statistical Package of Social Sciences and Excel in relation to the set objectives. The study employed descriptive statistics such as frequencies, mean and standard deviation as well as inferential statistics of ANOVA to test any significant differences on decadal means of rainfall and temperature while Chi-Square was used to test for any significant difference in rating used in Likert scale responses. Data was displayed in tables and graphs. Analyzed rainfall and temperature data obtained from Katumani (9137089) Kenya Meteorological Department station indicated that there was statistically significant mean temperature variation ($p < 0.005$) within 1975-2014 while no statistically significant difference in rainfall variation

within the same period. There was statistically significant correlation between mean annual temperature and rainfall ($p < 0.005$) at 2-tailed significance level. In terms of perception of significant weather changes observed, 39% and 27% of respondents in ARP and KLSP projects asserted that there has been prolonged droughts experienced in the area. Likert scale was used to rank project adaptation measures and based on Total Weighted Mean (T.W.M) used to compute the ranking, it was observed that on-farm water harvesting (T.W.M=337.08), soil conservation (T.W.M=262.91) and income diversification (T.W.M=232.23) ranked first, second and third respectively in ARP applied adaptation measure while KLSP applied adaptation measures, soil conservation was ranked first at T.W.M=387.80 and on-farm water harvesting second at T.W.M=346.36. Chi-square test performed to determine if there was any statistically significant difference in Likert scale rating of effectiveness of project adaptation measures indicated a significant difference ($p < 0.005$) in ratings under on-farm water harvesting and soil conservation in both projects. Socio-economic factors that influence uptake of project adaptation measures, it was observed that finance was ranked first T.W.M=314.52 and 341.46 in ARP and KLSP project respectively. The study therefore concludes that disaster risk management projects have an influence on the adaptive capacity to climate variability. In addition socio economic factors that would influence uptake of adaption measures should be put into consideration during project planning and implementation.

INFLUENCE OF AQUACULTURE DEVELOPMENT ON FISH POND WATER QUALITY AND LIVELIHOODS OF FISH FARMERS IN GATUNDU, KIAMBU COUNTY

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A growing fish demand in Kenya, coupled with Government support from the Government has seen an upsurge in the aquaculture sub-sector. The Government's Economic Stimulus Programme (ESP) has been the main boost to Aquaculture development in the country. Despite the high growth, there is inadequate information on impact of the growth in aquaculture on water quality and livelihoods. The main objective of this study therefore was to establish the quality of water in the fish ponds and also determine whether aquaculture has improved fish farmers' livelihoods in Gatundu, Kiambu County. The study was carried out between May 2015 and March 2016. Physico-chemical parameters were determined in pond and inlet water using standardized apparatus while nitrates and phosphate levels were determined using standard laboratory procedures. A semi-structured questionnaire was used to collect information on the impact of aquaculture on livelihood of fish farmers in the study area. Data analysis was done using one-way Analysis of Variance (ANOVA) to find the significant difference at $p \leq 0.05$. Independent t-test was used to compare means of inlet and pond water while Student Newman-Keuls test was used to separate the means. Livelihood data was analyzed using Chi-square to show association of variables in the different locations. Results of mean physico-chemical parameters of pond water were; Temp; $23.58 \pm 3.85^\circ\text{C}$, DO; $4.89 \pm 1.09\text{mg/L}$ pH; 7.68 ± 0.50 , TDS; $493.13 \pm 136.67\text{mg/l}$, EC;

34.63±19.50µScm-1, N-NO₃; 2.76±2.35mg/L, and PO₄-; P1.71±1.50mg/L and did not exceed permissible water quality limits. There was no significant difference among sampled fish ponds and among fish ponds except in EC. Mean concentrations of measured parameters significantly increased in pond water as compared to inlet water except for N-NO₃. The farmers' livelihood survey showed aquaculture had improved livelihood of fish farmers through income, better nutrition and employment. Livelihood improvement was significantly different between sampling locations. Most farmers had a production cycle of 9-12 months and only 27% of the farmers had table-size fish by 8 months. 72% of the farmers earned below Ksh 20,000 (USD 200) in a production cycle. The study concluded that water quality of pond and inlet water was within acceptable limits and was not an immediate threat to the ecosystem, however aquaculture practices were significantly influencing the quality of fish pond water. The study therefore recommended that pond water should not be disposed directly into water bodies without treatment because of its rich nutrient content. Regular monitoring of the water quality in fish ponds and good aquaculture practices were important in ensuring the water quality was maintained within the acceptable range. Aquaculture as an enterprise had improved farmers' livelihoods and should be promoted, however farmers needed training on commercialization and better management technologies in order to increase fish production and returns.

EFFECT OF IRRIGATION WATER QUALITY ON GROWTH AND CHEMICAL COMPOSITION OF AFRICAN NIGHTSHADE (*Solanum scabrum* MILL) GROWN IN WATER FROM FOUR SOURCES KIAMBU COUNTY, KENYA

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The type of water used for irrigation directly not only affects the quality of crops produced but also the level of bioaccumulation. Rapid urbanization and population growth has resulted to water scarcity, thus making many urban farmers to depend on wastewater for farming. As a result, there is the need to evaluate ways in which different sources of water available in peri-urban areas can be used to sustainably grow crops with minimal effects to the environment. Therefore, the main aim of this research was to evaluate the effect of irrigation water source on growth and chemical composition of African nightshade grown using different sources of water in Kiambu County, Kenya. The study was carried out between July and September 2016, and the area lies between latitude 1°12'0.45" South and longitude 36°55'59.34" East. The specific objectives were to analyze the effect of irrigation water source on the agronomic parameters of *S. scabrum*, assessing how the uptake of chemical elements by *S. scabrum* is influenced by the source of irrigation water, and analyzing how the chemical elements in *S. scabrum* compare to the World Health Organization human exposure limits. To achieve this, randomized complete block design (RCBD) was used. Results show that at day 30, there was a significant difference ($p \leq 0.05$) between the number of mature leaves and height for plants samples grown using tap water as compared to that of shallow well. The results of the study demonstrate that *S. scabrum* is affected by the source of irrigation water used. This is owing to the fact that crops samples grown using water from

a shallow well, recorded the highest mean values of 0.38 cm², 9.53, and 22.81 cm as far as the cross-sectional area, number of mature leaves, and height are concerned respectively. Crop samples grown using borehole registered the highest mean value in regard to Zn²⁺, Mn²⁺ and Pb²⁺ concentration at 37.17, 10.63 and 8.49 ppm respectively. Low concentration of heavy metals Pb²⁺, Cu²⁺ and Cd²⁺ at 4.36, 3.98 and 2.09 ppm respectively was detected in crops samples grown using tap water. The soil-to-crop transfer factor was high in all crop samples from all the sources indicating that indicating that soil colloids significantly affects chemical uptake by *Solanum scabrum*. As compared to the WHO standards, the values of Cd²⁺ and Pb²⁺ were significantly above the recommended human exposure limits across all the blocks for the plant samples which will result to bioaccumulation in the long run. From the results, policy makers should educate the farmers on the need to carry out phytoremediation as one of the innovative risk-reduction interventions measures in regard to bioaccumulation.

INFLUENCE OF STAKEHOLDER PARTICIPATION ON DOMESTIC WASTE MANAGEMENT IN BIASHARA RESIDENTIAL AREA, KIAMBU COUNTY, KENYA

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Researchers have found that to achieve efficient and sustainable solid waste management, it is important to involve all stakeholders in the process. This study was conducted to investigate the influence of stakeholder participation on domestic waste management in Biashara residential area, Ruiru sub-county Kiambu County, Kenya. The study had the following objectives: To establish the influence of stakeholder participation strategies on domestic waste management, To determine the influence of stakeholder forums and communication practices on domestic waste management, and To examine the influence of stakeholder engagement frequency on domestic waste management. The study utilized cross-sectional descriptive research design and a sample of 383 respondents was utilized, data was collected using questionnaires and interview guides and analysis was done using SPSS version 23. The study established that majority of the residents (59%) are empowered to recycle and separate their waste and that there is a strong positive correlation between stakeholder's empowerment to recycle their waste and improved DWM ($r=0.539$, $n=342$, $p=0.01$). On waste storage, the results indicated that there is a significant positive correlation between stakeholder consultations on appropriate waste storage techniques and improved DWM ($r=0.328$, $n=342$, $p=0.01$). In terms of waste collection, the study deduced that stakeholder negotiations are sometimes held to designate waste collection days and that there is a very strong and significant positive correlation between adherence to negotiated waste collection days and improved domestic waste management ($r=0.838$, $n=342$, $p=0.01$). On waste transport and disposal, the study established that, 38.6% and 42.7% of the respondents respectively agree that partner and tenant meetings are held. Additionally, the study deduced that there is a significant strong positive correlation between adequacy of partner meetings and improved DWM ($r=0.491$, $n=342$, $p=0.01$) and a significant moderate positive correlation between the adequacy of tenant meetings and the improvement of DWM ($r=0.317$, $n=342$, $p=0.01$). Finally, the study determined

that there is no significant correlation between stakeholder engagements carried out multiple times a year and improved DWM and that the correlation that exists is negative ($r = -0.077$, $n=342$, $p=0.157$) while there is a mild and significant positive relationship between stakeholder engagements carried out annually and improved DWM ($r=0.197$, $n=342$, $p=0.01$). The study concluded that overall, there is a significant positive correlation between stakeholder participation in DWM and improved DWM and recommended a significant increase in stakeholder participation in DWM and further studies into ways of enhancing stakeholder participation in DWM.

EVALUATING WATER AVAILABILITY AND ACCESSIBILITY FOR IMPROVED STUDENTS' HEALTH AND ATTENDANCE IN SECONDARY SCHOOLS IN RACHUONYO, HOMA BAY COUNTY, KENYA

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Water scarcity is a major global problem, and climate change has made it even worse. The study evaluated water availability and accessibility and how it affects students' health and attendance in secondary schools in Rachuonyo North Sub-county, Homa Bay County, Kenya. The objectives of the study were: to assess the influence of accessible water on the health of secondary school students; to evaluate how available water affects secondary school attendance, and to analyse the effects of the dry and rainy season on water availability and accessibility on secondary schools in Rachuonyo North Sub-county. The study used descriptive research design and the sample of the population was calculated to be 278 students but 328 students participated in the study. Quantitative data was collected using questionnaires and analysed using Statistical Package for Social Sciences. The water samples from the tap, school tank, and water plant were analysed at Aquatreat Solutions Limited. Qualitative data were recorded using voice recorder and notebooks and analysed through content analysis method. About 87% of the students indicated that they have been affected by waterborne diseases that have affected their education while 13% disagreed. The students (32.9%) considered tap water to be the most common drinking water, 24.7% argued that it was rain harvest while 24.1% considered rainwater to be the most common drinking water in the county. Pond and other water sources had 10.1% and 6.7% respectively while 1.5% failed to respond. Tap water was analysed with samples collected from the tap in school before getting into the tank, after getting into the tank and tap water at the treatment point before distribution. Upon treatment, the water at the treatment point met all the KEBS recommendation. The water from the tap before getting into the tank had excess turbidity, colour, total suspended solids, nitrite, and iron. It also had *Entamoeba histolytica*. Water from the tank had an excess of turbidity, colour, total suspended solids, nitrite, and iron. *Entamoeba histolytica*, *Escherichia coli*, and *Shigella dysenteriae* were also present. About 51.2% of the students indicated that the quantity of water affected their education while 47.3% thought otherwise. The students (58.0%) argued that rainy season affects their school attendance negatively while 42.0% indicated otherwise. A Chi-square test was conducted to determine the association between water scarcity and learning among secondary school students in Rachuonyo North Sub-county. The p-value was < 0.001 which is less than 0.05 during the Chi-

square test. This proves that there was no significant difference between the observed values and the theoretical argument on the effect of water scarcity on secondary school students in Rachuonyo North Sub-county. It is recommended that the government should invest more in the distribution of tap water and build the capacity of students on how to mitigate the impacts of water scarcity. Schools should also invest in tap water and harvesting of rainwater so as to access cleaner water and a policy should be put in place that ensures that students have adequate and free drinking water while in school. Again, the water tanks used to store water in schools should be cleaned regularly. A similar study needs to be carried on the primary schools and determine if water scarcity affect student performance in the area. A water analysis should also be conducted on all water sources in the area including boreholes, weirs, and springs.

FACTORS INFLUENCING KNOWLEDGE LEVELS OF CLIMATE VARIABILITY ADAPTATION STRATEGIES AMONG SMALL-SCALE FARMERS IN KITUI COUNTY, KENYA

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Climate variability poses as a major challenge for small holder rain fed agricultural production with a relatively greater impact on small scale farmers worldwide. Despite this, adoption of climate variability coping strategies remain low. Strategies such as water harvesting techniques through use of terraces, Zai pits, drip irrigation, agro-forestry and conservation tillage continue to be fronted as possible climate adaptation options for small holder farmers. However, research into levels of knowledge of these strategies among farmers is relatively scarce. Kitui County, Kenya, particularly remains relatively less focused on climate change and farmer understanding of climate variability response strategies. This study sought to assess variability of climatic factors of rainfall and temperature in Kitui County from 1980-2012 and assess influence of household socio-economic factors on farmer's level of knowledge on climate variability adaptation techniques. The study also investigated the challenges faced by farmers in applying climate variability adaptation techniques. To achieve the objectives outlined above, a survey design was employed and a sample of 387 respondents selected. Majority of the respondents were small scale farmers in Kitui County. Questionnaires were designed and administered to the selected subjects to solicit data on climate adaptation techniques and socioeconomic factors influencing farmers' knowledge levels on climate variability adaptation techniques. Rainfall and temperature data were collected from the Kenya Meteorological department (number 9137089) and analysed to establish variation patterns in temperature and rainfall parameters. Data were statistically analysed using Statistical Package for Social Sciences and results discussed and presented in tables, charts and graphs. The study found that climate has over the years varied with temperatures having increased by 2°C in the 1980s and early 1990s. The rainfall has reduced to less than 600mm with the lowest rainfall (226mm) being recorded in 2006. This implies that the Kitui County is increasingly becoming drier and hotter. These findings were further ascertained by majority of the respondents (91.1%) who agreed that rainfall

patterns had varied in the last ten years and that were warmer significantly over the past ten years. The study however found that there were no significant differences on how local farmers adapted to the changes in climate with regard to income, age and even ownership of land. An exception however, was on education levels with the study finding significant statistical differences ($p < 0.005$) on how farmers with different levels of education adapted to climatic variability and change. Highly educated farmers adapted more coping strategies than those who had very little education. The study noted lack of information on how to mitigate against effects of climatic change, lack of good equipment, high cost of adopting some strategies among others pose serious challenges that hinder adoption of climate coping strategies. To enable farmers effectively mitigate and adapt to the adverse effects of change of climate, the study recommends that farmers be sensitised and informed on climatic change and coping mechanisms through agricultural extension services and capacity building programmes.

EFFECTS OF STOCKING DENSITY ON GROWTH PERFORMANCE OF NILE TILAPIA (*Oreochromis niloticus*) IN CAGE-CUM-POND-INTEGRATED SYSTEM IN MWEA, KIRINYAGA COUNTY, KENYA

Ann Nyaguthii Kimotho-M.ENV

Department: Environmental Science

Supervisors: Dr. Esther Kitur

Prof. Charles C. Ngugi

Due to limiting space and the need to reduce waste accumulating in the ponds, a strategy that entails stocking fish in cages and ponds referred to as cage-cum-pond integrated system is now recommended. However, fish growth, water quality and socio-economic benefits of the system may be constrained by the critical standing crop based on the number of stocked fish in cages. The aim of the study was to determine the effects of initial stocking density on growth performance, water quality and socio-economic outcomes of Nile tilapia (*Oreochromis niloticus*) culture in a cage-cum-pond-integrated system. The stocking densities were 25 fish/m³, 50 fish/m³ and 75 fish/m³. The study was carried out between 2nd March, 2016 and 2nd August 2016. Physico-chemical Parameters (pH, dissolved oxygen (DO) were determined in the field using standardized apparatus, Nitrates and total ammonia nitrate and nitrites levels were determined using the standard laboratory procedures, while a semi-structured questionnaire was used to collect information on the effects of cage-cum-pond integrated system on livelihood of fish farmers in the study area. Analysis within cage, pond water samples was done using One-way ANOVA to find the significant difference ($p < 0.05$). The effects of stocking treatments on growth performance and survival, and feed conversion ratio were analyzed using one-way ANOVA. Results indicate that the fish growth performance in terms of final mean weight, specific growth rate, survival and feed conversion ratio and growth trends significantly ($P < 0.05$) reduced with increasing cage stocking density. The final mean weight, specific growth rate, survival and feed conversion ratio were highest at stocking density of 25 fish/m³ followed by 50 fish/m³ and lowest in fish reared at 75 fish/m³. In this study, stocking fish at 50 fish/m³ posted the best returns above the Total Variable Cost and Total Cost of kshs 517,331 and kshs. 348,331 respectively compared to 75 fish/m³ and 25 fish/m³. Water quality parameters analyzed were significantly affected by stocking density ($P < 0.05$). The concentration of dissolved oxygen was higher in cages at 6.1 mg/l than in the ponds at 5.6 mg/l while total ammonia

nitrogen was higher in ponds at 1.12±0.23 than cages at 0.55±0.19. There was significant ($P < 0.05$) reduction in dissolved oxygen in pond and cages with increasing stocking density. pH did not show significant ($P > 0.05$) variation in cages but significantly ($P < 0.05$) increased in pond with increasing stocking density. The concentration of total ammonia nitrogen and nitrates increased significantly $P < 0.05$ with increasing stocking density of fish in cages and in the open pond. The enterprise budget showed that the highest yield, net returns above total variable cost and total cost was Kshs.19,745,932 and Kshs. 17,663,932 respectively occurred among farmers practicing cage-cum-pond integration system as compared to farmers practicing pond culture alone and cage culture alone posted. It is concluded that the best stocking density was 50 fish/m³, water quality was within the tolerable range and that farmers adopting the cage-cum-pond integrated system were operating more sustainably than either pond culture alone or cage culture alone.

IMPACTS OF HUMAN ACTIVITIES AND THE CONSERVATION STATUS OF KARIMA HILL FOREST, NYERI COUNTY, KENYA

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ABSTRACT

All over the world, forests are being over exploited; despite numerous attempts to conserve them. Forests remain one of Africa's most undervalued resources and so long as the planners and policy makers continually disregard the benefit, forests will continue being degraded by human activities and lost. Consequently, forest cover in Kenya has reduced drastically over recent past decades and only 6.99% of the country is under forest cover. The reduction in the Kenya's Forest cover is a sign of missing links between conservation of forests and the prevailing human forest uses. This study looked into human activities and how they impact on the conservation of Karima Hill Forest in Nyeri South sub-county of Nyeri County. The main objective of the study was to explore the impacts of human activities carried out in Karima Hill Forest and how they affect its conservation. A descriptive survey design was used in the study on a sample size of 361 respondents and 6 key informants from Iriaini tea factory, the sub county council of Othaya and the Kenya Forest Service. Stratified random sampling was applied in the identification of the local community respondents while purposive sampling was used to select the key informants. Data was collected using interview schedules for the key informants while questionnaires were used for the respondents in the local community. The Quantitative data was coded and analysed using Statistical Package for Social Sciences (SPSS). Qualitative data was analysed using qualitative techniques which established the categories, themes, the relationships as well as conclusions of study objectives. Results of the study identified commercial activities (59%), domestic activities (32%) and social activities (9%) as the major activities that negatively affect Karima Hill Forest respectively. The findings realized both positive and negative effects of human activities on conservation of Karima Hill Forest. However, the negative effects outweigh the positive effects hence confirming existence of challenges affecting conservation of Karima Hill Forest. These negative impacts are fuelled by factors

such as; poor implementation of forest policies (43.3%), ease of forest accessibility by forest users (4.7%), conflicts among forest stakeholders (11.4%), high population growth rate (6.4%) among others. The study recommended the need to create awareness on the effects of human activities on the ecosystem of Karima Forest Hill among the stakeholders, training for the managers on effective and sustainable forest resource management and constant monitoring to ensure that the conservation measures applied are effective.

SCHOOL OF HUMANITIES

EVALUATING THE DETERMINANTS FOR THE ADOPTION OF TISSUE CULTURE BANANA TECHNOLOGY BY SMALL-SCALE FARMERS IN NYAMIRA COUNTY, KENYA

Evans Motanya Nyang'au-M.A.

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Dr. Francis O. Onsongo

To address food insecurity in Kenya, there has been a significant intensification of agriculture to feed the growing population. One of the technologies used is tissue culture (TC) banana technology. However, in spite of the exertions done to disseminate this technology to small-scale farmers, research studies report low adoption rates of the technology. Hence, this study seeks to establish the determinants of the adoption of tissue culture banana technology. The study was carried out in Nyamira North sub-County. The study objectives were; to examine socio-economic characteristics determining the adoption of tissue culture banana technology, to determine benefits accrued from the adoption of tissue culture bananas and to identify constraints farmers face in the adoption of TC banana technology. The study adopted a descriptive study design, and data collection was mainly done through the use of questionnaires, interview schedules and direct observation. Secondary data were collected from published materials, journals and magazines. Qualitative data were analyzed using simple descriptive statistics while quantitative data were cleaned, coded and analyzed using the Statistical Package for Social Sciences (SPSS). Regression analysis was finally used to determine the relationship between variables. Findings indicated that farmers' socio-economic characteristics such as age, gender, marital status, level of education, farming experience, land size and access to credit affect adoption of banana tissue culture technology. They further revealed that sources of information affect farmers' adoption of improved banana farming practices. Farmers identified diverse challenges like lack of capital, TC plantlets, poor extension services and poor infrastructure affect farmers in the adoption of TC bananas. Intervention measures were suggested on how the problems could be addressed to positively enhance adoption of TC bananas. The study recommends formation of savings and credit cooperatives, awareness creation among farmers, improving road network in rural areas, establishing one nursery of TC bananas in each ward and subsidizing the costs of TC banana plantlets. The research findings are expected to be useful to various stakeholders boost the production of bananas and enhance food security.

CHARACTER FORMATION AND TERRORISM IN ELNATHAN JOHN'S BORN ON A TUESDAY AND OBINNA UDENWE'S SATANS AND SHAITANS

Dedan Onyango-M.A.

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Dr. Oscar Macharia Maina

This study explores how character formation has been deployed in Elnathan John's *Born on a Tuesday* and Obinna Udenwe's *Satans and Shaitans* in the advancement of their discourse on the different propensities for terrorism in literary studies. The study is premised on the knowledge that character formation is an essential literary element, especially as far as delivering the ideas of a literary writer is concerned. The research is grounded on three objectives namely; to investigate the deployment of character formation as a literary technique used to present the different propensities for terrorism, secondly, to explore how the characters have been presented in the texts to illuminate terrorism, and lastly to interrogate how characterization has been used to reveal the sub-conscious undertones of religious extremism in the two texts. The rationale for this study is based on the wide gap of knowledge in regards to character formation and its relationship with terrorism. The study is delimited to two Nigerian texts, *Born on a Tuesday* and *Satans and Shaitans*, which are both rich in form and content and fall in the basket of Africa's contemporary writing on polemical issues. The study adopts the psychoanalytic literary theory, which gives insights into the basic approaches to character formation and revelation of the sub-conscious undertones of religious extremism in literary texts. The study has also employed the New Historicism literary theory as propounded by Stephen Jay Greenblatt, which helps us gain insight on the relationship between the different power structures that shape the various characters under study and the historical epochs of the two texts were crafted in. The study adopted a qualitative research approach. It also utilized library research, which involved textual analysis of the primary texts and the use of secondary data. Purposive sampling was also done to select characters seen to be rich in the aspects named above for the analysis. The study observes that there are several propensities for terrorism that result in acts of terrorism being witnessed in the two texts. Among them, included the notion of religious extremism, the ramifications of globalization, occultism, among others. It was also discovered that the presentation of characters was achieved through contrastive technique. The characters were presented as either belonging to the moderate wing as well as the extremist side of the two antagonistic groups in the texts. Through the contrastive presentation of characters, the aspects of religious extremism were exposed. Furthermore, this study also found out that, through characterization, the sub-conscious undertones of religious extremism, such as undertones of extreme thoughts, verbalizations, and actions, are the main contributors to the terrorism acts witnessed in the two texts. This study concludes that character formation is an essential component in any investigation that looks into the relationship between literature and terrorism and that it functions to aesthetically question and ideologically attempts to explain the interconnectedness between literature and terrorism extrications. The study recommends that future studies may interrogate the narrative and structural choices employed by the two authors. Moreover, other literary theories can be used to widen the scope of criticism of the two texts.

A CRITICAL ANALYSIS OF FEMALE PROTAGONISTS AS ROLE MODELS IN SELECTED WORKS OF CYNTHIA HUNTER

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Dr. Macharia Mwangi

This study focuses on a critical analysis of the representation of female protagonists as possible role models to readers of the selected texts of Cynthia Hunter: Anna the Air Hostess, Truphena the Student Nurse and Pamela the Probation Officer. The study establishes the character traits that may positively impact young adults' perception and development of self. It explores the narrative techniques that the author uses to communicate her vision and positive values that depict the female protagonists in the novels. The study employs Narratology as a theoretical framework. The theory helps the researcher to analyse and interpret the three texts in providing description of the narrative in literary form and content. The researcher employs a qualitative research methodology anchored on close textual reading of the selected texts which are the primary source of data collection and analysis. The critical analysis of the three primary texts involves collection, organization, interpretation and explanation of information gathered. Secondary data is obtained from books, theses, dissertations, essays, critical works, internet, and other library materials to enhance and enrich the work. The study findings established discovery of a new identity of the protagonists from the old social construction through education. The objectives of the study are achieved through extensive reading and analysis of the three texts. The study establishes that through education the protagonists find a new identity from the old social construction. Finally, the study shows that narrative techniques are vital instruments that may inform, influence and (re-)shape the identities of protagonists turning them into role models in the formation of value systems for young adult. Narratology theory serves as a tool for investigating and analysing Hunter's literary works. The study found out that, portraying young protagonists as role models may help in shaping new social identities. The study concludes that positive depiction of female protagonists can be a transformative tool relevant for readers' coming of age in Kenya. In other words, giving value to the education of the girl child in Young Adult Literature serves as a model that will help the youths in Kenya in the 21st Century and shape their experiences and worldview.

IMPACT OF POPULATION PRESSURE ON ENVIRONMENTAL DEGRADATION IN KATAGUM REGION, BAUCHI STATE, NIGERIA

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Dr. Francis O. Onsongo

There exist a significant relationship between population and the environment as the two affect each other under certain circumstances causing effects both positive and negative. In this case, the study examines the impact of population pressure on environmental degradation in Katagum Region as there has been a high rate of increase in population as well as a deteriorating environment. The study assesses the impact of population pressure on environmental degradation, investigates the method of coping with the effect of population pressure on the environment and measures employed in reducing population pressure and environmental degradation in Katagum region. Primary data generated through Interview Schedules, Questionnaires, Direct Observations and Focus Group Discussion. Similarly, secondary data was used to obtain from journals, library, books and the internet. These data used in developing literature complement the primary data. The data were analyzed using the Chi-square test, and tables and charts used in presenting results. The results in assessing the impacts of population pressure include deforestation, migration, pollution, soil erosion, and so on. The Chi-Square result showed a connection between population pressure and environmental degradation in the Region. Also, community methods of coping with population pressure influenced by religion and cultural background of communities in the Region. The findings show the methods used in reducing the impact of population pressure on environmental degradation in Katagum Region are a delay in marriage, family planning, public awareness creation, free medication and also government/community intervention in the Region. The significance of this study will help the community and Government to know about assessing the impact of population growth on the environment, and methods to be used in coping with the population pressure and also ways in reducing population growth to minimize stress on the situation in Katagum Region. The population considered valuable resources in the development and, it is also a significant source of environmental degradation when it exceeds the carrying capacity of the support system in the Region. The study recommended that the Government should check population pressure through; birth control pills, encourage trees planting by individual household and also give some incentives to people that participate with this desertification would reduce, soil erosion can be control, Government should allocate more funds to the people at a zero interest loan to boost economic activities in the area in order to reduce the rate of poverty, crime and conflict and pollution in the Katagum Region and with this, sustainable development will be achieve. Government should create awareness among the population on methods to use in copying with Population Growth, population movements, and their impact on the natural environment and the built environment in Katagum Region through: use of family planning method, improve economic status of women, alternative source of energy and finally, the community and Government should adopt strategies to provide and promote effective family planning services, sex education in school curriculums, free education for women, jobs for women in terms of those that finished school and those that are permanent house wives, this will reduce the effect of population pressure on environmental degradation in Katagum Region.

THE DRIVERS OF FERTILITY DECLINE AMONG WOMEN IN MURANG'A COUNTY, KENYA

Michael Njihia Ndome-M.A

Department: Geography

Supervisors: Prof. Leonard. M. Kisovi

Dr. Francis O. Onsongo,

Declines in world's fertility over the last three decades have been termed by scholars and demographers as the most notable demographic change. Fertility stall has been in Kenya coming after decades of very high levels of fertility. Inconsistent with the national demographics, Murang'a County recorded an abnormal age sex pyramid during the 2009 national census. This thesis focuses on the proximate determinants of Total Fertility Rate (TFR) in Murang'a County. This thesis presents an empirical investigation of the drivers of fertility decline in Murang'a County by determination of how sexual exposure, contraceptive use, postpartum infecundability and abortion among women in Murang'a County have impacted on the Total Fertility Rate. The study was guided by the revised Bongaarts (2015) proximate determinants Model (PDM). The study made use of descriptive survey design and both qualitative and quantitative approaches were used. It was carried out in Murang'a County and targeted women in the reproductive age. In selecting participants, the study used NASSEP V – a selection framework developed by the National Sample Survey and Evaluation Program V and previously utilized by KDHS (2009). Data from primary and secondary sources were used in the study. While primary data originated from directly interacting with the participants in the field through focus group discussions key informants interview and questionnaires, secondary data was obtained from critical textual analysis of books, journals, newspapers, reports, dissertations and thesis. Analysis of qualitative data was done by creating themes around the study objectives. Quantitative data was analysed in terms of percentages, means and percentiles which provided indices for Bongaarts (2015) proximate determinants model. Presentation of analysed data was by bar graphs, histograms and pie charts followed by brief explanations. In the findings the study presents the decline in the T.F.R on Murang'a County to be 25.17% as a result of sexual exposure, 24.2% as a result of contraceptive use, 11.1% as a result of postpartum infecundability and 3.2% as a result of incidence of abortion. The study presents recommendations for policies that demystify the above indices among them tightening of laws that govern the sale and use of legal brew, curbing juvenile sex and involvement of men in fertility issues. Findings from this study will be helpful to the stakeholders of the current demographic and fertility concerns as it will act as a stimulus and force in the formulation, execution and monitoring of demographic policies not only in Kenya but also globally.

CULTURAL EXPRESSIONS OF MASCULINITIES AND THEIR EFFECTS ON EDUCATION: A CASE OF MARALAL MIXED-DAY SECONDARY SCHOOL, SAMBURU COUNTY; KENYA

Rachel Wairimu Njuguna-M.A.

Department: Sociology, Gender and Development Studies

Supervisors: Dr. Leah Wanjam

Dr. Pacificah Okemwa

This study examined the cultural expressions of masculinities and their effects on education processes in Maralal Mixed-Day Secondary School in Samburu County. The study was based on the premise that despite the legal provisions and efforts to address negative forms of culture that affect education processes, particularly for boys, negative effects of cultural expressions are still prevalent in schools today. Cognizant of these effects in the classroom setting, this study therefore, was based on the objectives to (1) describe the cultural practices associated with the making of men among the Samburu

and Turkana communities (2) establish the effects of the positive and negative cultural expressions of Turkana and Samburu masculinities on educational processes in Maralal Mixed-Day Secondary School (3) identify the differences in participation in the educational processes among the Turkana and Samburu boys in Maralal Mixed-Day Secondary School (4) suggest strategies that address the negative expressions of masculinities and enhance the positive expressions of masculinities to improve the educational processes. Connell's theory of masculinity guided the study. The study targeted teachers and students in Maralal Mixed-Day Secondary School. Education officials were also sampled. Non-probability sampling methods, that is, purposive sampling was employed to sample 30% of the school's population. Students, teachers and educational officials served as key informants. Primary data were collected through semi-structured questionnaires, interview guides and observation checklists. Secondary data were obtained through library research. Analysis of quantitative data was done using the Statistical Package for Social Sciences (SPSS) Version 17.0 and the findings presented in tables, graphs and figures. Qualitative data was qualitatively analyzed using content analysis method. The findings were presented in form of verbatim and narratives. The research found that cultural expressions of masculinities affect educational processes both positively and negatively. 92.9% of the respondents reported that they had gone through various cultural practices that transformed them into men and agreed that these practices make them express different forms of masculinities which affect their educational processes. The results further revealed a significant disparity in the participation in educational processes between the Turkana and Samburu boys. These were influenced by several variables such as different cultural processes that initiate them to manhood. Moreover, the findings also demonstrated that cultural expressions of masculinities could either promote or subdue educational processes. To address these challenges, the study recommended attention to this issue in policy making, which is a critical strategic starting point if the effects of cultural expressions of masculinities on educational processes are to be addressed. Positive expressions of masculinities needed to be enhanced to improve the educational processes.

NATIVISATION OF KISWAHILI LOANWORDS INTO KIPSIGIS: AN OPTIMALITY THEORY APPROACH

Philemon Kirui-M.A

Department: English and Linguistics

Supervisors: Dr. Gerry Ayieko

Dr. Hilda Kebeya

This study focuses on nativisation of loanwords from Kiswahili language to Kipsigis dialect using Optimality Theory. The objectives of this study included the following; to describe the process of resyllabification of Kipsigis loanwords, to analyse the phonological adjustments and adaptations of Kipsigis loanwords and to account for nativised loanwords in Kipsigis using Optimality Theory. These objectives were achieved when the following research questions were answered; a) How are Kipsigis loanwords re-syllabified? b) What are the phonological adjustments that Kiswahili words undergo when adapted to Kipsigis? c) How does OT account for nativisation of loanwords into Kipsigis? This dissertation is restricted to Kiswahili loanwords into Kipsigis Dialect and therefore no input from other languages was considered. The study also employs a theoretical approach where the phenomenon under study (i.e.

borrowing) is described accordingly. The methods of data collection used include questionnaires, interview schedule and pictures of items likely to bear borrowed words. The data collected was finally analysed using Optimality Theory. The study found out that Kipsigis language has both vowel and consonant structures and that the language is both CV and CVC structured. The study also highlights various phonological processes involved in nativisation of loanwords. These processes are categorized into three; re-syllabification of loanwords, vowel adaptation processes and consonant adaptation processes. The study shows that the optimal candidate is the one to be a nativised loanword that the Recipient Language adapts to its structure. The study recommends that further studies should be conducted on morphological, semantic and pragmatic effects of loanwords from Kiswahili to Kipsigis.

AGRICULTURAL TRANSFORMATION IN NYAMIRA COUNTY, KENYA; 1945-2002

Isaac Motanya-M.A.

Department: History, Archeology and Political Studies

Supervisors: Prof. Mildred Ndeda

Dr. Felix Kiruthu

The study focused on agricultural transformation in Nyamira County between 1945 and 2002. The study objectives included process of agricultural transformation and policies during the onset of the Second World War, drivers of agricultural transformation in the County since 1945. The study also examined the social-economic effects of agricultural transformation between 1979 and 2002. The year 1945 was important to the study because after the Second World War, for the first time in history there was a deliberate attempt by the colonial government to resuscitate agriculture following negative socio-economic effects of the war. Therefore, it marked a watershed and provided basic historical background information on agricultural development in Kenya and on the topic of study. The research ended in the year 2002, when Kenya witnessed the lowest level of economic development characterized by poor performance of the agricultural sector. The study was guided by one, articulation of modes of production theory which explain that two or more modes of production emerge to co-exist. The two combined to form a mixed economy which was exploitative in nature particularly to African farmers. The other theory used was dependency and underdevelopment which elucidate that resources flow from the 'periphery' the poor and underdeveloped states to a 'core' of wealth states, enriching the latter at the expense of the former. Here, the poor states were improvised by the rich as their economy was integrated into the world system. The research adopted a descriptive design and historical approach because it sought to probe the experiences of peasants in the agricultural sector in the area of study. The research used primary sources of data which included use of archival and oral evidence. The study also marshalled secondary materials in libraries and internet sources. The study population included the five sub-counties of the County and findings were analyzed using both quantitative and qualitative methods. Some of the key findings of the study included the confirmation that agricultural changes have been taking place from the advent of European colonial economy. However, it was also found that there were no special incentive packages to motivate farmers to engage in meaningful agriculture. Weak producer cooperatives worsened the situation on the ground because of mismanagement and corruption among other factors. Notwithstanding that, the sector created some meaningful socio-

economic impacts in the society. The findings will be of great value to social and economic historians in understanding trends, drivers, and socio-economic impacts of agricultural transformation in the County.

FORMANT CHARACTERISTICS OF THE SOUTHERN GĪKŪYŪ DIALECT VOWELS

Evans Konye Kinyanjui-M.A.

Department Literature, Linguistics and Foreign Languages

Supervisors: Dr Nandelenga Henry Simiyu

Dr Itumo, Joshua Mulinge

The current study is an acoustic analysis of vowels of southern Gĩkũyũ dialect. The study sought to establish the formant values of vowels which were plotted on the acoustic vowel space. The acoustic vowel space was compared with the vowel space determined by perceptual based studies of Gĩkũyũ vowels. In doing so, this study described the vowel segments of southern Gĩkũyũ dialect based on the formant values. In addition, it accounted for the distribution of Gĩkũyũ vowels within the vowel space and described how Gĩkũyũ acoustic vowel space compared with the auditory perception based vowel space. The study used the Source Filter Theory to account for the production of the vowels and the Dispersion Theory to describe the distribution of vowel sounds in the acoustic vowel space. 21 Gĩkũyũ male speakers were audio recorded as they read word tokens with vowel sounds. The vowel sounds were in carrier consonant-vowel structure CVCV in the environment between voiceless sounds /h/ and /t, k/. These sound tokens were analysed using Praat software to extract the formant values of the vowel tokens. The Statistical Package for Social Sciences (SPSS) was used for quantitative data analysis. The findings showed that these Gĩkũyũ vowels maintained a minimal distance to make them distinctively and perceptually contrastive. In addition, among the back vowels, the vowel sound /u/ was the most back, the vowel /o/ was slightly advanced to the centre. The lack of the central vowels in the acoustic space, as observed, was because of the need for the vowel sounds to be maximally and perceptually contrastive.

THE DRIVERS OF FERTILITY DECLINE AMONG WOMEN IN MURANG'A COUNTY, KENYA

Michael Njihia Ndome-M.A.

Department: Geography

Supervisors: Prof. Leonard. M. Kisovi

Dr. Francis O. Onsongo,

Declines in world's fertility over the last three decades have been termed by scholars and demographers as the most notable demographic change. Fertility stall has been in Kenya coming after decades of very high levels of fertility. Inconsistent with the national demographics, Murang'a County recorded an abnormal age sex pyramid during the 2009 national census. This thesis focuses on the proximate determinants of Total Fertility Rate (TFR) in Murang'a County. This thesis presents an empirical investigation of the drivers of fertility decline in Murang'a County by determination of

how sexual exposure, contraceptive use, postpartum infecundability and abortion among women in Murang'a County have impacted on the Total Fertility Rate. The study was guided by the revised Bongaarts (2015) proximate determinants Model (PDM). The study made use of descriptive survey design and both qualitative and quantitative approaches were used. It was carried out in Murang'a County and targeted women in the reproductive age. In selecting participants, the study used NASSEP V – a selection framework developed by the National Sample Survey and Evaluation Program V and previously utilized by KDHS (2009). Data from primary and secondary sources were used in the study. While primary data originated from directly interacting with the participants in the field through focus group discussions key informants interview and questionnaires, secondary data was obtained from critical textual analysis of books, journals, newspapers, reports, dissertations and thesis. Analysis of qualitative data was done by creating themes around the study objectives. Quantitative data was analysed in terms of percentages, means and percentiles which provided indices for Bongaarts (2015) proximate determinants model. Presentation of analysed data was by bar graphs, histograms and pie charts followed by brief explanations. In the findings the study presents the decline in the T.F.R on Murang'a County to be 25.17% as a result of sexual exposure, 24.2% as a result of contraceptive use, 11.1% as a result of postpartum infecundability and 3.2% as a result of incidence of abortion. The study presents recommendations for policies that demystify the above indices among them tightening of laws that govern the sale and use of legal brew, curbing juvenile sex and involvement of men in fertility issues. Findings from this study will be helpful to the stakeholders of the current demographic and fertility concerns as it will act as a stimulus and force in the formulation, execution and monitoring of demographic policies not only in Kenya but also globally.

EFFECTS OF RAINFALL VARIABILITY AND OTHER NON-CLIMATIC FACTORS ON WHEAT YIELDS AND FARMERS' ADAPTATION STRATEGIES IN NAROK COUNTY, KENYA

Kimamo John Maina-M.A

Department: Geography

Supervisors: Dr. George L. Makokha

Dr. Kennedy Obiero

In recent decades, variability in climate has been experienced globally. The rainfall patterns in Kenya are becoming unpredictable just like other regions in tropical Africa. Changes in rainfall patterns occur in the onset of long rains and low average amount throughout the year. Droughts in Narok County usually lead to wheat shortages and fluctuations in agricultural production. The current study specifically examined rainfall variation patterns during the growing season (March, April and May) and effects of this variability on wheat yields in Narok County. The study was guided by four objectives: To determine variability of seasonal rainfall characteristics from year 1981 to 2016; to establish effects of these rainfall characteristics on wheat yields; determine non-climatic variables affecting wheat yields and to analyze factors affecting adaptation strategies by wheat farmers. This was done by collecting a 36-year rainfall data and wheat yields per hectare in tones from Kenya Meteorological Department and Narok County

government respectively. A purposive sampling design was used to select wheat farming households in four sub-counties where wheat is grown. Proportionate allocation was used to determine the sample of farmers to be picked in each Sub-County. Random sampling technique was used to pick wheat farmers in this sample. A structured questionnaire was administered to the sampled population to collect data on adaptive strategies employed by the farmers and non-climatic variables in the region. Seventy six percent (76.0%) of the administered questionnaires were fully filled and returned. Variability of rainfall characteristics was analyzed using variability indices. Pearson correlation analyses followed by linear regression were used to determine the degree to which rainfall characteristic predicts wheat yields. The coefficient of multiple determinations for correlation (R^2) was used to explain the percentage of wheat yields explained by rainfall characteristics. The individual R^2 for number of rainy days, amount, cessation and onset was 0.215, 0.205, 0.029 and 0.016 respectively. This showed that the most influential rainfall characteristics on wheat yields are amount and number of rainy days. The results further showed that, while rainfall amount and number of rainy days were significant, deviation on onset and cessation dates had no significant effects on wheat yields ($P > 0.05$). Stepwise regression ($Y = 0.727 + 0.464X_1$) showed that rainfall amount had the highest significant relationship with wheat yields. Pearson correlation analysis and measures of central tendency were used to assess how the non-climatic variables influence the yields. Results showed that non-climatic variables did not have a significant effect on wheat yields where the R^2 for number of agricultural officers, wheat price and cost of CAN, DAP and NPK was 0.132, 0.007, 0.116, 0.001 and 0.002 respectively. A SWOT analysis was used to explain adaptation strategies by farmers. The study findings will to benefit policy makers in the field of Agriculture, academicians and other stakeholders' sector by making decisions that will improve adaptation measures by wheat farmers.

RELATIONS BETWEEN THE ITALIANS AND AFRICAN COMMUNITIES IN MALINDI, KILIFI COUNTY, KENYA, 1963-2007

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Scholarly works about the relations of the African societies in Kenya and other nations across the world have been done and documented by various scholars across the world. The Italian community has been in Kenya for decades and have been residing particularly within Malindi region of Kilifi County at the Kenyan coast. However, little scholarly attention has been given to try and understand the Afro-Italian relations in reference to their socio-political interactions and economic implications of these interactions in Kilifi County. It is against this background that this study examines the relations between the Italians and African communities in Malindi region of Kilifi County. The study sets out to achieve three objectives. First, to examine the social, economic and political organization of the people of Malindi before the settlement of the Italians in 1963. Secondly, it investigates the social-cultural and economic relations between the Africans and Italians in Malindi during the early independent period from 1963 to 1990. Finally, it analyzes the Afro-Italian social-cultural and economic relations in Malindi

during the post-cold war period from 1990-2007. The study was carried out in Malindi Sub-County of Kilifi County. The study covers the period 1963– 2007. This study is significant since it provides new knowledge on the dynamics of the socio-cultural and economic relations between the Africans and the Italians to enhance future interracial relations and cohesion. Theoretically, the study uses two variants of the post-colonial theory, that is, Plurality and Hybridity to interrogate the relations between the Italians and African communities in Malindi region of Kilifi County. In this study, a qualitative research design and historical approach was used. Purposive sampling was also adopted while both oral and secondary data were collected and corroborated with archival sources for authenticity and validity.

ASSESSMENT OF THE SPREAD AND SOCIAL EFFECTS OF HIV AND AIDS AMONG MUSLIMS OF KIBERA INFORMAL SETTLEMENT, NAIROBI CITY COUNTY-KENYA

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Dr. Josephine Gitome

The title of the study is assessment of the spread and social effects of HIV (Human Immunodeficiency Virus) and AIDS (Acquired Immune Deficiency Syndrome) among Muslims of Kibera Sub-county, Nairobi County, Kenya, authored by Dinah Nyangweso Omondi. HIV and AIDS is a social- health pandemic that has entered its third decade with an estimated 36.7 million people living with HIV and AIDS (PLWHA) and 25 million AIDS- related deaths globally. Islam encourages fidelity by prohibiting some practices in an effort of up-bringing a morally upright society. Despite the Islamic proscriptions, some Muslims engage in the prohibited practices thus, causing a paradox between the teachings and the individual behavior since they are sometimes in conflict, hence, the need for this study. The general objective of the study is to assess the spread and social effects of HIV and AIDS among Kibera Muslims and how they mitigate them. The specific objectives are to examine the spread of HIV among Muslims of Kibera, discuss the influence of Islamic practices on the spread of HIV and AIDS, discuss the social effects of HIV and AIDS, and assess how Islam mitigates the spread and social effects of HIV and AIDS. The study employs a descriptive design and both quantitative and qualitative research methods are used to collect and analyze data. The independent variable for the study is the HIV risk behaviors, while the dependent variable was the HIV prevalence. The intervening variables are the knowledge, skills, beliefs, attitudes. The study is conducted in Kibera Sub- County, Nairobi County since Nairobi is one of the Counties well represented by all religions found in Kenya Islam included. Kibera Sub- County was suitable for the study because it has a larger Muslim population and a high HIV prevalence of 20%. The target population for the study is Muslims living with HIV and AIDS (MLWHA). Purposive, convenience and random samplings techniques were used to get the sample population. The data is collected through observation, questionnaires and focus group discussions. The findings are analyzed and presented manually using the narrative form, frequency tables and percentages. According to the study findings, Muslims of Kibera are among those infected by HIV and AIDS since the ratio of infected Muslims as compared to non-Muslims is 1:30. Muslim practices (prohibited and enhanced) can either mitigate or enhance the spread. Some of the HIV and AIDS social effects include among others; stigma, discrimination, orphans and

poverty. To mitigate the HIV and AIDS social effects, Muslims make charitable contributions which are used to assist the less privileged in the society such as MLWHA.

SOCIO – ECONOMIC AND LEGAL ENVIRONMENT OF THE GAY COMMUNITY IN KENYA: THE CASE OF GAY AND LESBIAN COALITION OF KENYA, NAIROBI CITY COUNTY

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The purpose of this study was to identify the socio – economic and legal challenges facing the LGBTs in Kenya. The research took place at the Gay and Lesbian Coalition of Kenya (GALCK) in Nairobi County which was used as a sampling frame. The organisation is located south – west of Mater Hospital. GALCK was chosen as a case study because of its position as an umbrella organization that consists of LGBTs and its high number of registered LGBT individuals who hail from different parts of the Country. The objectives of the study included: to identify the social, economic, legal environment of the LGBT community; to document past studies on the causes of LGBT identity and to identify effective strategies that can be used to address the social, economic and legal challenges facing the Lesbian Gay and Bisexual and Transgender (LGBT) community in Nairobi County. Queer theory was adopted as it was instrumental in the deconstruction of the socially constructed ideology of heterosexuality as being the only form of sexual orientation and in addition in the deconstruction of labels directed at the LGBTs which facilitate in their discrimination. A case study design was used. The study adopted both quantitative and qualitative research. The study targeted 1000 individuals who were both registered and active members of GALCK. Stratified random sampling was applied to generate a sample size of 278 where a total of 142 men and 136 women participated in the study. The study identified the following social challenges facing LGBTs: discrimination, unjust or prejudicial treatment, stereotyping, stigmatization, physical, emotional, sexual and verbal abuse. The economic challenges facing the LGBT community were found to be lack of opportunities, losing jobs, being treated unfairly by employers, their sexual orientation acting as a customer push factor in business, that is, a negative aspect that motivates customers to avoid that business. Vices resulting from lack of employment or finances included: prostitution, drug trafficking and theft. The study found that the lack of recognition and protection in law of LGBTs leave them vulnerable to the violation of their rights, dignity and respect. In addition, law enforcement officials also play a role of abuse and discrimination. This is despite their rightful duty to serve and protect all citizens. The study also found that majority of LGBTs are afraid to report any incidences of violation of their rights to the police due to fear of being arrested and retribution when filing their complaints. Causes of LGBT identity were peer influence, sexual abuse and socialization. Strategies identified to address the LGBT challenges included: awareness creation and sensitization, legal and policy frameworks, providing the or enabling them to undertake income generating activities, health programs and alternatives and guidance and counselling. The study concluded that LGBT issues have failed to be prioritized despite the matter being a development and human rights issue where they have been sidelined for a long period of time by both law and

society. There is a failure by the state to protect LGBTs and the failure of the application of human rights for all as per the Constitution where there is selective application. The study recommends an open discussion on the gay community as a development issue and the recognition of their human rights despite their sexual orientation. It also recommends not only a revision of the legal framework but effective implementation of it for redress of violation of LGBT rights and enhances gender equality.

THE TRIPARTITE PSYCHE AS REFLECTION OF SOCIAL VISION IN SELECTED PLAYS OF FRANCIS IMBUGA

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Dr Macharia Mwangi

This study aims at assessing how Francis Imbuga in *Betrayal in the City*, *Man of Kafira* and *The Successor* employs the tripartite psyche to bring to the fore his social vision. It evaluates whether the psychic states of the lead characters in these fictional societies influence their behaviour, and subsequently whether Imbuga crafts his social vision by exploiting the tripartite psyche. The study is guided by three objectives: First, it examines how the writer uses the lives and deaths of his characters to manifest the tripartite psyche; second, it interrogates how dreams and Freudian slips among the characters are informed by the tripartite psyche and third, it investigates how the writer uses the tripartite psyche in the construction of his characters to express his vision for the society. The study fills the gap in knowledge on the role of the tripartite psyche in literary works. It argues that psychic states of the lead characters in these fictional societies influence their behaviour and that Imbuga uses the tripartite psyche to craft his social vision. To interpret the psychic states of the characters, the study employs psychoanalytic criticism. Specifically, it utilizes the postulations of Sigmund Freud on the unconsciousness, on the interpretation of dreams, on the tripartite psyche, on defence mechanisms and on psychopathology of everyday life; as well as those of Carl Jung on self-archetypes. The study is textual in nature and takes a descriptive qualitative approach. Data was collected from primary texts while the secondary texts aided in the interpretation of the plays. The study established the existence of tripartite psyche in characters' lives and deaths and in their dreams and Freudian slips. It recommends an extensive study of Imbuga's recently published works to reveal the changing post-colonial social vision of a literary writer in Africa.

DISCOURSE FUNCTIONS OF INTERJECTIONS IN KIKAMBA

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The purpose of this Discourse Analysis study was to explain the nature and function of Kikamba language interjections in discourse. Kikamba is a Bantu language and the Kimasaku dialect of the language was the focus of this research study. This survey study used three theories in explaining the nature and function of interjections in Kimasaku dialect of Kikamba language discourses. The Functional Theory of Interjection (Ameka, 1992), the Speech Acts Theory (Austin 1962) and Brinton's (1996) Taxonomy of Discourse Markers were the theories used. Data was collected and analysed using Qualitative research methods. The study used a combination of two research instruments namely; questionnaires and a content analysis guide. These two tools helped in the identification of interjections for analysis from a book- Kikamba Self-Instruction Manual and a questionnaire. Ten respondents sampled out through social network participated in the filling of the questionnaires. There was also a key informant, purposively sampled to assist in the research. There were seven mini dialogues sampled from the book above, for analysis using the content analysis guide. One of the objectives was to describe the various structural forms of the interjections. Findings revealed that structurally, interjections are in the forms of sound, word, phrase, clausal and sentential structure levels. The second objective was to find out the role played by interjections in Kikamba language discourse and the contextual conditions defining their functions in the discourses. The findings revealed that interjections play important roles in discourse such as discourse marking and acting as speech acts. It was concluded that the role that an interjection played in discourse was determined by the context of the interjection use/ appearance. Finally, categories of discourse markers as well as the types of speech acts constituted by the interjections in Kikamba language discourses were compiled. Findings revealed a variety of discourse marker functions performed by the interjections such as; showing subjectivity by expressing a reaction to the preceding discourse/action and turn taking among others. Some interjections served as information carrying units and concluded to be speech acts. Assertive and directive SAs were some of the speech acts functions performed by the interjections. The results of this study demonstrated that interjections are key expressions that serve important functions in conversations by transmitting information and structuring discourse. Thus language users and speech writers ought to be enlightened on the importance of interjections in language use. Curriculum developers in the Language Subjects need to provide fleshy information concerning interjections just the same way other word classes have adequate details. This is because a lot of information details about the structural and functional aspects of this important word class across different languages.

INTERNATIONAL TERRORISM AND ITS IMPLICATIONS ON KENYA'S NATIONAL SECURITY: A CASE OF NAIROBI CITY COUNTY: 1975-2013

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Terrorism has become and remains a major international concern and a high priority security matter of the global community. It contravenes the basic principles of law, order, human rights and physical security. Other than Nigeria in the sub Saharan Africa, Kenya has felt the devastating effects of

international terrorism in the region. Kenya especially suffers crime levels at the upper end of the African scale, which adds to the intrinsic internal insecurity. This study focused on international terrorism and its implications on Kenya's national security, a case of Nairobi City County; 1975-2013. The objectives of this study were to investigate trends of International terrorism in Kenya; 1975 - 2013. Secondly, to interrogate the implications of international terrorism on Kenya's national security and finally, to assess the strategies employed by the Kenyan government to counter international terrorism; 1998-2013. The study applied both primary and secondary data in order to realize the objectives. The theoretical framework was based on the Securitization Theory. It states that political issues are usually construed to be highly security concerns that must be dealt with immediately they are characterized to be dangerous or alarming by the actors who have the mandate to move the issue beyond politics. For instance, terrorism is securitized in Kenya hence the attention given to it is usually of high significance. The study revealed that there have been consistent upward trend in international terror attacks in Kenya between 1975 and 2013. The study also discovered that the Kenyan problem is escalated by the unstable states neighboring it, this is coupled by a number of incompetent and corrupt officials at the security agencies in the country. According to the study, Kenya experienced numerous attacks after the 2011 military incursion in Somalia. The study further revealed that the ability by terrorists to always change tact has led to their prolonged 'survival' despite the government of Kenya deploying all the available machineries at its disposal to fight it. To this end the study argued that these factors have had far reaching implications on Kenya's national security.

DETERMINANTS OF ADOPTION OF DAIRY FARMING TECHNOLOGIES BY RURAL WOMEN IN KAKAMEGA COUNTY, KENYA

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Adoption of dairy farming technologies in dairy production has potential to allow for higher output and lower per unit cost in rural households. Observation had shown extensive dissemination of dairy farming technologies targeting rural women in Kakamega County. This study therefore, sought to identify the existing dairy farming technologies, assessed the status of adoption of dairy farming technologies, established constraints experienced in adoption of dairy farming technologies and finally explored strategies that would enhance effective adoption of dairy farming technologies by rural women of Khwisero, Kakamega County. The research was guided by Innovation Diffusion Theory, Rogers (2003) and Social Cognitive Theory of Gender Development and Differentiation, Bassey & Bandura (1999). A descriptive survey research design was employed with a total of 72 rural women dairy farmers randomly selected to cover Khwisero Sub-County. Data was collected using questionnaires, observation guides, interview schedules and FGDs. Quantitative data was analysed using descriptive statistics in terms of frequencies and percentages, were utilized in presenting the findings. Analysis of qualitative was done using themes and verbatim. The result rated high awareness level on exotic cow breeds, fodder establishment and conservation technologies. A majority rural women adopted to cross- bred cows,

improved variety of nappier grass, mullato grass and sweet potatoe vines. The study found slow status of adoption of dairy farming technologies characterised by norm based socialisation that promoted hierarchy of power within rural households. These norms relegated rural women to limited rights of resource ownership and household decisions making. Other determinants in adoption emerged as straining practical gender needs, costs of external inputs and technologies characteristics. The strategies suggested for the enhancement of the adoption included, County Government and NGOs as implementers synchronizing their efforts and advocating for the enforcement of gender roles in dairy production. In conclusion, rural women's roles and constraints need to be fully understood and reflected in all information packaging. This would be propagated by increasing the inclusivity of women's voice along all the adoption process phases. The study recommend provision of dairy farming technologies programmes directed to all adult members in the household, incorporate gender perspectives in awareness creation, promote laws protecting women's right of ownership to land at grassroots level.

**CAUSES AND EFFECTS OF NEGLECTING ORPHANS BY THEIR MUSLIM GUARDIANS IN CHANGAMWE
CONSTITUENCY, MOMBASA COUNTY.**

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Neglecting orphaned children is one of the major social concerns in Changamwe Constituency, Mombasa County of Kenya. This social phenomenon has negatively impacted on the orphans at the constituency level, the county, the country and the world at large. The orphans are not able to lead their normal lives; their future lives have been jeopardized by the nature of the treatment they got from their guardians. Therefore this study investigated the causes and effects of the neglect of orphans by their Muslim guardians in Changamwe Constituency. Despite the fact that Islam has underlying guidelines of good treatment and caring of orphans in all aspects of life, some guardians still have a tendency of neglecting them. The neglect leaves the orphans to fend for themselves; this is difficult for them. This situation puts them to the risk of suffering materially, physically, psychologically and in all other aspects of life, thus affecting their health in the long run. The study reviewed literature based on four themes which included the Islamic teachings on caring and treatment of orphans, the factors contributing to the neglect of the orphans by their guardians, how the orphans are neglected by their guardians and finally the effects of such neglect by the guardians. The study was guided by The Parenting Skills Attributes Model of Imam al Ghazali that helped in the formation of the Theoretical framework. The study used a descriptive survey method for primary data collection through interviewing and administering of questionnaires. The key target population was the orphaned children, the guardians (the Awliyaa), the Aimmah (the Muslim religious leaders), the Asaatidh (the Muslim religious teachers), the children's charitable institutions or social workers. These were sampled out using the Snowball sampling technique from all the five wards of Changamwe Constituency. The primary data was analyzed on both qualitative and quantitative techniques supported by the descriptive statistical data in the form of tables and

figures. The study found out that the orphans were neglected and the effects of that neglect were pinpointed as ill health, aggressiveness, traumas, early pregnancies and death among others. The study made recommendations to the guardians which if acted on could bring down cases of neglect of orphans. The study also made recommendations for further research on this matter.

TRENDS OF TERRORISM AND THEIR IMPLICATIONS ON KENYA'S NATIONAL SECURITY, 1976 - 2015

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Security is one of the critical issues in the contemporary international political order. One current manifestation of the security threat is terrorism as witnessed in the increased global terror incidences. Kenya has experienced numerous terrorist attacks including but not limited to the 1980 Norfolk hotel bombing, the 1998 USA Embassy bombing and the 2015 Garissa University attacks. As a result, the government instituted counterterrorism measures like the use of military force, legislation, intelligence and diplomacy. However, the threat of terrorism still remains real within the country. This study therefore explored the trends of terrorism and their implications on national security in Kenya from 1976 to 2015. The study sought to achieve the following objectives: to investigate the manifestation of terrorism incidents in Kenya from 1976 to 1990; to examine the emerging global trends of terrorism in the post-Cold War era up to 2015 and to analyze the elements of global terrorism and their implications on national security of Kenya up to 2015. The study employed rational choice and the divine command theory as well as historical research design to explain the trends of terrorism in Kenya. Being a qualitative study, it employed the use of both primary data and secondary data which was organized into themes using content analysis and harmonized using triangulation. The study found out that terrorism is a dynamic phenomenon that develops over time, gradually changing its shape and activities and carried out by various groups having different ideologies. Kenya has thus been targeted by terrorist groups like the Popular Front for the Liberation of Palestine (PFLP), the Al Qaeda, Al-Shabaab and radicalized locals. The motivation of these actors have varied from retaliation for Kenya's close ties with the West (Israeli and USA) to revenge against KDF incursion into Somalia since 2011. These actors have been changing their targets from complex areas with tight security like embassy, hotels owned by foreigners and a school to softer targets like churches, local bars / hotels and transport sectors where the population is mainly military personnel and civilians. The group has also targeted Christians hence increasing religious rifts between Muslims and Christians. They have used different strategies such as indiscriminate shooting, bombing, use of machetes, IEDS among other. Implications of global terrorism in Kenya have thus been manifested in the decline in tourism, increased crime related activities like poaching, proliferation of arms, drug trafficking, increased marginalization of Muslims and increased religious fundamentalism in Kenya. The changing nature of terrorism thus calls for a combined socio-political approach in preventing the threat in future.

USAWIRI WA WAHUSIKA WA KIKE KATIKA DIWANI YA ARUSI YA BULDOZA NA HADITHI NYINGINE (2013) YA SAID AHMED MOHAMED

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Dr. Gakuo J. Kariuki

Utafiti huu ulidhamiria kuchunguza usawiri wa wahusika wa kike katika Diwani ya Arusi ya Buldoza na hadithi nyingine ya Said Ahmed Mohamed. Vilevile utafiti ulinua kuchunguza uhusiano uliopo baina ya kazi hii ya Said Ahmed Mohamed na jamii. Utafiti huu ulitimiza malengo matatu. Kwanza, kubainisha jinsi Said Ahmed Mohamed anavyosawiri ukandamizaji wa wahusika wa kike katika diwani hii ya Arusi ya Buldoza na hadithi nyingine. Pili, kudhihirisha jinsi ambavyo wahusika wa kike wanavyopigania ukombozi wao katika diwani ya Arusi ya Buldoza na hadithi nyingine. Tatu, kuonyesha uhusiano wa kazi hii ya fasihi na jamii. Nadharia iliyoongoza utafiti huu ni kitengo kimoja cha mtazamo wa kike ambayo ni nadharia ya Ufeministi wa Kiafrika. Nadharia hii hujaribu kueleza matatizo yanayowakabili wanawake wa Kiafrika, kiini cha matatizo haya na jinsi wanavyoweza kujiepusha nayo. Nadharia ya pili iliyoongoza utafiti huu ni ya Uhalisia. Data imekusanywa kwa kusoma kwa kina na kudondoa maudhui. Data hiyo ilichanganuliwa na kuwasilishwa kwa mbinu ya kimaelezo kuambatana na malengo, maswali ya utafiti na nadharia zilizoongoza utafiti huu. Uwasilishaji ulifanywa kwa sura tano. Hadithi zilizoambuliwa ni;- Dhuluma Inamojificha, Ukarimu wa Mwishaji, Baku na Bakuzi, Dakika ya Mwisho, Uhuru wa Subira, Mkono wa Salama, Mwanaarusi, Tofauti na Mtoro na Pigo la Tamaa. Mtafiti ametumia njia tatu kuainisha taswira mbalimbali za wanawake katika Diwani hii ya Said Ahmed Mohamed: (i) Kutumia maelezo ya wanawake wenyewe (wanajihisi kama akina nani), (ii) Kutumia maelezo ya mwandishi kuhusu wanawake na (iii) Kutumia maoni ya wahusika wengine katika hadithi. Matokeo ya utafiti yamewalishwa kwa maelezo, picha na chati. Utafiti huu umeona kuwa ukandamizwaji wa wanawake upo katika jamii. Utafiti zaidi unafaa ili kutoa suluhisho la uovu huu wa ukandamizaji wa wanawake. Kuna visa vingi vya ukatili katika ndoa, jambo ambalo laweza kufanyiwa utafiti.

This research set out to investigate the depiction of female characters in the work of art entitled Arusi ya Buldoza na Hadithi Nyingine by Said Ahmed Mohamed. It also set out to investigate the relationship between this work of art and society. To achieve this, the specific objectives of the research were; a} To determine how Said Ahmed Mohamed portrays discrimination against female characters in Arusi ya Buldoza na hadithi nyingine. b} To determine how female characters in Arusi ya Buldoza na hadithi nyingine fight for their independence and emancipation from a male chauvinistic society. c} To establish the relationship between this literary work and society. The first theory that was used to guide this study is African feminism which was expanded by Steady (1981). This theory explains problems facing African women, the root causes, and the solutions to their problems. The second theory that was used to guide this study is the theory of realism. It was used to analyse the relationship between this literary work and the society. The study applied content analysis whereby data was collected by reading chosen books, thesis and journals. Data collected was analysed using descriptive analysis in line with the

objectives and research questions in the library. Data presentation was done by use of written explanations and charts. Findings were presented using descriptive analysis in five chapters. A content analysis of ten stories reveal that women have diverse and ambivalent images. The stories that were analyzed in depth are;- Dhulumu Inamojificha, Ukarimu wa Mwihaji, Baku na Bakuzi, Dakika ya Mwisho, Uhuru wa Subira, Mkono wa Salama, Mwanaarusi, Tofauti, Mtoro na Pigo la Tamaa. The images were derived from the author's point of view about women, other characters' depiction of women and women's personal views. The study concludes that there is need to establish why women are perceived negatively and how the negative image can be changed. The research recommends that more studies be done to get a solution to this problem of gender violence in the society.

GENDER DIFFERENCES IN RECEPTION OF INFORMATION AND ITS EFFECTS ON THE ADOPTION OF IMPROVED SOYBEAN TECHNOLOGIES IN NJOMBE REGION-TANZANIA

Daphrose Nimbona: M.A.

Department: Gender and Development Studies

Supervisors: Dr. Pacificah Okemo

Dr. Muthoni Maina

This study sought to establish gender differences in the reception of information from scaled-up improved legume technologies (SILT), regarding the adoption of improved soybean technologies (ISTs) in Njombe region of Tanzania. The study focused on SILT project implemented in Tanzania by the International Institute of Tropical Agriculture (IITA) in 2015. This study attempted to explain the gendered information reception among the project affected persons and how this affects men and women's decisions to adopt ISTs. The objectives of the study are to explain SILT specific sources of information preferred by men and women and their influence on the adoption; to establish factors influencing the access to SILT sources of information and the adoption of ISTs by men and women; to establish gender related challenges that men and women face in adopting ISTs and to identify strategies to address these challenges. Ex-post facto research design was used to achieve the objectives of this study. Primary data was collected using focus group discussion guide, key informant interview guide and questionnaires. Secondary sources included the SILT documents such as gender strategy, books and articles related to the topic under investigation. The study was guided by Harvard analytical framework. Quantitative data was analyzed using descriptive statistics and qualitative data was analyzed thematically. The results of this study show that women are not accessing at all the information disseminated through SILT sources of information. The study established that the nature of soybean crop (food crop) has influenced the adoption of ISTs by men and women. Financial capacity and availability were found to be positive factors influencing the access to SILT information by men. In addition, it was found that time constraints and workload are the factors that influence negatively the access to SILT information by women. Further, the study established that gender roles and responsibilities impact on women's time use, mobility and access to and control over resources as important challenges for women. Fear of failure, low price of soybean, lack of markets for soybean were the most important challenges for men. Strategies formulated to address those challenges are gender differed.

INDISCIPLINE AND ITS CONSEQUENCES ON STUDENTS BY GENDER IN PUBLIC MIXED DAY SECONDARY SCHOOLS IN KITUI COUNTY, KENYA.

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Dr. Grace Okong'o

The study assessed indiscipline and its consequences on students by gender in public mixed day secondary schools in Kitui County. The following objectives guided the study: to establish the prevalence of cases of indiscipline among students by gender, to examine types of indiscipline among students by gender, to determine causes of indiscipline among students by gender and to identify the best strategies to address student indiscipline by gender among students in public mixed day secondary schools in Kitui County. The study was based on the Learning theories and the theory of Reasoned Action which were used to investigate how students' behaviours change. Descriptive survey was adopted for this study which was conducted in Kitui Central Sub County. The target population was 3929 and it comprised of all students who were in school at the time of study and a few school dropouts, teachers in charge of G and C, principals, PTA members, a few parents of the indisciplined students and the SCDE. Purposive, simple random and snowball sampling techniques were used to yield a sample size of 175 respondents. Two instruments were used to collect data: questionnaires and interview guides. The study collected both quantitative and qualitative data. Quantitative data was analysed using excel to yield descriptive statistics, that is, percentages and frequencies and presented in tables and graphs. Qualitative data was analysed according to themes and was presented in narrative and verbatim quotations. The study established that more male than female students engaged in indiscipline; the numbers of girls and boys involved in each type of indiscipline varied with more boys indulging in drug abuse and more girls in sexual relationships as reported by 85(91.40%) and 80(86.02%) of the respondents respectively, resulting to negative consequences of indiscipline faced at different levels by both boys and girls. The recommendations were that: there should be proper coordination between parents and teachers on the time students leave school for home and home for school and that there should be proper monitoring on what students do in between school and home, men who lure girls into sex should be punished severely and that thorough punishment should be meted on boys who abuse drugs as they spoil other students, parents should avoid giving excess pocket money to students as this is what they use for buying drugs and should also avoid giving students excess free time as this is when they indulge in indiscipline and finally, schools should invite role models, most specifically, successful people in the area of study who have gone through the mixed public day secondary school system to talk to and encourage students. The research suggests that further studies be done public mixed boarding secondary schools in Kitui County in order to draw inferences.

SCHOOL OF EDUCATION

ROLE OF DYSLEXIA ON ENGLISH PERFORMANCE AMONG STANDARD SEVEN LEARNERS IN SELECTED PUBLIC SCHOOLS IN KASARANI SUB COUNTY, NAIROBI COUNTY.

Department: Early Childhood and Special Needs

Supervisors: Dr Jessina Muthee

Prof .Geoffrey Karugu

Dyslexia contributes to poor performance and low participation of a learner in reading. Reading in English is an essential feature of Kenya's education trajectory. The primary purpose of this study was to investigate the role of dyslexia in learners' performances in English, with specific references to standard seven learners in public primary schools the sub county of Kasarani. The decision to study performance in English and not any other language was deemed necessary for besides being a language of instruction in Kenyan schools; it is also a significant pillar of Education. The Dyslexia Functional theory guided this study. The objectives of this research were (i) to investigate the risk of dyslexia among class seven learners with persistently poor performances in English in Kasarani Sub County, (ii) to establish whether there is a significant relationship between the risk of dyslexia and performance in English among standard seven learners within Kasarani Sub County, (iii) to assess whether there is a significant relationship between the frequency at which learners with dyslexia interact with reading materials and their performance in English, (iv) to determine whether there is a significant relationship between the frequency at which learners with dyslexia interact with initiators of reading and their performance in English, and (v) to establish whether the effectiveness of the methods that teachers apply to handle learners with dyslexia is significantly associated with learners' performance in English. The study sample comprised 20 class seven learners (10 boys and ten girls), 20 parents, five teachers of English, and five head teachers sampled from five public primary schools in the country. The study followed a mixed descriptive and correlational design to summarise and to analyse the possible relationships between dyslexia and performance. Non random sampling technique, was used to select the schools for the study. Purposive and subsequent random sampling were employed in sampling of the respondents. Learners risk of dyslexia was assessed using a behavioural checklist and the Dyslexia Screening Test. Data collection from teachers and parents were through the use of questionnaires. Quantitative data were analysed using descriptive statistics; percentages, frequencies, inferential statistics (Pearson correlation tests). All the sampled learners were at risk of dyslexia as measured by both the behavioural checklist indices (mean = 25.5; SD = 2.64) and the DST indices (mean = 27.30; SD = 2.255). There were negative and significant correlations between performance in English and risk of dyslexia as measured by both the behavioural checklist ($r = -0.432$; $p = 0.047$) and the DST ($r = -0.422$; $p = 0.049$). There were also significant and positive associations between performance and learners' rates of interaction with reading materials ($r = 0.438$; $p = 0.036$) frequency of interaction with parents ($r = 0.558$; $r = 0.013$), and the effectiveness of the methods used by teachers ($r = 0.673$; $p = 0.031$). A comparison of the means of the learners' performances showed that the learners who interacted more frequently with their teacher (once a week) had slightly higher average scores (mean = 15.00; SD = 2.646) than those who interacted only once with their teachers (mean = 13.00; SD = 4.630). The primary recommendation then was that informed increased frequency of interaction for learners with initiators of reading accompanied by the application of specific pedagogy for learners at risk of dyslexia.

PARENTAL AND SCHOOL CHARACTERISTICS INFLUENCING CHILDREN'S PARTICIPATION IN PRE-PRIMARY SCHOOL IN MLOLONGO SLUM, MACHAKOS COUNTY, KENYA

Nelly Mwendwa Mpekethu-M.ED

Department: Early Childhood and Special Needs

Supervisors: Dr. Rachel W. Kamau-Kange

Dr. Maureen Mweru,

The aim of this study was to investigate the influence of parental and school characteristics on pre-primary participation. Children who access holistic, quality Early Childhood Development Education services have a better start in learning, and are better prepared for entering and staying in primary school. However, many children are missing out on the stated benefits of early childhood education since a large percentage of the pre-primary children are not attending the early childhood education programmes. The average number of children enrolled in each pre-primary range between 42 and 52%. This means that many children in Kenya do not have access to pre-primary education while those from poor backgrounds of semi-arid, arid and slum areas are less likely to enroll. Therefore, the purpose of this study sought to examine how specific parental and school characteristics influence participation of children in pre-primary schools in Mlolongo Slums. The study was guided by the following objectives; To establish how parental involvement influences children's participation in pre-primary in Mlolongo Slum; To examine how the economic status of parents influences children's participation in pre-primary in Mlolongo Slum; To establish how parents' level of Education influences children's participation in pre-primary in Mlolongo Slum and finally to examine how school characteristics, influence children's participation in pre-primary in Mlolongo Slum. This study adopted the culture of poverty view by Osca Lewis. In addition, the study adopted a descriptive survey design and employed both qualitative and quantitative methods in data collection and analysis. The study employed simple random and purposive sampling to obtain the study sample. The target population in this study was 30 headteachers, 68 pre-primary teachers and 1466 parents in the thirty schools in Mlolongo slum in Athi River Sub-county. From the 30 registered pre-primary schools, simple random sampling was employed to get 9 schools to be included in the sample. The head teachers in the sampled schools were purposively selected for the study. Simple random sampling was used to select 68 pre-primary teachers and 440 of parents who had children in the 9 pre-primary schools. The study used semi-structured questionnaires to obtain data from teachers and head-teachers, and interview schedules for parents. Piloting was carried out in two pre-primary schools within Mlolongo slum. Any ambiguity in the instruments was corrected after piloting. Qualitative data was analyzed using thematic approach. Narrative passages and tables were used to convey the findings of the study. The findings of the study revealed that 84% of school going age children were not attending school daily and therefore did not participate in school activities. This confirms that an alarming large number of pre-primary age children do not participate effectively in pre-primary education which definitely affects their future educational endeavors. The findings revealed that learners were caned which seemed to make them dislike school. It was evident that many parents had little or no knowledge on the importance of pre-primary school education, therefore they may not give their children the necessary support to enable them attend pre-primary school effectively. Harsh treatment from teachers contributed a lot to low participation in most schools. Moreover, the

study established that most of the preschool teachers who taught in the sampled schools were not adequately trained to teach. These undermined their morale in teaching children; therefore the researcher recommends that the Kenyan Government should formulate clear policies to decrease school dropout especially in informal areas.

INFLUENCE OF THE UTILIZATION OF INSTITUTIONAL RESOURCES ON INTERNAL EFFICIENCY OF PUBLIC VOCATIONAL TRAINING CENTERS IN NAIROBI CITY COUNTY, KENYA

Rachel Adhiambo Okinyi-M.ED

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Dr. Samson Ikinya Kariuki

The efficiency of educational institutions is key in the rationalization of resource allocation and use. However, developing countries like Kenya are facing efficiency challenges regarding resource use as well as the flow of students through the school system at various levels of education and programs. The government of Kenya (through county governments) has increased investments in the development of vocational training centers in recent years, but the number of students already enrolled are dropping out, thus rendering most of the allocated resources underutilized. The purpose of this study was to analyze the influence of the utilization of institutional resources on internal efficiency of public vocational training centers in Nairobi city county, Kenya. The study specifically determined the wastage and survival rates in the public vocational training centers in Nairobi city county; determined the influence of the level of utilization of human resources on internal efficiency; established the influence of the level of institutional preparedness for practical skills training on internal efficiency; and then assessed the influence of the adequacy of financial resources on internal efficiency. The study was conducted by the theory of Modern Efficiency Measurement and education production function. Correlational research design was employed in the study. A sample of 45 tutors from six purposively selected vocational training centers were selected for interview. The data was collected using semi-structured questionnaire. Prior to the study, a preliminary survey (pilot study) was carried out to ensure that research instruments employed were reliable. To ensure reliability the instruments were subjected to statistical analysis to determine the Cronbach's alpha. Data was analyzed as per the research questions. The collected quantitative data was analyzed using linear regression to show the relationship, while the qualitative data was analyzed thematically to provide supplementary information to support the quantitative data. The findings reveal internal efficiency rates of between 12% and 47%. The results further indicated a total human resource utilization rate of about 24% and the level of institutional preparedness to practical skills training of 70%. The linear regression indicated a simple correlation of +0.68 between internal efficiency and human resource utilization; a simple correlation of +0.42 between internal efficiency and the level of institutional preparedness to practical skills training; and a simple correlation of +0.34 between internal efficiency and adequacy of financial resources. All these were statistically significant at 0.000, 0.004 and 0.022 respectively. Finally, the results were presented in form of tables and figures

EFFECTS OF CATTLE RUSTLING ON ACCESS AND PARTICIPATION IN PRIMARY EDUCATION IN ALALE DIVISION, WEST POKOT COUNTY, KENYA.

Simatwa Barnabas Cheromoi-M.ED

Department: Educational Foundation

Supervisors: Prof. Daniel Sifuna

Prof. Augustine Karugu

This study investigated the extent to which cattle rustling had impacted on pupils' access and participation in primary education in Alale Division, North Pokot Sub-county. The study investigated enrolment, retention, drop-out and absenteeism rates of both pupils and teachers in schools. It also evaluated general performance of schools' KCPE results. It is intended that this research will shed light to education stakeholders in this region so as to manage better children's access and participation in education in this cattle rustling prone region. This study was guided by „cattle complex“ theory advanced by Melville Herskovits (1926), which posited that pastoralists hold insatiable, irrational and irresistible love for cattle. This theory explains why pastoralists would use any means including stealing cattle from their neighbors in order to maintain a large herd of cattle. The study reviewed related literature on causes of cattle rustling among pastoralists and effects on pupils' access and participation in education. It also reviewed Government, NGOs and Religious Organizations efforts in education matters. Descriptive Survey Design was used to elicit information from the respondents. The study was limited to 5 schools within Alale Division. The study sampled out 200 pupils and 20 teachers from the 5 sampled schools for the study. The respondents comprised of Headteachers, an education officer, an administration officer, NGO official, a religious leader and 15 members of the community. The research instruments used for collecting data were questionnaires, interview schedules and Focus group discussions. The reliability of the instruments was determined using test-retest technique. To measure validity of the instruments, the researcher availed the instruments to the supervisors for scrutiny to determine if they addressed adequately the objectives of the study. The study generated both qualitative and quantitative data which were analyzed using descriptive and inferential statistics. The results were presented in the form of frequency distribution tables, bar graphs and pie charts. Based on the research findings, the researcher found out that indeed cattle Rustling was an impediment towards Access and Participation in primary Education in Alale Division. There were high school drop-outs, Absenteeism of both teachers and pupils, poor schools infrastructure and general insecurity. All these translated to low quality of education as realized from poor exam results. The study recommended that boarding schools to be increased to shield the pupils from negative cultural practices and to guaranteed them maximum security. The community also needed sensitization to have mental shift from cattle rustling to embracing other alternative sources of income. However, the researcher pointed out areas of research gaps that can be exploited for further research to improve education in North Pokot Sub-county. Study can be conducted on effects of Cattle Rustling on secondary schools and also on how CR is affecting girl-child education.

TACTILE MATERIALS AS CORRELATES OF PERFORMANCE IN MATHEMATICS AMONG LEARNERS IN THIKA HIGH SCHOOL FOR THE BLIND, KIAMBU COUNTY, KENYA

Department: Early Childhood and Special Needs

Supervisors: Dr. Margaret Murugami

Dr. Wamunyi Chomba

The purpose of the study was to assess the use of tactile materials as correlates of performance in Mathematics among learners in Thika High School for the Blind. The objectives were to: identify the tactile Mathematics materials used by teachers while teaching learners who are blind; explore the adequacy of the tactile teaching and learning materials; identify the challenges that teachers face in adapting Mathematic tactile teaching materials; investigate learners' perception on Mathematics tactile learning materials and investigate general performance of Mathematics among the learners who are blind. Two hypotheses were tested in this study. This study adopted social constructivism theory and used a case study research design. Target population was 85 respondents comprising 5 Mathematics teachers and 80 learners who are blind in the school. Purposive sampling technique was used to select Mathematics teachers while stratified random sampling was used to select the learners who are blind according to class and gender. Thereafter, simple random sampling was used to select 24 learners. Questionnaires were used to collect data. Pilot study was done at St Lucy School for the Blind to test validity and reliability of the research instruments. Quantitative data was collected, coded and organized. After analysis of data, the findings were presented in graphs, pie charts and bar graphs with the aid of Statistical Package of Social Sciences (SPSS version 20). The major findings were: available resources are inadequate and unsuitable to effectively assist learners' performance. Some teachers were not proficient in Braille Mathematics, thus a major hindrance for them to teach effectively. Many respondents recommended that the government should set aside more funds for Mathematic teaching and learning resources since their use in teaching was of uttermost importance. Therefore, this study recommends a need for the Ministry of Education to introduce AT courses in teacher training colleges. In addition, more time should be allocated in the school timetable for effective use of materials in teaching Mathematics to learners with visual impairment. Also, there is need for proper planning; preparation, presentation, appropriate application and essential follow up make the use tactile Mathematics materials ineffective by the teachers.

DETERMINANTS OF TEACHERS' USE OF INSTRUCTIONAL STRATEGIES FOR ENHANCING LITERACY SKILLS AMONG GRADE ONE PUPILS IN BUSIA COUNTY, KENYA

Otwate Paul-M.ED

Department: Early Childhood and Special Needs

Supervisors: Dr. Nyakwara Begi

Dr. Margaret Mwangi

Children who possess adequate basic language skills develop cognitive and social skills required in life and workplace. It also enhances smooth transition, performance, and retention and completion rate. The purpose of this study was to establish the determinants of teachers' use of instructional strategies

to enhance grade one pupils' literacy skills in Nambale Sub-county, Busia County Kenya. Nambale Sub-county was selected because it constitutes the highest number of primary schools within Busia, which recorded low levels of pupils' performance in literacy achievements reported by Uwezo study. Grade one was chosen because it forms a basis for pupils' achievement in upper primary education, their personal holistic developments and gains in abilities to solve social problems faced later in life. The study was anchored on Paul Freire's theory of Participatory Learning Approach (PLA). Descriptive survey design was employed in the study to find out the teacher qualities which influence the use of instructional strategies to promote pupils' literacy skills during instruction. The study methodology used in the research was quantitative. The dependent variable of the study was; instructional strategies teachers use to promote pupils' literacy skills. The independent variables of the study were; teachers' professional training, teaching experience, and scores in English in Kenya Certificate of Secondary Education examinations. The target population were grade one teachers and pupils in all primary schools within Nambale Sub-county. The sample size was grade one pupils and teachers in forty seven primary schools within the sub-county. Purposive and stratified sampling techniques were employed to select sample for the study and data collected using questionnaire and observational checklist. A pilot study was conducted in two schools to ensure validity and reliability of the instruments. Content validity was used to measure validity of instruments while test re-test method was used to measure reliability of study instruments. Reliability co-efficient were calculated using Cronbach's alpha whereby the acceptance co-efficient was .70. Data was analysed using descriptive and inferential statistics that is Independent Sample t-test and ANOVA with the help of a Statistical Package for Social Sciences (SPSS). The results were presented and discussed using tables and texts. Results revealed that there was no significant difference in use of instructional strategies across teachers' level of professional training, teaching experience and scores in English in Kenya Certificate of Secondary Education. The study recommends that school board of management should organise teacher-capacity-refresher trainings on use of variety instructional strategies to meet diverse needs of pupils. This would stimulate teachers to consistently use variety instructional strategies to enhance literacy skills among children during early years of school and increase their overall academic outcomes and social performance later in life.

TEACHERS' AND STUDENTS' PERCEPTIONS ON USE OF NON-VERBAL COMMUNICATION IN INSTRUCTION OF ENGLISH IN PUBLIC SECONDARY SCHOOLS IN BAUCHI METROPOLIS, NIGERIA

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Dr. Mueni Ngungui Kiiro

English language teaching is all about effective classroom communication. Classroom communication is in verbal and non-verbal form. Non-verbal communication is an important aspect of classroom communication in language. In spite of this, teachers of English language in Bauchi state have no adequate knowledge on the important functions of non-verbal cues in English language teaching. The study was guided by the following objectives: to establish non-verbal communication used by teachers in the instruction of English language, to establish the perception of teachers and students on the use of

non-verbal communication in instruction of English language, to establish the functions of non-verbal communication in instruction of English language, to investigate the challenges experienced in the use of non-verbal communication in instruction of English language. The study was guided by two theories. The Kinesics Theory by Birdwhistell of 1970 and the Communication Accommodation Theory (CAT) developed by Howard Giles in 1976. Kinesics theory assumed that all body movements are aspects of human communication while Communication Accommodation Theory is concerned with the linguistic and non-linguistic aspects of communication. The study adopted descriptive survey design. Two research instruments were used for this study, namely; observation complemented by video recording and interview schedule for both teachers and learners. The study adopted both qualitative and quantitative methods of data analysis. Quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS) in descriptive statistics, while qualitative data were categorized in themes according to the research objectives and reported and narrated. The target populations were Five (5) schools which were selected based on quota sampling technique for the study. Sixteen (16) teachers while fifty-eight (58) students' respondents were conveniently sampled for the classroom observation and the interview. Piloting was conducted before the actual data collection was done to test the validity and reliability of the research instruments. The study found that the two categories of non-verbal communication that were used frequently by the teachers were the Kinesics and Oculistics behaviours. Hand movement, facial expression and eye contact played a very significant role in language teaching and learning. Findings of this study revealed that teachers use non-verbal communication in teaching. This non-verbal behaviour performs various functions and for better understanding in classroom teaching. Findings also revealed that non-verbal communication is an important aspect of English language classroom communication as it promotes good teaching and learning of English language. Both students and teachers perceived NVC as a useful tool for effective classroom communication. Teachers and students do not normally experience many challenges when non-verbal gestures are used in classroom communication. The study recommends that teachers should be enlightened on the use, functions and importance of non-verbal communication in teaching English language.

CONTRIBUTION OF NUTRITION EDUCATION TO HEALTHY FOOD CHOICES AMONG PRIMARY SCHOOL PUPILS IN NYERI COUNTY, KENYA

Waithaka Simon Runo-M.ED

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Dr. Francis Kirimi

In Kenya, nutrition education is included in the school curriculum as recommended in the year 2009 national school health policy. Nevertheless, policy advocacy and communication strategies on nutrition education are relatively weak, and there is insufficient focus on operational research on nutrition. In addition, nutrition education is not taught as a standalone subject and is only infused in science subjects. Consequently, the malnutrition problem is not as well understood as it could be. Today's form of malnutrition consists of over-consumption of energy dense and fatty foods. These have led to an upsurge of non-communicable and lifestyle diseases such as cancer, diabetes, bone and heart

conditions. Therefore, there was need to explore influence of nutrition education on eating habits in order to help pupils acquire discriminative skills that can enable them make healthy food choices. The pupils can act as agents of change in the community through the symbiotic relationship that exists between the school and the society. This will be the first step towards curbing food-related health problem. The purpose of this study was to determine the contributions of nutrition education in enabling pupils to make healthy food choices. The Health Belief Model as a predictor of preventive health behaviour was the guiding theory for this research. The study was mainly descriptive in design with purposive and random sampling as the key sampling techniques. The target population was 30 primary schools in Nyeri County, 570 teachers, 1950 pupils in class seven, 1910 Class seven parents. The sample size was 3 primary schools, 57 teachers, 191 parents and 195 class seven pupils. This was representative of 10% of the target population. Data collection tools were semi-structured interviews, focus group discussions, food diary, and Food Frequency Questionnaire. Data was analysed both qualitatively and quantitatively guided by the themes from research objectives. Quantitative data was analysed using basic descriptive statistics and presented in form of tables, pie charts, graphs, and percentages. The Qualitative analysis involved narrative records and informants" quotations. The study findings showed that nutrition education was scant for pupils" and healthy eating was not sustained. The study concluded that knowledge alone is not sufficient to influence behaviour and parents should model on healthy eating as pupils depend on them for food. Additionally, mediating factors, such as access to the target food and outcome expectations, and the modern lifestyle of snacking and convenience eating have been affecting food choice. Knowledge on unhealthy food choices and non-communicable diseases should be included in the competency based curriculum. The study findings may be used by the Ministry of education to inform nutrition education content in the school curriculum.

PARENT CHARACTERISTICS INFLUENCING THEIR INVOLVEMENT IN PRE-SCHOOL CHILDREN'S EDUCATIONAL ACTIVITIES IN SIKALAME ZONE, SIA YA COUNTY, KENYA

Sakwah N. Victor-M.ED

Department: Early Childhood and Special Needs

Supervisors: Dr. Maureen Mweru

Dr. John Ng'asike

Parental involvement in pre-school education still remains a question when it comes to promoting pre-school children"s education amidst the diverse family backgrounds in the current generation. Parents have shown mild and inconsistent involvement in their children"s educational activities leading to poor academic achievement. Sikalame zone which is the location of this study has been facing challenges of low community and parental involvement which has contributed to the neglect of early childhood development centers. The study therefore aimed at finding out the extent of parental involvement in pre-school activities and identifying factors that influence parental involvement in pre-school activities. The study was guided by Joyce Epstein theory of parental involvement. Descriptive research design was adopted for this study. The study had a target population of 42 preschool teachers and 450 parents with preschool children in Sikalame zone. All the teachers of the selected pre-schools were involved in the study. A simple random sampling was carried out to select 90 parents who were included in the sample,

resulting to a total sample size of 126 respondents. Questionnaires for both teachers and parents were used to collect data. Validity was tested using content validity while reliability was tested using Pearson product moment correlation coefficient which was 0.782 for teacher questionnaire and 0.788 for parent questionnaire. Collected data was analyzed both qualitatively and quantitatively. The analyzed data were presented using bar-graphs, tables and pie charts. Findings revealed that majority of parents did not get involved in their children academic activities and rarely assisted their children with homework implying that parents were not fully engaged in their children's education. The chi-square test results showed that the level of involvement in the children's education had significant association with parent's gender, level of education and socioeconomic status. The test did not find significant relationship between parents' marital status and involvement in preschool activities. The study concluded that there was low parental involvement in Sikalame zone. The study recommended that there is need for the preschool administrators to provide some form of training to parents, so that their involvement will have a meaningful impact on the children's development. In addition, the study recommended a large scale survey on determinants of parental involvement in preschool activities to generate more generalizable statistics.

IMPACT OF MANAGEMENT STRATEGIES ON INCLUSION OF LEARNERS WITH HEARING IMPAIRMENT IN REGULAR PRIMARY SCHOOLS IN THARAKA NITHI COUNTY, KENYA

Mpaku Mukire Julius-M.ED

Department: Early Childhood and Special Needs

Supervisors: Prof. Geoffrey Karugu

Dr. Beatrice Bunyasi Awori

The purpose of this study was to investigate the impact of management strategies on inclusion of learners with hearing impairment in regular primary schools in Tharaka Nithi County. The objectives of the study were to; establish the level of training of education managers on special needs, establish the number of managers trained on special needs identify inclusion placement options and models for learners with hearing impairment in regular primary schools, investigate the effectiveness of management strategies in implementation of inclusion of learners with hearing impairment in regular primary schools and analyzing challenges faced in implementing managements strategies for inclusion of learners with hearing impairment in regular primary schools. The study used management theory founded by Henly Fayor on management functions and process. The theory was important for the study because it examined how the managers in regular primary schools carried out the various functions to ensure that there is inclusion in their schools. Descriptive research design was used. The target population was education managers from Tharaka North Sub County in Tharaka Nithi County. The study used a sample of Eighteen (18) managers out of target population of sixty. Simple randomly selected twelve (12) managers were from regular schools without special units while purposive sampling of three managers from schools with special unit and three education managers from Sub county office. Questionnaire was used for managers in regular primary schools without special unit while interview guide was used for managers with special unit and from Sub county education office. Pilot study was conducted where the results from two instruments were compared through criterion related validity to

test reliability and validity of the instruments. Data was collected through mixed research design, (Qualitative and Quantitative approach). In qualitative, data was coded and thematically presented while Quantitative data was analyzed through use of Statistical Package for Social Sciences (SPSS) and then presented through use of charts and frequency tables. The finding from the study revealed that there were few managers trained to handle learners with hearing impairment, inadequate training of managers on sign language which is medium of instructions for learners with hearing impairment. Placement options and models for learners with hearing impairment were inadequately used. The role of managers were underperformed as most of them were not conversant with inclusion of learners with hearing impairment in their schools, Challenges noted to threaten inclusion of learners with hearing impairment in regular school were; low qualification of some managers to perform management roles,, communication barriers, Inadequate in-service seminars and workshop for education managers to get knowledge of using sign language, monitoring and evaluating on inclusion from national level to the primary level. The conclusion of the study was that managers have not been able to implement strategies for inclusion of learners with hearing impairment in regular primary hence making inclusion of learners with hearing impairment nonfunctional. The main recommendation of the study is that sign language be made compulsory and examinable at all level of learning while managers should be degree holder and trained in sign language.

IMPLEMENTATION OF GOVERNMENT POLICIES ON THE TEACHING OF ENGLISH: A COMPARATIVE ANALYSIS OF SECONDARY SCHOOLS IN NAIROBI CITY COUNTY, KENYA.

Damaris Wambui Kimam-M.ED

Department: Educational Foundations

Supervisors: Dr. Isabella Musyoka

Dr. Maurice I. Makatiani

Language is important for communication to take place. A universal language is vital for global communication. One of the internationally accepted languages of communication is English. Thus, the government of Kenya has come up with policies that ensure that at the end of secondary school, students are able to communicate competitively using the English language. However, there has been a worrying concern from both employers and educationists that employees and graduates, respectively, have poor English language skills. The aim of this study was to establish the existing gaps between stated government policies on the teaching of English in secondary schools in Kenya on one hand and on the other the actual school practices during the implementation of these policies. Also it set to establish the challenges that teachers of English face when implementing the government policies on teaching English in public secondary schools in Nairobi County. This study was based on structural functionalism theory by Durkheim. It adopted descriptive research design which was carried out in public secondary schools in Nairobi County. The study had a target population of 480 from 60 Schools which included: the heads of English department and teachers of English who are charged with the role of implementing government policies on teaching of English. The study employed purposive sampling where the schools' Heads of English Department (HODs) and teachers of English were sampled into 62 respondents composed of 8 HODs and 56 teachers. Out of the 60 schools the researcher used random sampling and 8

schools were sampled. Questionnaires and observation checklists were used to collect data. To assess the validity of instruments, a pilot study was conducted and the results were analyzed and used to modify and remove ambiguous items on the instruments used in the study. Its reliability was established using the test-retest method. Data was analyzed both qualitatively and quantitatively. The qualitative data was grouped into different categories which helped establish the themes drawn from the objectives of the study. Through the use of the statistical package for social sciences (SPSS) programme, quantitative data was analyzed using descriptive statistics percentages, frequencies, and tables where appropriate. The study established that full implementation of the government policies on teaching of English was lacking in all the secondary schools sampled. English was not being fully taught as an integrated subject, syllabus was not completed within the prescribed period of time and it was also noted that teachers of English experienced a lot of challenges during the implementation of government policies on teaching of English. The study recommended: that teachers of English access regular professional development programs to enhance their teaching and acquire skills to enable them overcome some of the challenges they were facing during teaching; The Kenya National Examination council (KNEC) to come up with oral and listening examinations to help students achieve communication competence in English as these examinations were not available.

RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS AND ACADEMIC ACHIEVEMENT AMONG SECONDARY SCHOOL STUDENTS IN KAKAMEGA COUNTY, KENYA

Neondo Fridah Everlyne-M.ED

Department: Educational Management, Policy and Curriculum Studies

Supervisors: Dr. Mukirae Njihia

Dr. Michael Murage

The purpose of this study was to investigate the parents' socioeconomic factors affecting student's academic achievement in KCSE in public secondary schools in Marama-south ward Butere sub-county. The main objectives of this research were: Establish how parental education level affected student's academic performance in the KCSE, Examine the extent to which parental occupation influenced the student's academic achievement in the KCSE and Assess how the household income of the parents affected student's academic performance in the KCSE in Marama-south, Kakamega County. The study adopted family stress model which proposes that economic pressure experienced by parents' increases parental stress which are associated with greater hostility generally by parents towards their children. Literature was reviewed along the following themes: parental education level, parental occupation and parental income levels in relation to student academic achievement in the national examination. Correlational research design and Chi-Square statistic were employed. The key variables for the study included independent variable (parental socio-economic status) and dependent variable (student academic achievement in KCSE). The locale of the study was Marama south in Kakamega County. The target population comprised of all the 300 form four students and 240 parents in public secondary schools in Marama south. Probability sampling was employed that yielded a sample size of 175 representing 58% of the students' population and 175 representing 73% of the parents' population. Questionnaires for both students' and parents' were used as data collection instruments. Content validity

was ensured by checking whether the items in oth students and parents' questionnaires reflected o jectives stated. The reliability based on scales reported in terms of internal consistency of scores on items purported to measure the same concept. Data was analyzed in three forms; demographic information, descriptive and inferential statistics. Correlation, Regression analyses and Chi-Square tests were used respectively. The findings of the study are presented in tables of frequency distributions, percentages and pie charts. The study established a positive and statistically significant correlation between parental education level, parental occupation, parental income levels and the student academic achievement in the national examination, KCSE ($r = 0.628$, $p = 0.001$; $r = 0.703$, $p = 0.001$; $r = 0.609$, $p = 0.001$) at alpha 0.01 level of statistical significance respectively. Moreover, difference in students' performance in KCSE in relation to their parents' level of education was found to be significant ($\chi^2 = 56.253$, $df = 6$, $P = .001$). Thus, null hypothesis was rejected. The difference in students' performance in KCSE in relation to their parents' occupation was found to be significant ($\chi^2 = 87.624$, $df = 6$, $P = .001$), hence the rejection of the null hypothesis. Also, the difference in students' performance in KCSE in relation to their parents' income level was found to be significant ($\chi^2 = 56.739$, $df = 6$, $P = .001$). The null hypothesis was rejected. With regard to the study findings, the study concluded that the parent's education level, occupation and income levels determined student's academic achievement in the national examination, KCSE in Marama south in Kakamega County. It therefore recommended that adult and continuing education provision, expansion of job opportunities at the village level and diversification of sources of income for the residents of Marama south in Kakamega County to be done by individuals, civil societies and the national government.

TEACHING AND LEARNING FACTORS INFLUENCE ON ADAPTIVE SKILLS ACQUISITION AMONG MODERATE INTELLECTUAL DISABILITIES LEARNERS IN SPECIAL UNITS IN MURANG'A COUNTY, KENYA

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Prof. Geoffrey Karugu

Learners with intellectual disabilities are found everywhere throughout the world. This group of learners needs to acquire some activities of adaptive skills. The proposed study sought to explore influence of teachers' factors on acquisition of adaptive skills among children with intellectual disabilities in special units in Muranga County, Kenya. The study was guided by the following objectives: To assess the influence of teacher related factors, to determine the influence of curriculum, to establish the influence of teaching methods, to examine the influence of teaching/learning resources on acquisition of adaptive among learners with ID in special units in Muranga County. The study was guided by Bandura's Social Learning Theory. The study applied a Mixed Methodology and mixed methods design. The target population was 51 teachers from 17 special units in Mathioya Sub-county in Muranga County. The sample size was 15 primary school head teachers and 30 teachers in the special units. A total of 45 respondents were used in the study. The instruments of the research were questionnaires for both primary school head teachers and teachers in special units for intellectual challenged learners and observation checklist. The questionnaire consisted of both open and close ended questions. A pilot

study was conducted in a special unit at Njumbi primary school in Mathioya Sub-county. This school was used in the proposed study. Test-retest was used to estimate reliability of questionnaires. Validity of the instruments was determined by a team of three experts in the Department of Special Needs of Kenyatta University. The data collected both qualitative and quantitative. Quantitative data was analyzed using descriptive statistics and presented in form of percentages, frequency tables and graphs. Qualitative data was analyzed thematically as per the objectives. The findings revealed that some of the teachers in special units had no training in special education at all, majority of teachers who had training in special units had no special skills to teach adaptive skills and a few were not specialized but handled children with intellectual disabilities. Head teachers did not adequately provide resources and materials suitable for the acquisition of adaptive skills among the learners with intellectual disabilities. The study concluded that learners with ID were not taught adaptive skills effectively since teachers did not use suitable teaching methods and strategies. The study recommends that special units should be staffed with teachers who are specialized in a given area of disability. It also recommends that in-service courses should be facilitated to enable both head teachers and teachers in special units improve the methods of teaching and strategies of implementing the methods towards facilitating the acquisition of adaptive skills among learners with ID. The findings of the study are envisioned to inform policy and practice of acquisition of adaptive skills for the ID children.

DETERMINANTS OF TEACHERS' PERCEPTIONS ON INCLUSION OF LEARNERS WITH DISABILITIES IN REGULAR PRIMARY SCHOOLS OF CENTRAL AND ANSEBA REGIONS, ERITREA

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Dr. Lubna Mazrui

The purpose of the study was to investigate the determinants of the perceptions of teachers on the inclusion of learners with disabilities in regular primary schools of Central and Anseba Regions of Eritrea. The objectives of the study were to establish teachers' perception on the implementation of inclusive education in regular primary schools; and to examine the impact of demographic factors, teaching-learning resources, and school administrative support on teachers' perceptions of inclusion for learners with disabilities in regular primary schools of Central and Anseba regions of Eritrea. The proposed study was guided by Heider and Kelley's "attribution theory" of perception. The study used descriptive research design, targeting (650) teachers and (28) head teachers in (28) regular primary schools of Central and Anseba regions, Eritrea. Purposive sampling technique was employed to select a sample of (6) regular primary schools from the two regions of the country, (6) head teachers and (120) regular primary school teachers. The study utilized a questionnaire and interview guide for data collection. Questionnaires were administered to regular primary school teachers, while an interview was conducted to head teachers. A pilot study conducted in one primary school in the Central region. The validity of the instruments was assured by extensive discussions with supervisors and through piloting. The test-retest technique was applied to ensure the reliability of the instruments, and the correlation coefficient of $r=0.87$ achieved. Qualitative data collected were analyzed thematically based on the

research objectives. Quantitative data collected from the questionnaires were also coded, entered, edited, and analyzed using SPSS version 20 for windows, tests of ANOVA, t-test and Pearson correlation were applied. Data presented in the form of text, charts, graphs, tables, and figures. The study findings revealed that regular primary school teachers have a positive perception of including learners with disabilities. However, the knowledge base and practice of inclusive education was very low. Findings further revealed that young age groups, trained teachers and teachers who have experience with learners with disabilities showed positive perceptions towards inclusive education than old, untrained and non-experienced teachers. Finally, inadequate teaching and learning resources and lack of school administrative support have a detrimental effect on the regular primary school teachers' perception. The study concluded that regular primary school teachers have a positive perception of inclusive education. However, lack of training and inadequate resources mainly influenced teacher perception toward the practice of inclusive education. The study recommended that there is an urgent need for pre-service and in-service training of regular primary school teachers. For successful inclusion, schools should be equipped with adequate teaching and learning resources.

ACADEMIC ACHIEVEMENT OF LEARNERS WITH DOWN SYNDROME IN SPECIAL PRIMARY SCHOOLS FOR LEARNERS WITH INTELLECTUAL DISABILITY IN KIAMBU COUNTY, KENYA

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This study sought to analyse academic achievement of learners with Down syndrome in special primary schools for learners with Intellectual disability in Kiambu county. The study was guided by the following objectives: To Analyse academic achievement of learners with Down syndrome in special schools; to identify the instructional resources used by teachers to teach learners with Down syndrome; to assess the instructional strategies used in teaching learners with Down syndrome; and to examine the instructional challenges caused by Down syndrome secondary conditions. The study was guided by Social Cognitive Theory (SCT) of 1986 by Albert Bandura. This study adopted descriptive survey design. The study targeted the 6 head teachers, 74 teachers and 147 parents from the six special primary schools for learners with Intellectual disability in Kiambu County. Purposive sampling method was used to select the 6 head teachers, 44 teachers were randomly sampled and 40 parents were conveniently sampled translating to a total of 90 respondents. Questionnaires were used to collect data from the headteachers and teachers. Interview guide was conducted on parents/guardians and observation checklist was used by the researcher to observe learners with Down syndrome in class. Piloting was done at Waithaka special school to enhance validity and reliability of the research instruments. Questionnaires from the respondents were checked for completion. The data was analyzed using Statistical Package for Social Sciences (SPSS) computer program. The findings were presented in form of frequency tables, pie charts and bar graphs. Data collected from the interviews and observation schedules were analyzed using narrative descriptions. Study findings revealed that most of the learners with DS had communication difficulties. The findings further indicated that even though communication

books, charts, pictures, visual schedule timetables and drawing items were available in special schools, they were inadequate. Secondary conditions of DS were characterized by fatigue, sleep complications, slow motor development, speech problems, poor counting skills, poor memory, lack of competition among peers and poor social skills. The study concluded that engaging students with Down syndrome based on the individuality of their learning profiles had positive impacts on teachers' experiences. The study recommended that teachers should involve a wider body of professionals in order to improve the secondary conditions of learners with DS. The Ministry of Education should allocate more funds on instructional materials to special schools so that the resources can be adequate for all learners.

TEACHER FACTORS INFLUENCING USE OF MUSIC AS A MEDIUM OF TEACHING MATHEMATICS IN PRE PRIMARY SCHOOLS IN NAIROBI CITY COUNTY, KENYA

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Dr. Esther N. Waithaka

Music is a significant teaching strategy in early childhood education it improves development of young children's self-confidence, self-esteem and their expression orally and mentally. Despite the fact that, use of music is a strategy that motivates and sustains children's interest in the learning of mathematics, research studies in this area are scanty. The purpose of this study therefore was to find out preschool teacher factors influencing the use of music as a mode of teaching mathematics within Kasarani, Nairobi County. The study sought to determine the link between preschool teacher factors namely their training, teaching experience, academic qualifications, and attitude towards use of music in teaching mathematics. Theory of planned behavior by Ajzen and Fishbein (2010) guided the descriptive survey research design study. The study's dependent variable was use of music as a medium of teaching mathematics while the independent variables were preschool teacher factors influencing use of music in teaching mathematics. Multistage sampling technique was used to arrive at the required sample size. Specifically, random sampling was used to select 15 preschools out of the 30 targeted and purposive sampling used to select 15 head teachers out of 30 and 45 out of 90 preschool teachers. An observation guide and questionnaires were used to collect data for preschool teachers and head teachers. A pilot study was conducted in four public preschools using their head teachers and eight teachers. To ensure validity of the instruments, the study content was strictly guided by the objectives while the split half technique was used to ascertain reliability of the instruments at a coefficient of 0.7. Quantitative data were analysed using the thematic approach and presented in narrative form while for quantitative data, descriptive statistics involving frequencies, standard deviation, means and percentages were employed. Inferential statistics used to test null hypothesis Chi-Square at alpha value 0.05 ($p < 0.05$). The inferential statistics established significant association between teacher training and teacher attitude and use of music during mathematics instructions. However, the study did not find significant relationship between teacher academic qualifications and experience and use of music during mathematics instructions. The study concluded that preschool teachers in Kasarani Sub-County were using music to teach mathematics. The study recommended the Kenya institute of curriculum development should come up

with modules on step by step guidelines on how to teachers should integrate music during maths lessons. The study also recommended that further research should be conducted to establish other factors that may influence use of music to teach mathematics.

EFFECT OF CARTOONS AND COMICS INTEGRATED INSTRUCTION ON STUDENTS' ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL PHYSICS IN KIAMBU SUB-COUNTY, KIAMBU COUNTY, KENYA

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Dr. David Oludhe

Secondary school students in Kiambu sub-county have been achieving lower scores in KCSE than the average national mean score between 2012 and 2016. This low achievement is also reflected in the national KCSE physics mean score. This study addresses cartoon and comics integrated interaction (CII) learning in Physics and how it can bring about better learning of concepts, theories, and laws. The study sought to compare the student achievement in physics, leaner behaviour, the extent of teacher and learner involvement in classroom activities CII and non-cartoon interaction (NCI), and the attitudes of the teachers and learners towards CII in Kiambu Sub County. A quasi-experimental research design was used. The target population for this study comprised form two students in public secondary schools in Kiambu Sub County. Stratified random sampling was used to sample boys, girls, and mixed schools and two schools randomly sampled from each category of schools and one assigned the experimental group and the other in the control group. Form two class in the selected secondary schools were purposively used in the study. Data was collected using Students Assessment Tests (SATs), teachers and student interview schedules. The collected data was analysed using both descriptive and inferential statistics and presented in the form of notes, numerals, tables, and graphics. Statistical analysis using the paired t-test at a 95% confidence interval revealed $0.000 < p < 0.05$. The alternative hypothesis which states that the use of CII affects student achievement was accepted. The findings of this study revealed that students who are taught with CII score highly. In addition, cartoons and comics created an interactive environment in the classroom and enhanced memory retention, created sustained attention, and broke the monotony. This study recommended the use of cartoons and comics integrated instruction by physics teachers to improve learning.

TEACHING METHODS AND STUDENTS' PROFICIENCY IN ENGLISH FUNCTIONAL WRITING SKILLS IN NJORO SECONDARY SCHOOLS, NAKURU COUNTY, KENYA

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Dr. Harrison Mulwa

The purpose of this study was to investigate the teaching methods and students' proficiency in English functional writing skills in Njoro secondary schools, Njoro Sub-County, Nakuru County. The objectives of the study were the teaching method teachers use to teach FWS and teachers' experiences in teaching FWS. Learners' errors in English FWS and analysis of some of the English language recommended and approved course-books by the Ministry of Education, were other objectives of the study. The study was based on Richards and Rodgers functional view theory of language teaching and learning. It adopted the qualitative design. The study target population was 1500 Form Three students from 30 secondary schools and 70 English Language teachers in the Sub-County. Simple random sampling technique was used to select a study sample of 10 English language teachers and 100 Form three students. Two secondary schools from each of the five zones of Njoro Sub-County were randomly picked as a study sample to make the study more representative. One stream from each secondary school was selected to participate in the study. The teacher teaching that stream was the automatic respondent. For schools with more than one stream, only one stream was randomly selected to participate in the study. Two Secondary schools which did not form part of the study sample were used for pilot study to verify the validity and reliability of the research instruments. Questionnaires were administered to the sampled teachers. A lesson observation schedule was used to observe teaching. A written test on official letter and minute writing was administered to the sampled students. Qualitative and quantitative data was collected and analysed by the researcher. The research found that the main method used to teach official letters and minute writing in Njoro secondary schools was lecture method. From the lesson observation schedule, most teachers of English in Njoro Sub-County are experienced on focusing on the final product instead of using the process oriented approach. Learners' errors in official letters and minute writing were identified and Integrated English and Headstart Secondary English were the preferred recommended course-books. The recommendations were that teachers should vary their teaching methods, use the process oriented approach when teaching FWS. Other recommendations were that learners should be exposed to many writing practices, and teachers should use a variety of course-books for clarity and a wider scope of content.

FACTORS AFFECTING MANAGEMENT OF MALADJUSTED BEHAVIOURS IN BEHAVIOUR ADJUSTMENT FOR LEARNERS WITH INTELLECTUAL CHALLENGE IN SPECIAL UNITS, KIAMBU COUNTY, KENYA

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Dr. Chomba Wa Munyi

The purpose of the study was to find out factors affecting management of maladjusted behaviours (MB) for behaviour adjustment in learners with Intellectual challenge (IC) in special units in Kiambu County, Kenya. The study was guided by the theory of Operant Conditioning of B.F Skinner (1938). The objectives of the study were to: identify learner factors affecting the management of MB in learners with IC, Inquire parental factors affecting the management of MB in learners with IC, Investigate teacher factors limiting the management of MB in learners with IC, Determine school internal factors hindering management of MB in learners with IC and to Establish intervention measures for behaviour adjustment

in learners with IC in special units. The study used systematic random sampling to select 7 schools with special units and 8 teachers from the 7 special units. Stratified random sampling was used to select learners from the units. Headteachers of the 7 schools with special units were purposively selected. The target population comprised 235 individuals; composed of school heads, teachers in charge of the units and learners in the units. The sample population for the study was 8 teachers of the 7 units, 7 head teachers of the schools with the units and 62 learners of the sampled units, a total of 77 respondents. This formed 32.8% of the target population. Four Research instruments were used: A questionnaire for sampled teachers in the units, Interview guide for head teachers, behaviour observation checklist for the teachers in the unit and observations schedule for the researcher. Validity and reliability of the instrument were checked through piloting. Collected data was analyzed qualitatively and quantitatively. The open-ended items were analyzed qualitatively while closed-ended items were analyzed quantitatively and tabulated by application of statistics package for social sciences (SPSS). From the observation checklist which was thematically analyzed, tearing of books was common in most special units with a higher frequency of 7 (87.5%) followed by throwing objects to others in class and banging head on the wall which had equal frequencies of 6 (75%). The study observed that the main contributing factors of MB in learners with IC were delayed developmental milestone in learners, parental negligence, lack of proper training among teachers and inadequate facilities. All teachers (100%) had done inclusive special education hence did not have special skills to manage MB among learners with IC. The intervention strategies employed by teachers towards managing MB among learners with IC include time out 6 (75%), extinction 5 (62.5%), contingency contracting 4 (50%), token economy 3 (37.5%) and response cost 2 (25%). The study concludes that strategies ought to be established upon early intervention which would effectively enable both teachers and parents identify learners possessing MB and positively change their behaviours. The study recommends that teachers should seek assistance from the special education assessment centers to ascertain the behaviour. It also recommended that the causes of MB should be investigated closely and be addressed, observed closely so that the learners can have the opportunity to learn without any triggers of the behavior. Teachers should go for in-service courses to acquire knowledge on how to identify the behaviour and causes of the behaviour and how to manage MB among learners with IC.

SCHOOL OF PUBLIC HEALTH AND HUMAN APPLIED SCIENCES

PREVALENCE OF POST-PARTUM DEPRESSION AMONG MOTHERS ATTENDING NAKURU LEVEL 5 HOSPITAL IN NAKURU COUNTY, KENYA

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Supervisors: Dr. Florence Okwara

Dr. Kibiwott Koima

Postpartum depression (PPD) is a non-psychotic mood disorder that can affect women during perinatal period to one year after childbirth. Regardless of the outcome, women who experience postpartum depression, experience feelings of sadness, hopelessness and worthlessness, consequently, impacting negatively not only to the mother, but also to the family and the child's development. Many women suffer silently from PPD due to the little emphasis placed on the emotional and psychological care with a global statistics of 10-20%; the prevalence is estimated to be higher in Africa at 10-32% with 11 and 13% reported in Kenya. The aim of this study is to determine the prevalence of PPD among mothers attending Nakuru Level Five hospital in Nakuru County. This research was a cross sectional descriptive study design, which was carried out among mothers from six to eight weeks postpartum seeking maternal child health care clinic services as outpatient. Simple random sampling was used to identify 381 study participants. Data was collected using a researcher-administered structured questionnaire comprising of the Edinburgh Postnatal Depression Screening tool, this collected information regarding socio-demographics, obstetric and child factors. The key informant guide with questions that helped to identify barriers associated with PPD. Analysis was done using statistical software – SPSS version 20 to provide descriptive and inferential statistics by use of t-test for normal distributed data, chi-square for categorical variables and also regression and correlation for comparisons. Results: Majority of the study participants were aged 20-29 years majority 78.7% of them were married, 40.7% reported to have achieved secondary education level while 3.7% had none. 67.5% reported a household income of less than Ksh. 19,000 whereas 5% reported of a household income of above 60,000. 17.6% reported to have experienced intimate partner violence, 37.6% reported to have been stressed during the peripartum period, 81.1% reported to get spousal support, and 67.5% said the pregnancy was planned. The PPD prevalence of 11.3% was obtained from this study. On their knowledge level, only 32% were aware and only 2% had ever been screened of PPD. On bivariate analysis, there was a significant relationship between Postpartum depression and gender based violence ($p=0.00$), peripartum stress ($p=0.00$), spousal support ($p=0.00$) and planned pregnancy ($p=0.001$). This study identified the following barriers to early diagnosis and treatment of PPD: Lack of screening tool in the study area, lack of holistic approach in examination of the mother as more emphasis was placed on the physical wellbeing of the mother other than the psychological and lack of health education on PPD among health care workers. In conclusion, this study identified the prevalence of PPD in Nakuru County at 11.3%, and noted significant association between gender based violence, stress, lack of spousal support, unplanned pregnancy and PPD. PPD is common in our setting however, diagnosis is often missed thus, this study recommends the following that may help improve early detection. For mothers, psychosocial support during the perinatal

period that should target victims of Gender Based Violence and offer family support. The health care workers should be sensitized through Continuous Medical Education (CME), provision of policies and screening tools in the health care facility and there should be Community sensitization through mass media on stigma and recognition of early signs of PPD.

UTILIZATION OF THE FEMALE CONDOM AMONG YOUTHS IN SELECTED TERTIARY TRAINING INSTITUTIONS IN MIGORI COUNTY, KENYA

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Supervisors: Dr. Albert Gachau

Dr. Dickson Ombaka

The female condom is a dual protection tool for both prevention of HIV/ AIDs transmission and unwanted or unplanned pregnancies. The study was done in Migori County among the youths attending selected tertiary training institutes, with specific objectives of identifying the socio-demographic characteristics of the youths that influence use of female condom, the extent in which access to the female condom and other social cultural factors affecting use of the device in Migori County. A cross-sectional descriptive study was used to collect both quantitative and qualitative data. A pre-test study was conducted in Msomi teachers training college to test the validity and reliability of the data collecting tools. The tertiary institutions were purposively sampled while the research participants in the selected institutes were sampled using systematic random sampling and a sample size of $n= 385$ was chosen proportionately. Data was collected using structured questionnaires, in-depth interviews and focus group discussions. Research respondents were required to sign consent form and data collected was dealt with confidentiality. Quantitative data collected was cleaned, and analyzed using SPSS version 24 Program while qualitative data was analyzed using N Vivo version 11. A p value of < 0.05 was used to determine significant findings. The findings were correlated to identify association; this was followed by Chi-square analysis. Fissure exact test was used when the cell counts were less than 5. Descriptive tables and bar graphs were used to present the findings of the research. It was evident from the research findings that majority of the youths 83.9% were single with 61.3% of the youths getting information about female condom use from media, 73.9% used it to prevent pregnancy than to prevent transmission or contracting HIV/AIDs. Most youths 97% had a challenge in inserting the device. Married youths were more likely to use the female condom compared to the ones who were single $p \leq 0.000$, $\chi^2=66.969$; denomination and age were not significantly associated with use of the female condom. The insertion process of female condom was significant at p value of 0.002 while negotiation for safe sex was significant at a p value of 0.034. Availability and cost of the female condom was significant at $p \leq 0.001$, attitude of the user was also significant at p value of 0.024. Prevalence of male condom to female condom ($p=0.02$) and use of condom is a sign of mistrust ($p=0.010$). Culture and religious teachings were not significantly associated with use or disuse of the female condom. In conclusion the marital status of the youth, personal efficacy on insertion and skills on negotiation for safe sex increases use of female condom. The cost, availability of the female condom affects its use. The study recommends the

government to subsidize the cost of female condom and ensure its availability, the health workers to champion for use of female condom.

INSTITUTIONAL AND STUDENT CHARACTERISTICS INFLUENCING RISKY SEXUAL BEHAVIOUR AMONG UNIVERSITY STUDENTS IN THARAKA NITHI COUNTY, KENYA

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Supervisors: Dr. Judy Mugo

Dr. Joan Njagi

It is essential to recognize the factors that persuade youth's education and to understand how the forces interweave at the higher institution of learning. The primary objective of the study was to establish the risk sexual behaviour among the students attending Universities in Meru South, more so on how physical infrastructure at the University influences Students risky sexual behaviors, also to establish how institutional social structures influence students risky sexual behaviour, and to identify student's risky sexual behaviors modeled by the available resources in Universities in Tharaka Nithi County. The study population comprised of 7950 University students at Chuka and Presbyterian University of East Africa. The study employed Random sampling to obtain a sample of 402 students. Data for the study was collected using a researcher-made questionnaire that was pre-tested in Meru University of Science and Technology using a sample of 40 students to determine the instrument reliability. A Cronbach Alpha coefficient of 0.89 was obtained on computing the reliability. Content and face validity was ascertained by evaluating the judgment of the research supervisors and experts within the Department of Environmental and Population Health of Kenyatta University. SPSS version 21 .0 for windows was used to analyze data to facilitate generation of inferential statistics owing to the quantitative nature of the obtained data. The information that was collected was then presented in the text in the form of tables and charts. The study established that the physical infrastructure; type of hostel, surveillance cameras in lecture halls, recreational centers located at isolated places, and buildings with basements at the University have greater relationship with students' risky sexual behaviors ($\chi^2 = 49.120$, $df = 1$, $p = 0.508$). A correlation between peer influence, family background and social structures of stratification and University students' risky sexual behaviors were established ($\chi^2 = 49.120$, $df = 1$, $p = 0.806$). The study further established that availability of free Internet (72%), laptops (64%) and computers (64%) contributed to a large number of students spending much time surfing the net on their cell phones (100%), watching sex explicit oriented videos (3%), viewing sexually explicit messages online (24%), watching programs with sexual contents on the televisions (72%), listening to sexually explicit lyrics were correlated with students' sexually risky behaviour (chi-square was 0.012 significant at 0.883). The social structures established in the Universities also contributed greatly to the students' risky sexual behaviors ($\chi^2 = 20.909$, $df = 1$, $p = 0.007$). Based on the findings of this study it was concluded that Universities in the study area had physical facilities that promoted students risky sexual behaviors. The university administration should train student peer counselors and equip them with the best skills of handling the risk sexual behaviour issues. The study further concludes that student's risky sexual behaviors were to a great extent modeled by the available resources such as free Internet at the

university. Based on research finding recommendation to the university management should to device ways in which they can restrict the available resources and infrastructure, in order to contain the students' behaviors.

PERCEPTIONS OF TEACHERS ON PHYSICAL EDUCATION TEACHING RESOURCES AND IMPLEMENTATIONS OF CURRICULUM IN PUBLIC SECONDARY SCHOOLS IN KISII COUNTY, KENYA

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Supervisors: Prof. Rintaugu G. Elijah

Prof. Andanje Mwisukha

Late Muniu Robert,

The purpose of this study was to ascertain the adequacy of teaching resources for the implementation of Physical Education curriculum in public secondary schools in Kisii County. The study aimed at establishing the extent of adequacy of indoor and outdoor facilities, equipment and apparatus, trained PE teachers, textbooks and related reference materials, time allocated for teaching PE and maintenance of facilities and extent of implementation of the PE curriculum in public secondary schools in Kisii County. The study adopted the descriptive survey design. Stratified random sampling procedures were used to attain a sample of 76 head teachers and 76 Physical Education teachers in the 317 public secondary schools in the county. A questionnaire and an observation check list were used to collect the data from the respondents. The response rate was 91% with 70 head teachers and 68 PE teachers responding. The SPSS version 22 was used to analyze the quantitative data where frequencies, charts, graphs and percentages were used to present the data. One way ANOVA was used in testing of the hypotheses. On the adequacy of physical facilities and equipment the study revealed that all the schools had facilities for soccer, volleyball, netball and track athletics though they were inadequate. All the schools did not have adequate indoor facilities and none of the schools had a swimming pool. On the adequacy of teachers, 81% of the respondents indicated that the number of PE teachers was inadequate while 69% of the respondents indicated that time allocated for PE was inadequate. On the availability of textbooks and reference materials 80% of the respondents indicated that there were no textbooks and reference materials for teaching PE. The study recommends that the National government and the Kisii County government in partnership with parents and non-governmental organizations should partner to provide enough facilities and equipment to public secondary schools in the County for teaching and learning of PE. TSC should also employ more trained teachers to teach Physical Education in public secondary schools. The study finally recommends that PE should be made an examinable subject at KCSE as that is the only way to make all stake holders take the subject seriously.

CHILD SPACING AND NUTRITION STATUS OF CHILDREN 6-59 MONTHS IN KAKUZI, THIKA EAST, KIAMBU COUNTY, KENYA

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Supervisors: Prof. Judith

Dr. Eunice Njogu

The concept of child birth interval is an important part of child health studies. Its role has however been downplayed going by the few studies that have been done in this area. Child birth intervals and their associations have a big role in realization of sustainable development goal 3 which aim at ensuring healthy lives and promoting well-being for all at all ages. Birth intervals help to initiate actions towards children and mothers. Shorter than expected child birth intervals have been shown to affect maternal repletion and pregnancy outcomes. Studies have shown that child spacing plays a crucial role on the child caring practices and on the nutritional status of the child. The overall objective of the study was to determine the relationship between child spacing, child care practices and nutrition status of the index child in Kakuzi, Thika East Sub-County. Kakuzi is an administrative rural ward, an ASAL region and with high proportion living on less than a dollar which made it an appropriate area for the study. The study covered 212 households with children 6-59 months in Kakuzi ward. The study employed a cross-sectional analytical study design. Cluster sampling was used where the village constituted a cluster unit and the household constituted the unit of measurement. Data was collected using a researcher administered structured questionnaire and a focus group discussion to bring out other confounding factors on child's nutrition status and the attitudes towards child birth intervals. A key informant interview (KII) was also used to validate data from both the questionnaire and the focus group discussion (FGD). Data was analyzed using Statistical Packages for Social Sciences (SPSS) version 16 where descriptive statistics were analyzed using means and frequencies. Chi square test was used to test for any relationship between the variables. A p value of < 0.05 was used to determine the level of significance. Results from the study indicated that 95.8% of the caregivers were the child's mothers. Study findings indicated that 58.5% of the caregivers were farmers earning less than a dollar a day (49.1%). The most common birth interval was 18 – 23 months with an almost equal number for 24 – 35 months 34.9% and 33.5% respectively. However, 81.5% of the caregivers would prefer a birth interval of 24 – 60 months. From the study, 78.7% of the caregivers obtain information on child spacing from the health facilities and this is reflected in the choices of the methods employed. From the focus group discussion the caregivers did not recognize breast feeding as an effective way of enhancing child spacing. The prevalence of stunting was 28.3% with 60% of the stunted children being boys. There was a significant relationship between child spacing and nutrition status ($p = 0.001$). The study indicated that 99.5% of the children were breastfed with 65.1% being exclusively breastfed. There was no significant relationship between the caring practices and nutritional status ($p = 0.67$). The government should strengthen and facilitate the implementation of policies that encourage mothers to space their children. More research should be carried out in this area to enhance generalization of results.

NUTRITION KNOWLEDGE, ATTITUDE, AND PRACTICES IN MANAGEMENT OF STAGE 5 CHRONIC KIDNEY DISEASE BY ADULT PATIENTS AT KENYATTA NATIONAL HOSPITAL, KENYA

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Stage 5 Chronic Kidney Disease (CKD) is the fifth stage of the quiet stages of Chronic Kidney Disease. Optimal nutrition, medical treatment and management are inevitable in improving the quality of life, reducing morbidity and thus mortality of the patients. While there is no clear data on prevalence and incidence rates in Kenya and most developing countries, Kidney Disease is one of the most serious and currently emerging non-communicable diseases and continues to undermine the health of all age groups in Kenya and globally. There is evidence that nutrition intervention greatly alleviates adverse effects of the disease. Paucity of adequate documentation on nutrition knowledge, attitude and management practices justified the need for this study. The purpose of this study was to carry out an assessment of nutrition knowledge, attitude, and practices by adult patients in management of Stage 5 chronic kidney disease. The study was carried out in the renal unit of Kenyatta National Hospital. The study employed cross-sectional analytical design at facility where simple random sampling technique and random number generator were used to get 103 respondents. The researcher administered questionnaire was used to collect information from the respondents. Key Informant Interview (KII) guide was used to get information from health care workers on patients' nutrition knowledge, attitude and practices in management of their condition. The qualitative and quantitative information obtained from the questionnaire was triangulated with literature review. Descriptive and inferential statistics was analyzed using statistical package for social sciences version 22. Chi-Square was used to find out the association between socio-demographic factors and nutrition knowledge of the patients. Correlation analysis test using Pearson correlation coefficient at 95% confidence with a probability value of $p < 0.05$ was used as a criterion for establishing statistical significance. The test was used to analyze relationships between nutrition knowledge, attitude and practices among the participants. The findings depicted participants with moderate nutrition knowledge levels regarding dietary intake. Their attitude to nutrition information and management practices was positive. Their ability to put nutritional management prescriptions into practice was poor as determined by duration on dialysis. There is need to improve nutrition knowledge levels of the patients, further enhance their attitudes by engaging participants to take up dietary practices for sustainable impact. This will alleviate complications arising from renal failure thus prolonging and improving the patients' quality of live. The study generated information that may be useful to the ministry of health in policy formulation and review of operational standards in nutritional management of the condition Other organizations dealing with provision of nutrition care and support services for Stage 5 CKD patients may use results from this study to frequently update their health workers on dynamic nutrition management of their patients. A longitudinal research of similar study is recommended. The study results will be communicated back to the facility to improve and enhance nutrition management practices of patients by health care workers in the facility.

DETERMINANTS OF SKILLED DELIVERY SERVICES UTILIZATION AMONG WOMEN OF REPRODUCTIVE AGE IN MIGORI COUNTY, KENYA

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Skilled delivery is a key intervention that greatly contributes to improvement of maternal and child health. By extension, skilled delivery is a component of maternal and childcare provided during pregnancy, at delivery and post-delivery. Irrespective of the quality of service provided during pregnancy, delivery process remains a risk and hence needs to be given relevant attention. Global data shows that in developed countries, over 99% of the women access skilled delivery as compared to low accessibility of below 50% in developing countries and 61.8% in Kenya. This study sought to investigate the factors that determine utilization of skilled delivery services among women of reproductive age in Suna-West Sub-County, Migori County, Kenya. The objective of the study was to establish the factors influencing utilization of skilled delivery services among women of reproductive health in Suna West Sub County. Mixed design model was used to assess the views of the study population. Quantitative data was collected through household questionnaires targeting women of reproductive age. Qualitative data, on the other hand, was collected through focus group discussions and key informant interviews among health service providers, traditional birth attendants and male partners. Independent variables, of the study, were; demographic, economic, socio-cultural, and physical factors; whereas, the dependent variable utilization of skilled delivery services. The analysis was done using the Statistical Package for Social Sciences (SPSS version 24) software and Ms. Excel (office 2010). Chi Square was used to test the relationships between variables. The findings showed that Suna West Sub-County has a higher rate of skilled delivery (74.6%) as compared to national average 61%. Key factors identified to determine utilization of skilled delivery services were parity, $p < 0.005$, $\chi^2 = 13$; level of education, $p < 0.005$, $\chi^2 = 27.616$ and ANC attendance $p < 0.00$ $\chi^2 = 30.706$; though not statistically significant, distance to health facility, time of operation of the maternity and availability of services were identified to have an influence on type of delivery. In addition, the study found high level of maternal knowledge on risks of pregnancy and negative beliefs on utilization of skilled delivery services. On the other hand, level of household income or partner's occupation had no significant relationship. The study recommends establishment of policies by the County government to enhance risk assessment and risk-based health education during pregnancy, both at the community and at the antenatal clinics. In addition, there is a need to invest in infrastructure and human resource to ensure the women are able to get the services at any time they visit the health facility.

ASSESSMENT OF AWARENESS ON VESICO-VAGINAL FISTULA AMONG WOMEN OF REPRODUCTIVE AGE IN KAWANGWARE SLUMS, NAIROBI CITY COUNTY, KENYA.

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Obstetric Vesico-Vaginal Fistula is a reproductive health problem mainly caused by prolonged obstructed labour and delay in seeking emergency obstetric care after delivery. In developing countries such as those in sub-Saharan Africa, obstetric Vesico-Vaginal Fistula continues to cause suffering to a number of women and their families. Women with obstetric fistula not only have to endure the negative physical and emotional impacts of the disease but also social and economic impacts which are also negative. Considering the suffering of families associated with this disease, we set out to investigate community awareness of obstetric fistula especially in areas with poor access to social amenities such as informal settlements. The main aim of this study was to assess the level of community awareness among women of reproductive age in Kawangware Slums of Nairobi City County, Kenya. The study mainly focused on community awareness, knowledge levels, risk factors and attitudes towards Vesico-Vaginal Fistula. The study used descriptive cross-sectional study design. Both quantitative and qualitative data were collected. Quantitative data was collected using questionnaires administered to women of reproductive age while qualitative data was collected using focused group discussion guides. The study targeted 422 adult women aged 18 years and above in Kawangware slums. Systematic random sampling was used to select respondents using a predetermined interval. Every fifth woman who met the inclusion criteria was included in the study. The researcher obtained ethical clearance from the Kenyatta University Ethical Review Committee prior to data collection and a research permit from National Commission for Science, Technology and Innovation. Informed consent was also sought from study respondents. Data was then cleaned and entered into a Microsoft excel datasheet for processing. This was later exported to SPSS version 22.0 for analysis. Descriptive data were presented using frequency tables, graphs and pie-charts. Inferential statistics were done to establish the relationship between variables using Chi-square tests done at 95% confidence interval and p-values of <0.005 considered statistically significant. Qualitative data from focused grouped discussions were triangulated with quantitative data as direct quotes or narrations from respondents. The results revealed that 56% of respondents had low awareness with scores of less than 5. 57% of respondents had low knowledge on occurrence of VVF. Knowledge levels were significantly associated with community awareness ($p=0.004$). Majority of risk factors were significantly associated with community awareness such as early pregnancy ($p=0.001$), delayed access to obstetric care ($p=0.006$) and prolonged labour. 67% of respondents had negative attitude towards Vesico-vaginal Fistula based on Likert scale scores. There were significant statistical association between attitude and community awareness ($p=0.010$). The study concludes that the respondents from Kawangware had low awareness levels, low knowledge levels and negative attitude towards Vesico-Vaginal Fistula. The findings will be availed to governmental and non-governmental organizations for structuring programs and strategizing on interventions targeting creation of community awareness as well as its prevention and management. These results would also be of use to the Ministry of Health for purposes of health education, policy formulation and implementation with regards to workable short and long-term Vesico-Vaginal Fistula interventions.

EFFECTS OF CHILDREN DIARRHOEAL DISEASES ON FARMERS' HOUSEHOLDS RESILIENCE IN EWASO NAROK SWAMP, LAIKIPIA COUNTY, KENYA

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The growing food insecurity in East Africa has led to an expansion of cultivation to wetland sites. Individuals use them for farming, which may expose them to the risk of contracting diseases. Disease can have wide-ranging implications on households, which has been addressed by this study. The main research focus was to determine the effects of children under the age of five years diarrhoeal disease on farmers' households' resilience in Ewaso Narok Swamp. A cross-sectional analytical study design was employed. Quantitative study entailed household questionnaires being administered in the two stratified zones in Ewaso Narok Swamp. Eastern zone comprised Thome/ Jennings area whereby 211 households were sampled and the western zone along Sosian/ Maralal road whereby 211 households were sampled making 422 households. Qualitative data collection, mainly to supplement quantitative data, entailed five household members being selected in both sides of the stratified zones for participation in Focus Group Discussions. Key Informant Interviews were also held with health care providers. An ordinal logistic regression model was fitted in order to determine both the diarrhoeal diseases effect on health and productivity on farmers' household resilience in Ewaso Narok Swamp. The study showed that the child under five year old diarrhoeal disease incident rate was 0.65. Ordinal logistic regression results revealed a statistically significant relationship between diarrhoeal diseases effect on health and farmers' household resilience. The chi square statistic indicated statistically significant relationship between typhoid fever ($\chi=4.659$, $p=.034<0.05$) and farmers' household resilience. Also, the chi square statistic further indicated statistically significant relationship between amoebic dysentery ($\chi=3.194$, $p=.050<0.05$) and farmers' household resilience. Diarrhoeal diseases effect on productivity losses revealed excessive time losses by breadwinner caregivers attending to the sick child as well as study time lost by school going children, acting as caregivers, were also very high. Ordinal logistic regression revealed a statistically significant relationship between diarrhoeal diseases effect on productivity and farmers' household resilience. The chi square statistic indicated statistically significant relationship between lost time taking care of the sick ($\chi=5.002$, $p=.013<0.05$) and farmers' household resilience. Thus, various household forewent income reduction due to time losses as a result of absenteeism from their workplaces which negatively affected their overall productivity. The study concluded that majority of the households were less resilience to diarrhoeal diseases with 273 (64.7%) of the farmers' households had low resilience to diarrhoeal diseases, 89 (21.1%) had mid resilience to diarrhoeal diseases while 60 (14.2%) had high resilience to diarrhoeal diseases. It was also established that there is a statistically significant relationship between diarrhoeal diseases effect on both health and productivity affects farmers' household resilience in Ewaso Narok Swamp. In summary, households should adopt mechanisms that best enable them to tackle stressful situations associated with diarrhoeal disease expenses through effective use of both financial and psychological coping strategy. Effective health policy decision making requires a concise picture of diarrhoeal disease burden in order to priorities allocation of resources. Thus, the results will inform health policy makers in achieving the universal health coverage. It will also inform health policy in achieving SDG number three (Good Health and Well-being) as outlined in United Nations Sustainable Development Goals.

PERCEPTIONS OF PRINCIPALS AND TEACHERS ON PHYSICAL EDUCATION TEACHING RESOURCES AND IMPLEMENTATION OF THE CURRICULUM IN PUBLIC SECONDARY SCHOOLS IN KISII COUNTY, KENYA

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The purpose of this study was to ascertain the adequacy of teaching resources for the implementation of Physical Education curriculum in public secondary schools in Kisii County. The study aimed at establishing the extent of adequacy of indoor and outdoor facilities, equipment and apparatus, trained PE teachers, textbooks and related reference materials, time allocated for teaching PE and maintenance of facilities and extent of implementation of the PE curriculum in public secondary schools in Kisii County. The study adopted the descriptive survey design. Stratified random sampling procedures were used to attain a sample of 76 head teachers and 76 Physical Education teachers in the 317 public secondary schools in the county. A questionnaire and an observation check list were used to collect the data from the respondents. The response rate was 91% with 70 head teachers and 68 PE teachers responding. The SPSS version 22 was used to analyze the quantitative data where frequencies, charts, graphs and percentages were used to present the data. One way ANOVA was used in testing of the hypotheses. On the adequacy of physical facilities and equipment the study revealed that all the schools had facilities for soccer, volleyball, netball and track athletics though they were inadequate. All the schools did not have adequate indoor facilities and none of the schools had a swimming pool. On the adequacy of teachers, 81% of the respondents indicated that the number of PE teachers was inadequate while 69% of the respondents indicated that time allocated for PE was inadequate. On the availability of textbooks and reference materials 80% of the respondents indicated that there were no textbooks and reference materials for teaching PE. The study recommends that the National government and the Kisii County government in partnership with parents and non-governmental organizations should partner to provide enough facilities and equipment to public secondary schools in the County for teaching and learning of PE. TSC should also employ more trained teachers to teach Physical Education in public secondary schools. The study finally recommends that PE should be made an examinable subject at KCSE as that is the only way to make all stake holders take the subject seriously.

DIETARY PRACTICES, BODY IMAGE, PHYSICAL ACTIVITY LEVEL AND NUTRITION STATUS OF POSTPARTUM WOMEN IN NAIROBI, KENYA

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The global prevalence of overweight and obesity has increased from 6.4% in 1980, 12% in 2008 to 39% in 2014. These statistics show rising prevalence of overweight among women of reproductive age in many regions including Sub-Sahara Africa. Studies indicate sub-optimal dietary intake, body

dissatisfaction, less physical activity levels and increase of body weight at postpartum period as the main contributors. It is also emerging from research done mainly in western countries that African women tend to have a more positive perception of overweight and obese bodies as compared to women of other races. Kenya's Nairobi County as reported by Kenya Health Demographic Surveys has had an increase of prevalence of overweight and obesity among women of reproductive age from 41% in 2008 to 48% in 2014. Many studies have been conducted on women's nutrition in Africa and Sub-Saharan region but few have focused on postpartum dietary practices, physical activity and body image. This study therefore determined dietary practices, body image, physical activity level and nutrition status of postpartum women in Kasarani sub-county. The study was cross-sectional analytical with quantitative approaches in data collection, analysis and presentation. The sample size consisted of randomly selected 433 postpartum women with infants 6-9 months of age. Dietary practices were determined by use of 24Hr dietary recall and Postpartum Dietary Practices Questionnaire while body image was determined by use of the Stunkard Figure Scale (SFS). Nutrition status was determined by Body Mass Index (BMI), waist circumference (WC) and waist to hip ratio (WHR) as classified by WHO. Physical activity level (PAL) was determined using Metabolic Equivalent of Task values (MET values) by WHO. Analysis of data was done by use of Statistical Package for Social Sciences (SPSS) software version 20. Dietary intake data was analysed using the Nutri-survey software. Frequencies, percentage, proportion, mean and standard deviations were used to describe data on dietary practices, body image, PAL and nutrition status categories as well as demographic and socio-economic characteristics. Bi-variate analysis was used to analyze associations between nutrition status and dietary practices. This study used multiple regression analysis to analyze relationship among dietary practices, body image, PAL and nutrition status. The criterion for statistical significance was a p-value of <0.05. Mean number of main meals, snacks and energy intake were 3 ± 0.22 , 1 ± 0.92 and 2589.29 ± 580.6 , respectively for the recalled day. Foods increased at postpartum included vegetables (66.7%), sugar sweetened hot beverages (87.6%), water (91.2%), pulses (49.2%) and cereals (47.8%). More mothers (64.4%) reported to have eaten more quantity of food at postpartum compared to pregnancy period. Food chosen was mainly due to affordability (75.1%). Sources of nutritional decisions were own knowledge (32.6%), health professionals (27.9%) and friends/relatives advice (29.6%). Only 31.4% mothers were satisfied with their bodies and 43.9% desired to lose weight. Majority (86.8%) of the mothers met the recommended WHO's MET values for activity level. The mean WHR was 0.86 ± 0.082 , WC was 85.99 ± 13.34 cm while BMI was 26.29 ± 5.06 . Dietary practices, body image and physical activity level significantly predicted nutrition status for the postpartum women. Findings of this study will be useful to the Ministry of Health and other stakeholders involved in developing and regulating maternal nutrition guidelines as they may influence policy review and practice in maternal nutrition and care at postpartum.

DIETARY DIVERSITY, NUTRIENT ADEQUACY AND NUTRITIONAL STATUS AMONG CHILDREN AGES 6-59 MONTHS FROM FEMALE HEADED HOUSEHOLDS IN LAUPULA VALLEY, ZAMBIA

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Good nutrition provides a vital foundation for children's development and is key to meeting their full growth potential. Good nutrition status is attainable with diversified diets and adequate intake of nutrients. However, nutritional status among children ages 6-59 months has persistently remained poor in Sub Sahara Africa with a considerable number of children who are stunted, wasted, and underweight. Similarly, in Zambia but specifically in Luapula Valley, Luapula province; 43% children were stunted, 21%

underweight and 13% wasted in 2013. Literature shows that nutritional status of children ages 6-59 months is worse in Female Headed Households (FHHs). Literature cites low dietary diversity and inadequate intake of nutrients as contributing factors to malnutrition. As established in many areas, dietary diversity is low, and diets are mainly of staple crops and little nutrient dense foods. However, data is limited on dietary diversity, nutrient adequacy and nutritional status among children ages 6-59 months in female headed households in Luapula Valley. Hence, the need for this study. The purpose of the study was to determine dietary diversity, nutrient adequacy and nutritional status of children ages 6-59 months in female headed households in Luapula Valley, Zambia. A cross-sectional analytical study design was used with sample size of 228 children ages 6-59 months from 228 FHHs. Proportionality sampling was used in all four districts of Luapula Valley. Researcher administered questionnaire was used to collect data on demographic, socio-economic characteristics, food consumption pattern, dietary diversity, nutrient adequacy and anthropometric data. Quantitative data collected from 24-hour recall was analyzed using Nutri-Survey software and Zambia Food composition tables so as to determine nutrient adequacy and dietary diversity score. Food consumption pattern was established by data obtained from 7-day food frequency questionnaire (FFQ). Anthropometric measurements i.e. weight, height/length and children date of birth, MUAC measurements and presence/absence of edema were used to determine nutritional status of children by use of ENA for SMART software, 2011. Qualitative data collected from Focus Group Discussion and Key Informant Interview was coded and analyzed under thematic areas of study. Study results showed that 81.6% of female headed households were poor. Children's mean consumption days of cereals, roots and tubers were 6.8 ± 0.76 , pulse, legumes and nuts 2.5 ± 2.4 , vegetables 5.7 ± 2.2 , fruits 2.4 ± 2.6 , flesh food 2.7 ± 2.5 , milk 0.03 ± 0.46 , fats and oils 1.5 ± 2.1 and sugar 0.32 ± 1.1 . Twenty nine percent of the children met minimum dietary diversity score (DDS) of ≥ 4 food groups and the mean DDS was 2.92 ± 1.03 . Children with adequate nutrient intake of energy were 28.9%, carbohydrate (38.6%), protein (76.3%), vitamin A (41.2%), vitamin B12 (10.5%), vitamin C (43.9%), calcium (14.9%), iron (83.3%) and zinc (1.3%). Stunted children were 45.2%, 20.6% were underweight, 6.6% wasted and 1.3% overweight. Wasting was 4.8% by MUAC and 5 children had oedema. Children's nutritional status correlated positively with household head age ($p=0.001$), household size ($p=0.001$), marital status of the head ($p=0.002$), number of under five years old children in a household ($p=0.046$), education of household head ($p=0.004$), social cash transfer ($p=0.005$), money spent on food monthly ($p=0.043$), light main source ($p=0.015$), market distance ($p=0.001$) and toilet availability ($p=0.04$). Children's dietary diversity positively associated with Height for Age Z scores (HAZ) ($p=0.021$) and Weight for Height Z scores (WHZ) ($p=0.015$). Positive significant correlations existed also between nutrient intake of energy with HAZ ($p=0.049$), protein with Weight for Age Z scores (WAZ) ($p=0.036$) and WHZ ($p=0.02$), Iron with HAZ and WAZ ($p=0.021$), and Zinc with WHZ ($p=0.045$). Intakes of energy ($p=0.027$), protein (0.006), vitamin C ($p=0.006$), vitamin B12 ($p=0.033$) and Zinc ($p=0.039$) significantly correlated positively with MUAC. This study therefore, recommends that there is need to foster programs that improve socio-economic status of female headed households, which will in turn improve dietary intakes, and by implication children's nutritional status. Studies to be conducted in all seasons of the year so as to determine whether the nutritional status and dietary intakes among the children differs by seasons.

DETERMINANTS OF POST ABORTION CARE UTILIZATION AMONG YOUTH SEEKING SERVICES FROM NAIVASHA AND NAKURU COUNTY REFERRAL HOSPITALS IN NAKURU COUNTY, KENYA

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Supervisors: Dr. Stanley Murigi Kimuhu

This study sought to assess determinants of utilization of post abortion care among youth seeking services from Naivasha and Nakuru County referral hospitals in Nakuru County, Kenya. The specific objectives of the study were: to determine demographic, social economic, and social cultural factors that influence time taken to utilize PAC, to determine time taken to utilize PAC, to assess health system factors that influence utilization of PAC, to assess the immediate outcomes of abortion and finally to investigate the enhancers of utilization of PAC. The study was guided by Andersen's and Newsman Model of Health Service Utilization and adopted descriptive and analytical cross-sectional design. Study population was youth aged 15-24years seeking PAC in the 2 hospitals during the study period. Key informants were the health providers in the department of Obstetrics and Gynecology. A total of 142 participants determined by Fisher's formula were recruited into the study. Purposive sampling was used to sample the 2 hospitals. Proportionate sampling was used to sample 35 participants from Naivasha County Referral hospital and 107 participants from Nakuru County Referral hospital. An interviewer administered structured questionnaire was used to collect data and an interview schedule was used to obtain information from the key informants. Data was analysed by SPSS software version 22. Continuous variables were summarized by descriptive statistics. Chi-square and ANOVA statistic were used to test the association between categorical variables and utilization of PAC at a statistical significance of $P < 0.05$. Research findings indicate that women characteristics that influenced time taken to utilize PAC were age ($p=0.018$), level of education ($p=0.031$), marital status ($p=0.043$) and occupation ($p=0.046$). There was a long delay in seeking PAC after the onset of pregnancy complication with an average of 39 hours and the longest delay being 480 hours. Increasing the level of education reduced time taken to seek care except for those who had attained tertiary level of education. Single women who were younger (14-19yrs) with unintended pregnancies, no gainful occupation, with induced abortions and no support from partners or relatives took longer to seek PAC. The health system factors which influenced utilization of PAC were a high number of referrals (57.04%) from lower facilities, distance from health facility, cost for care and transport, lack of means of transport, long waiting queues and long hospital waiting time (33.4% waited for more than 3 hours). Insufficient funds was cited as the main delay factor as more than one third of the respondents had no gainful source of income. 90% paid out of pocket (no health insurance) and reported the cost of care to be expensive. Knowledge on PAC was low as 45.77% were not aware of the benefits of prompt utilization of PAC. The outcome of abortion was low morbidity (63.4%). Factors significantly associated with outcome of abortion were; age group, marital status, highest level of education, and occupation with p values of 0.002, 0.033, 0.0172 and 0.0435 respectively. Those with severe or moderate complications were mainly unemployed (16.26%), casual laborers (8.13%), and lived far from the health facilities. Facilitators of utilization of PAC cited by respondents were; bringing PAC services closer to the community (41.3%) creating awareness of PAC within the community (31.2%) and reducing or abolishing fee for service (13.8%). This study recommends youth empowerment through education and income generating activities to increase uptake of PAC, advocacy of PAC services through community mobilization and health education to reduce stigma associated with abortions, County Government of Nakuru to address high number of referrals from lower level facilities, strengthen referral system from the community and reduce or abolish fee for service through implementation of universal health care.

COMPLIANCE TO DIETARY AND PHYSICAL ACTIVITY RECOMMENDATIONS AMONG TYPE 2 DIABETIC PATIENTS IN THIKA LEVEL 5 HOSPITAL, KIAMBU COUNTY, KENYA

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Dr. Albert Gachau.

Worldwide, diabetes mellitus is rapidly emerging as a major public health concern and increasingly been diagnosed in the developing countries including Kenya. Abundant literature supports the beneficial effects of healthy dietary habits and physical activity for improving and maintaining type 2 diabetic patient's glycaemic levels. Patient compliance to lifestyle modifications is difficult to initiate and sustain. As new lifestyles, imported dietary practices, and globalization take roots in the developing world. The aim of this research was to determine compliance to healthy diet and physical activity modifications amongst type 2 diabetic patients. The study dependent variable was compliance to diet and physical activity; Independent variables were socio-demographic characteristics, perception of health diet and physical activity modification and factors contributing to compliance and non-compliance. It was a hospital based descriptive cross-sectional study that used systematic sampling method, targeting a minimum sample size of 240 respondents. Data was collected by interviewing respondents using interviewer administered structured questionnaires and analyzed using SPSS version 21, Chi square statistics and odds ratio were used to test hypothesis. Among the 240 respondents recruited 52.5% were females with skewness of 0.260 (SE=0.845) and a kurtosis of -0.546(SE=1.741), the prevalence of healthy dietary habit was 90.4% and 55.8% complied with physical activity lifestyle recommendations. Employment status (p value=0.045); age (p =0.019) and education (p =0.045) were significantly associated with compliance with physical activity while only age (p -value=0.005) was significantly associated with compliance to dietary habits. Majority of respondents 207(86.3%) understood that both physical activity and healthy dietary habits play role in diabetic management. A significant number of females 111(88.1%) and 110(87.3%) and males 99(86.8%) and 99(86.8%) perceived physical activity has role in management of type 2 diabetes and control of sugar respectively. Financial constraints 194(80.8), granting self-permission 111(46.3%) and eating out 98 (40.8%) were common barriers to recommended dietary habit compliance while having busy schedule 129(53.8%) and weather especially during cold seasons 127(52.9%) were cited as most common barriers to complying with physical activity. Age (p =0.005) and employment (p =0.038) were associated with compliance to health diet and physical activity respectively. The compliance to healthy dietary habits recommendations is higher than the rates of physical activity from interviewed respondents. Therefore, there is need to put more effort in exploring patient's background, moral, knowledge, behaviour and emotional supports (from friends, spouse and family), barriers, ability and readiness to initiate and willingness to sustain recommended lifestyle change that influences patient's compliance to recommended lifestyle modifications.

DETERMINANTS OF POST CAESAREAN SECTION WOUND SEPSIS AMONG POSTNATAL MOTHERS AT KENYATTA NATIONAL HOSPITAL, NAIROBI CITY CPOUNTY, KENYA

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Surgical site infection (SSI) is one of the most common post cesarean section complications among post-operative mothers. The global incidence of SSI ranges from 3% to 15% in the developed and developing countries respectively. The risk of infections occurring after a cesarean section is 5-20 times more than that of a normal delivery. It accounts for 10% of the postpartum maternal infections in pregnancy-related mortalities and occurs within 24 hours and up to 4 weeks after the surgery. The cases are more prevalent in developing countries with a majority of them reporting the incidence rate of more than 10%. At Kenyatta National Hospital, these cases are observed to be on the rise. The study aimed at establishing the determinants of post-cesarean section wound sepsis. This was a cross-sectional study conducted in post-natal wards and maternity theatre of Kenyatta National Hospital in the month of September/October 2018 after approval from Kenyatta National Hospital and University of Nairobi (KNH/UoN) ethics and review committees of the facility to which the author is affiliated, Kenyatta University scientific steering committee and National Commission for Science, Technology and innovation (NACOSTI). Semi-structured questionnaires were administered to 272 systematic, randomly selected respondents. Data was cleaned, coded, and entered to Microsoft Excel 2016 and later transferred to Statistical Package for Social Sciences (SPSS) version 21 for analysis. Descriptive statistics were performed to examine the demographics and incidences of surgical site infections. Odds ratios, 95% confidence intervals, and p-value set at 0.05 were used to determine associations between respondent's characteristics and sepsis. The mean age of the patient participants was 27.3 years (SD=5.0). The incidence of SSI was 10.4% (95% CI 6.4-14.4). Most (64.4%) of the patients had not heard of post-cesarean section wound sepsis. Most of the patients (72.1%) always washed their hands before touching the wound dressing, and a significant majority (94.0%) of the healthcare workers reported that patients were given prophylactic antibiotics before going for cesarean section. Socio-demographic factors were not significantly associated with sepsis ($P=0.477$). However, a participant who made 3 or more antenatal visits before coming for the caesarian section was significantly associated with minimal chance of sepsis OR 0.2 [95% CI 0.1-0.8], P value 0.021. In conclusion, the incidence of SSI at KNH was found to be 10.4% among women who have undergone caesarian section translating to one in 10 women undergoing cesarean delivery developing SSI. At most half of the healthcare workers had not gone for institutional training on infection prevention and control. The study recommendations highlights that there should be measures in place to reduce the number of incidence cases in the facility. The findings also highlighted the need to have in place improved training among the healthcare workers and created more awareness among mothers on post caesarian wound sepsis. The knowledge is vital towards the realization of universal

healthcare as one of Kenya's Big Four Agenda since data is needed for planning and monitoring of various health interventions.

HEALTH INFORMATION TECHNOLOGY UTILIZATION IN PATIENT SAFETY PROMOTION BY HEALTH CARE WORKERS, MAMA LUCY KIBAKI HOSPITAL, NAIROBI CITY COUNTY, KENYA

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Health IT is an application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision-making. The advantages of health information technology (IT) in health care includes facilitating communication between health care providers; improving medication safety, tracking, and reporting; and promoting quality of care through optimized access to and adherence to guidelines. Health IT systems permit the collection of data for use for quality management, outcome reporting, and public health disease surveillance and reporting. The study aimed at assessing Health Information technology utilization in patient safety promotion in Mama Lucy Kibaki Hospital (MLKH), while focusing on the following objectives; establish the role of Health Information Technology (HIT) in promoting Patient safety at MLKH, Nairobi City County Kenya. Specifically, identifying HIT technological factors, determining HIT organizational factors and describing the individual system components influencing utilization of HIT in promoting patient safety. The researcher adopted a Descriptive cross-sectional research design where a sample size of 147 derived using Fisher's formula. The researcher adopted a questionnaire and Key Informant guides for data collection. Pretesting for validity and reliability of tools was done at Mbagathi Sub County Hospital. Cronbach's alpha was used to calculate the reliability of the data collection tools, with the test conducted on 32 items for the questionnaire and 8 items for the Key informant guide. The reliability results produced alphas of 0.80 and 0.84 respectively, compared to an alpha of 0.7, which was the lower bound for acceptable reliability. Quantitative data was analyzed using content analysis; qualitative data was coded and analyzed using Statistical Package for Social Science (SPSS) version 22.0 and STRATA 12 software for windows where association of variables was tested using chi-square for comparisons. The study found out that 1) Most respondents 66 (56%) felt that HIT played a key role in promoting patient safety. EMR, CPOE and DSS were found to be important HIT useful in ensuring patient safety at the hospital. Following binary logistic regression, the study found sufficient evidence to suggest associations between effective patient safety promotions through HIT as follows; similarity of access passwords (OR=1.2 [95% CI 1.075-1.600]); periodic trainings on HIT (OR =2 [95% CI 1.456-2.027]); involvement of HIT users (OR=1.5 [95% CI 1.180-1.654]); auto logout of users (OR=0.2 [95% CI 0.052-0.801]), knowledge and use of EMR (OR=0.4 [95% CI 0.195-0.877]); notification on patients' identification number (OR=3.6 [CI 0.072-0.572]) and presence of backups to the systems (OR=0.2 [95% CI 1.306-9.916]). The study also observed that doctors were more likely to perceive the utility of HIT in promoting patient safety compared to pharmacists (OR= 0.56 [95% CI 0.131-2.135]) this showed that the results were significant at 95% CI. Based on the findings, it was

concluded that staff knowledge and experience on use of HIT improved patient safety, while HIT effectively improved storage, retrieval, automation and confidentiality issues pertaining to patient safety. The study recommended continuous evaluation and monitoring of patient safety outcomes by promotion and modification of HIT in the healthcare delivery in MLKH.

SCHOOL OF PURE AND APPLIED SCIENCES

PREVALENCE OF ENTERO-DIARRHOEARIC BACTERIA FROM WATER DAMS AND STOOL SPECIMENS OF PATIENTS ATTENDING GIRIAMA DISPENSARY IN KAYAFUNGO, KILIFI COUNTY, KENYA

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Diarrhea is a common problem in humans, mostly in children under five years of age in developing countries. Most families in Kayafungo have no access to clean water and reports of incidences of waterborne diarrhea diseases, including amoebiasis and typhoid. No study has been carried out to investigate the prevalence of enterodiarrhoeic bacteria and the diarrhea related diseases in Kayafungo. The main objective this study was to compare the prevalence and antibiotic sensitivity of entero-diarrhoeic bacteria isolated from water dams in Kayafungo Kaloleni district Kilifi County and stool specimens from outpatients attending Giriama dispensary. Water samples were collected from dams using a sterile plastic scooper by submerging them to a depth of about 20 cm at the deep shallow end of the dam, inlet and animal drinking points. A total of 20 samples were collected from each dam per month from June to end of August 2014 and filled into the pre-sterilized polypropylene bottles of 500 mL. Field tests were carried out to determine selected physico-chemical properties such as, Temperature, dissolved oxygen, electrical conductivity, turbidity and PH were done in situ using a portable universal multiline P4 WTW (Wilhem, Germany). The electrical conductivity had a significant difference between the dams with the highest conductivity recorded at Mwabayanyundo at $96.83\mu\text{Scm}^3$ and lowest Gotani dam at $54.88\mu\text{Scm}^3$. There was a significant difference in dissolved oxygen between the dams with Gotani dam recording the highest dissolved oxygen at 3.634mgL^{-1} and lowest at Mwabayanyundo at 2.418mgL^{-1} ($P=0.0001$). mean temperature was not significantly different as it ranged from 27 to 30°C . There was no significant difference in PH and temperature between the dams ($P=0.845, 0.821$) respectively. Mean bacterial isolates was significant between the three dams with Mwabayanyundo recording the highest (1.989 ± 0.41). A total of 64 samples were collected from the patients per month in the period of June to end of August 2014. Data collection questionnaire was used in recording the age, gender and source of water. Water and stool samples were analyzed at the Coast General Hospital laboratory. Isolation of the bacteria from water and stool specimens was done using enrichment and selective media and was characterized using colony morphology and relevant biochemical tests such as Indole test, Methyl red test, Voges-Proskauer test, Citrate test, Urease test,

Triple sugar iron test, Coagulase test and API 20E system. The Kirby Bauer technique was used to determine the antimicrobial sensitivity of the bacteria to the antibiotics commonly used in treatment of enteric infection. The bacterial pathogens isolated from the dams were Salmonella spp., Proteus spp., Escherichia coli and Klebsiella spp. Salmonella spp. isolated from water dams had highest resistance to Ceftriaxone and the least resistance was displayed in Ofloxacin whereby none was resistant. The frequency of the isolates from the dispensary was Escherichia coli, Salmonella typhimurium, Klebsiella spp., Shigella flexneri and Staphylococcus aureus. The highest resistance of the clinical isolates was displayed in Sulphamethoxazole and least resistance to Ofloxacin. There was a strong relationship between the bacterial isolates and physico-chemical properties of water. From the study the common types of pathogenic bacteria among the population in Kayafungo and water dams are Escherichia coli, Salmonella and Shigella spp. There is need to provide piped water in kayafungo location for safety of the residents and carry out more research to determine the factors contributing to multi-drug resistance.

SEROPROFILE, RISK FACTORS OF HEPATITIS B, C, SYPHILIS AND DISEASE STAGE AMONG HIV PATIENTS ATTENDING ENGINEER HOSPITAL, NYANDARUA COUNTY, KENYA

STAGE AMONG HIV

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Hepatitis, especially B, C and Syphilis co infections are very common among HIV infected individuals and their manifestation is a growing public health concern. These diseases share similar modes of transmission with HIV. However, at earlier stages these infections are myriads that mirrors one another hence they are easily missed. Due to this particular challenge, the infection prevalence of the cases is not fully known in most areas of the country, with rural settings of Nyandarua being one of them. This study was therefore aimed at determining the Seroprofile, risk factors of hepatitis B, C, Syphilis and disease stage of HIV infected individuals attending HIV care clinic. A hospital based cross sectional study was conducted and socio-demographic data collected using a well-structured questionnaire during the period of between July and September 2018. A total of 385 patients consisting of 263(68.3%) female and 122(31.7%) male were consecutively sampled during patients visit. The blood samples were screened for antibodies against HBV (HBsAg), HCV (anti HCV) and Syphilis (anti syphilis) using rapid test strips (CTK Biotech USA test strips) and confirmed by ELISA (cobas analyser). Their CD4 counts were also estimated using CyFlow® Counter technique (Sysmex Partec analyzer machine). From the analysis, the overall prevalence of co infections was HBV (3.9%), HCV (0.78%) and Syphilis (3.1%) among HIV patients attending comprehensive care clinic. The farmers, primary education level, age of 45-54 years, marital status and CD4 levels < 200 count/ul had high exposures of these co infections. However gender ($\chi^2= 8.822$, $p = 0.008$) was found to significantly be associated with co infections of HBV. Equally, CD4 levels had a significant relationship with age ($\chi^2= 35.096$, $p = 0.028$) and treatment ($\chi^2= 34.778$, $p = 0.010$).The overall mean of patients CD4 levels were 227 count/ul and this indicates the advanced stage of immunosuppression. Most of the patients had low detectable levels of HIV viral load (99%) with 1% high detectable level. However, HIV viral load had no significant relationship with CD4 levels ($\chi^2= 0.878$, $p =$

0.831).The rates of HBV and HCV infections were found to be lower than the national prevalence while Syphilis was found to be higher.The age, occupation, education level, marital status and CD4 T cells levels influenced the rates of HBV, HCV and Syphilis exposures although they were not significant at $p \leq 0.05$. As the HIV/HBV/HCV/Syphilis co infections are clinically consequential in people living with human immunodeficiency virus/Acquired immunodeficiency syndrome, there is need for constant screening of the population for these particular infections since they are common.

AN EVALUATION OF QUALITY AND BRANDS OF AMOXICILLIN FORMULATIONS MARKETED IN NAIROBI CITY COUNTY, KENYA

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Antibiotics are among the most counterfeited anti-infectious medicines in developing countries due to high demand. Amoxicillin is among the most prescribed, affordable and easily accessible antibiotic in Kenya. It is a broad-spectrum antibiotic hence commonly used for chemotherapy. Administration of poor-quality medicine possess the potential risks of treatment failure, emergence of resistance, side effects, and /or death to patients. This study sought to determine the quality and identify the various brands of amoxicillin and its combination amoxicillin/clavulanic acid marketed in Nairobi County. Nairobi is the capital city of Kenya, gateway for imports and exports and the headquarters to most of the pharmaceutical distributors and wholesalers. Ten wards in Nairobi County representing different socio-economic settings were purposively sampled for the study. A detailed questionnaire was used to collect background data on brands of amoxicillin and amoxicillin/clavulanic acid in the market. A total of 106 different brands of amoxicillin and amoxicillin /clavulanic acid formulations were found in the market, 85 were imports while 21 were locally manufactured. Fifty-three samples were analyzed with reference to the United States Pharmacopoeia monograph. Amoxicillin and clavulanic acid content for oral suspensions were determined immediately after reconstitution and 7 days thereafter to determine their stability during prescription period. On day seven 23.1% (3 out of 13) of amoxicillin and 66.7% (8 out of 12) amoxicillin/clavulanic acid oral suspensions presented levels below recommended limits. Potency determination for amoxicillin capsules and amoxicillin/clavulanic acid tablets showed 33.3% (2 out of 6) and 13.6% (3 out of 22) failure rate. For capsule and tablets dissolution tests, there was 17.9% (5 out of 28) failure rate. Overall, 30.2% of the drugs analyzed failed to comply with pharmacopoeia limits. It is therefore worth noting that quality of some amoxicillin formulations in Nairobi County is not to standard. This affirms the need for regular post market surveillance to inform on the situation of antibiotics quality in the Kenyan market.

IN VIVO HYPOGLYCEMIC ACTIVITY AND SAFETY OF SELECTED MEDICINAL PLANTS USED IN THE MANAGEMENT OF DIABETES MELLITUS IN ELGEIYO-MARAKWET COUNTY, KENYA

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Diabetes Mellitus is a group of metabolic disorders sharing a common underlying feature of hyperglycemia with disturbances of carbohydrate, protein and fat metabolism. The disease may present with characteristic symptoms such as polydipsia, polyuria, polyphagia, blurring of vision, and weight loss and in its most severe forms, ketoacidosis or a non-ketotic hyperosmolar state may develop and lead to stupor, coma and, in absence of effective treatment, death. Hyperglycemia may be as a result of defects in insulin secretion, insulin action or both. The use of conventional antidiabetic drugs may have adverse effects including hematological, cutaneous and gastrointestinal reactions, hypoglycemic coma, flatulent, diarrhea and impairment of liver and kidney functions. Some do not lower blood sugar when used alone and require combination therapy. The aim of this study was to determine the antidiabetic activity and safety in a rat model of five plants, *Maerua subcordata* (Gilg) De Wolf, *Chasmanthera dependens* Hochst, *Pappea capensis* Spreng, *Syzigium cordatum* and *Mayrtenus undata* (Thumb) traditionally used to manage diabetes mellitus (DM). The plant parts were collected, dried, crashed into fine powder, extracted using distilled water at 60°C and lyophilized using a Freeze Dryer, packaged in air tight containers and stored at -20°C ready for use. The extracts were orally and intraperitoneally screened in alloxan induced diabetic mice for their hypoglycemic activity at doses of 25, 48.4, 93.5, 180.9 and 350 mg/kg body weight. Diabetes in mice was induced using 186.9 mg/kg body weight of alloxan monohydrate. Negative controls included normal and diabetic mice orally and intraperitoneally administered with physiological saline while positive controls included diabetic rats administered with glibenclamide as oral and insulin as intraperitoneal reference drug. The safety of the extracts was studied in mice orally and intraperitoneally administered with 450, 670, and 1000 mg/kg body weight daily for 28 days by recording the changes in body and organ weight, hematological and biochemical parameters and histopathology. Mineral composition of the extracts was estimated using total reflection X-ray fluorescence system (TRXF) and atomic absorption spectroscopy while the types and quantities of phytochemicals present were assessed using standard procedures. Results revealed hypoglycemic activity in three out of the five studied plants at the five different doses when given either orally or intraperitoneally. Results revealed significant difference between the control and experimental mice on total white blood cell and differential white blood cell count, RBC, PCV, Hb, MCV in mice models treated with *Maerua subcordata* and *Mayrtenus undata*, α -AMYL in those treated with *Syzigium cordatum* and *Pappea capensis* and TC and LDL-C in *Chasmanthera dependens* extract treated mice. There was significant loss of body weight and loss or gain of organ weights. At tissue level, there was accumulation of inflammatory cells in mice treated with *P. capensis* and in mice treated with high doses of *Mayrtenus undata* and *Chasmanthera dependens*. Phytochemicals present included saponins, flavonoids, alkaloids, tannins and total phenols. All the analyzed trace elements were within the recommended daily allowance (RDA) except for Manganese in *P. capensis*. In conclusion, the studied

plants exhibited safe hypoglycemic activity which was contributed by the phytochemicals and mineral elements present in these plants extracts. The study recommends continued use of the three studied plant extracts at low doses. Similar studies should be carried out using higher animals including man.

ELECTROCHROMIC CHARACTERIZATION OF NiO AND NiO:MnO₂ DEPOSITED THIN FILMS FOR SMART WINDOWS APPLICATION

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Providing electrically driven indoor cooling system and glare reduction due to excessive incident solar radiation through ordinary glass windows is causing electrical burden both at personal level and globally. Increased electrical demand may warrant use of unclean electrical power sources leading to global warming effects due to carbon emissions. Incident solar energy can be modulated using a smart window system which change its optical states to either coloured or bleached. The dynamic switchable glass makes use of electrochromic properties of some transition metal oxides and derivatives of some organic compounds. More studies have shown that transition metal oxides like WO₃, NiO, TiO₂, and MnO₂ among others are either anodic or cathodic electrochromes. However, electrochromic studies on NiO has been promising but with little success due to the resulting insufficient electrochromic properties like short cyclic life time, long switch time responses and low coloration efficiencies (CE) or contrast ratio. This work aimed to prepare an electrochromic thin film based on NiO and co-deposit it with MnO₂ particles to improve its electrochromic properties. Thin film samples were cathodically electrodeposited on conductive ITO glass slides by varying deposition periods between 100 seconds to 400 seconds. Electrochemical, optical and electrochromic comparative studies were done on both pure NiO samples and those codeposited with MnO₂. Both samples deposited at 100 seconds denoted as N100 for pure and NM100 for co-deposited gave the improved electrochromic properties, the codeposited sample NM100 showed charge reversibility of near 1:1 for redox process while N100 gave 0.72:1 when both cycled at 20 mV/s scan rate between 0.0 mV to 800 mV. Optical stability and colouration efficiencies of the bleached and coloured states was determined at $\lambda_{max}=450$ nm during the 1st cycle and after 100 write-erase cycles. The codeposited samples proved more optically and electrochemically stable than pure ones. Sample NM100 maintained 80.47% of its bleached state while pure sample N400 dropped to 50.0% after 100 cycles respectively. The co-deposited sample NM100 achieved the highest colouration efficiency and stability giving 120.97 cm²/C in the 1st cycle and slightly dropping to 114.164 cm²/C after 100 cycles while pure sample N100 gave CE at 73.287 cm²/C and dropping to 39.60 cm²/C in the 1st and 100th cycles respectively. The findings show that cathodically co-depositing pure NiO with MnO₂ greatly improves its cyclic reversibility lifetime, coloration efficiency (CE) and optical stability. Since smart windows work on the basis of electrochromic behavior of the electrochrome element; the optical and cycle life stability, fast switch time response, low operational voltages and high coloration efficiency of the co-deposited sample will ensure smart windows are more energy efficient devices.

COMPARISON OF MALARIA RAPID DIAGNOSTIC TESTS AT HEALTH FACILITIES AND COMMUNITY LEVEL IN SIIAYA COUNTY KENYA

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Malaria remains a major public health problem affecting an estimated 40% of the world's population and resulting in more than 650,000 deaths worldwide every year. The emergence and rapid spread of parasite resistance to affordable, easy to use and widely available anti-malarial drugs such as chloroquine and sulfadoxine-pyrimethamine (SP) has prompted many countries in endemic areas to switch to the more effective artemisinin-based combination therapies (ACTs). To mitigate against the emergence of resistance and improve patient care, the World Health Organization (WHO) recommends parasitological confirmation by microscopy or Rapid Diagnostic Tests (RDTs) before treatment. Malaria diagnosis by microscopy has many challenges including need for electricity, well trained staff and high quality reagents which are often lacking in areas where malaria is endemic. In such areas RDTs provide an alternative diagnostic method since they do not require highly trained personnel and can be performed by the community health workers. However, there is limited information in the performance characteristics (sensitivity, specificity, positive and negative predictive values) of RDTs when performed in health facilities or in the community. In this study, the performance characteristics of SD Bioline malaria Ag P.f/ pan RDT in a cross-sectional survey was compared to that from four health facilities in an area of high malaria transmission of Siaya County, western Kenya. Expert microscopy was used as a gold standard and factors affecting their accuracy were explored using statistical analysis software (SAS) version 9.2. A total of 1223 children below five years; 604 from cross sectional survey and 619 attending four health facilities (HFs), were included in the study. Sensitivity and specificity of RDTs in the cross sectional survey were 96.2% and 48.1% respectively giving positive predictive value 49.9 and negative predictive value of 99%. The health facility study had a sensitivity of 99.5% and specificity of 54.4% with positive predictive value and negative predictive value of 84% and 98% respectively. The difference in RDT sensitivity and specificity between cross sectional survey and at HFs was statistically significant ($p=0.001$). The health facility prevalence of Plasmodium spp. infection was 70.60% by microscopy and 83.68% by RDT while in the cross sectional survey the prevalence was 34.93 % by microscopy and 67.38 % by RDT. The result of this study showed that there was a difference in the performance characteristics of RDTs carried out in health facilities and at the cross sectional survey. However, when the analysis of sensitivity is based on parasite density, the performance of RDTs in both health facility study and during cross sectional survey is comparable to expert microscopy. Deployment of RDTs, coupled with supportive supervision can potentially reduce misdiagnosis of malaria as a result of either over diagnosis or under-diagnosis.

PHYSICO-CHEMICAL AND BACTERIOLOGICAL QUALITY OF RIVER WATER IN SIGOR DIVISION-WEST POKOT COUNTY, KENYA

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Water is absolutely essential to sustainability of life. Quality as well as the quantity of clean water supply is of vital significance to the welfare of mankind. Water-borne diseases are among the main challenges to public health globally. In Kenya, most of the rural populations do not have access to potable water for use hence turning to rivers, streams, wells and ponds as their main water sources for their domestic use. The residents of the study area, Sigor Division of West Pokot County, similarly face the challenge of inadequate potable water hence use river water for drinking and for other domestic purposes. This puts them at the risk of exposure to water-borne diseases such as typhoid and diarrhea. This study sought to find out the Physico-chemical and bacteriological properties of water from selected water sources in the Sigor Division. Water samples were collected from Muruny, Weiwei, Chesogon and Lomut rivers into sterile bottles of 500 ml and transported to the laboratory for analysis. Physico-chemical conditions; temperature, pH, conductivity, alkalinity, salinity, and water color were determined at the source. To determine the microbial quality of water from the rivers, the most probable number of coliforms, total plate count, fecal coliform count, and presence or absence of *E. coli* were determined. The bacteria were morphologically identified using XLD, selenite F broth, MacConkey agar, SS agar, TCBS broth and confirmed by biochemical and serological tests. Descriptive statistics and one way ANOVA were used to analyze the data. The average number of bacteria in the rivers during the wet season showed that; river Wei Wei (259.000 x103 CFU/ml), river Muruny (288.167 x103 CFU/ml) and Lomut (262.667 x103 CFU/ml) had significantly higher numbers of bacteria than river Chesogon. During the dry season, river Wei Wei (80.667 x103 CFU/ml) had higher CFU than all the other rivers and also recorded the highest bacterial load. Comparison of the MPN values in the wet and dry seasons showed a significant difference from one river to the other across the seasons. Water temperatures, conductivity, dissolved oxygen (DO) and turbidity were significantly below the WHO accepted standards. However, water pH was significantly higher than the acceptable WHO level (pH 7.0, $p = 0.0001$). The presence of high levels of coliforms in the rivers raises concerns over the quality of water used by the residents. It is highly recommended that fecal coliforms counts/100 ml for human utilization should be zero. Study findings indicated fecal pollution in all rivers, implying a serious public health hazard. The water pH was significantly high and this might have been due to the increase in the discharge of domestic effluents into the rivers. River water from the study area was evidently polluted and using it for drinking could predispose the residents to water-borne diseases. To reduce the chances of infections, the residents should be sensitized on easy and affordable ways of water treatment. The County Government of West Pokot should initiate sanitation programs and propagate them through environmental education throughout the communities in the river catchments to prevent pollution of water bodies and consequent transmission of water-related diseases. Sensitization and awareness creation programs should be emphasized to educate locals to safeguard the precious rivers and their surroundings.

PROPHYLACTIC ACTIVITY OF HIV-PROTEASE INHIBITORS AGAINST MALARIA AND THEIR INTERACTION WITH ANTIMALARIAL IN MALE MICE

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Malaria and HIV/AIDS have a wide geographical overlap in several tropical regions. This makes co-infection of the two diseases very common. Due to enhanced global coverage of antiretroviral drugs (ARVs), HIV/AIDS patients are under ARVs including protease inhibitors (PIs). Just like HIV, malaria

parasite also depend on proteases in their life cycle. Therefore, PIs against HIV could offer some level of antimalarial activity by targeting the parasite proteases. This study sought to investigate the antimalarial activity of HIV PIs and their interaction with antimalarial drugs in mice models. The effective dose 50 (ED50) for three PIs ritonavir, saquinavir and nelfinavir and the antimalarial drugs artemether and lumefantrine was assessed using Peter's 4- day suppressive test against Plasmodium berghei. Chemosuppression was assessed on day 7, 10 and 13 after antimalarial and PIs treatment. Prophylactic activity was assessed 2h, 3h and 5h post drug administration (pda). Interaction of PIs with artemether and lumefantrine was also determined using the suppression test. The ED50 was calculated using regression equation in statistica software version 12.5. Student's t-test was used to compare the mean parasitaemia of the control and treatment groups. Drug interaction data was analysed using one-way ANOVA and Tukey's test. The analysis were done using SPSS version 22. Artemether, lumefantrine, ritonavir, saquinavir and nelfinavir had ED50 values of 1.04, 1.67, 3.84, 4.86 and 4.92 mg/kg, respectively. Antimalarial drugs had significant ($p < 0.05$) chemosuppression activity throughout and lumefantrine was more effective (67.7% - 84.5%) than artemether (24.5% - 73.6%). For PIs, on day 10 pi, ritonavir had significant ($p < 0.05$) antimalarial activity (24.5%) as compared to saquinavir (13.3%) and nelfinavir (9.8%). For prophylactic activity ritonavir and nelfinavir had significant ($p < 0.05$) parasitaemia suppression at 3h pda while for saquinavir it was 5h pda. Drug interaction studies indicated that drug combination were more effective than stand-alone but the suppression was only significant ($p < 0.05$) for ritonavir/artemether (93.2%) relative to artemether alone (80.4%). This study shows that protease inhibitors have chemosuppressive and prophylactic activity against malarial infection. There was enhanced suppression of parasite load by PIs co-administered with ACT partner drugs artemether or lumefantrine, and the interaction of the two classes of drugs ranged from additive effect to synergy. The absence of antagonism in all combinations was remarkable with implied clinical relevance that the co-use of HIV-PIs with first-line antimalarial drugs have no adverse effect.

PREVALENCE AND GENETIC DIVERSITY OF HEPATITIS A AND B VIRUSES AMONG JAUNDICED PATIENTS AT COAST GENERAL HOSPITAL, MOMBASA COUNTY, KENYA

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Viral hepatitis is a great public health problem world over. Hepatitis A and B are

among the viruses that lead to hepatitis infection. However, these viruses are known to lead to high morbidity and mortality rates especially in both high-risk populations like intravenous drug users and in settings with poor sanitations. Nevertheless, the levels of infection especially among individuals visiting hospital with jaundice and myriad high fever have not been validated. Generally, during acute stage of most infections, patients present with similar kind of symptoms which may lead to wrong diagnosis or delay in patient management. This study was therefore aimed at determining the prevalence of these viruses by age, gender and genetic diversity of HBV among jaundice patients in and outpatients in Coast General Hospital, Mombasa County, Kenya. A total of 222 blood samples were drawn from consenting study participants recruited from outpatients and those hospitalised in medical wards, paediatric clinic, hepatic clinic and HIV comprehensive care clinics during the period between February and August 2018. The Blood samples were screened for HBsAg in HBV and anti-HAV IgM for HAV. For positive cases, viral DNA was extracted and partial HBV-pol gene was amplified by nested Polymerase Chain Reaction, directly sequenced and the generated sequences analysed using MEGA X software. The generated

sequences were aligned with reference sequences using Clustal W 1.6.6. software, joined using neighbour joining software and finally trees viewed using Fig Tree software at 1000 replicates of bootstrap values. From a total of 222 patients screened, no HAV detected and 47(21.2%) for HBV were detected. Among those infected with HBV, 8(6.5%) were females and 39(39.8%) were males. Individuals aged between 19-28 years were most affected ($p < 0.001$) with elderly aged above 55.1 years 0(0.0 %) were not affected. Occupation was a risk factor with unemployed participants most infected 43(28.3%) ($p=0.002$). From the phylogenetic analysis, the predominant HBV genotype was A2 35(77.8%) followed by genotype A1 7(15.6%) with HBV genotypes A3, B and C2 which have never been isolated in Kenya but were found to be in circulation in this study; each occurred at 1(2.2%). The detected prevalence of HBV in Coast General Hospital indicates possible increasing trends in HBV infections with HBV genotype A2 being the most predominant genotypes circulating in coast regions unlike the rest of the country. We therefore suggest a continuous surveillance of HBV infections and tracking of HBV genotypes.

INVESTIGATING THE OPTICAL AND ELECTRICAL PROPERTIES OF Cu₂O AND ZnS: Al THIN FILMS FOR SOLAR CELL APPLICATIONS

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Semiconductor materials have been used in fabrication of a variety of electronic devices for example solar cells, photo-detectors, integrated circuits (ICs), light emitting diodes (LED) among others. A lot of focus is on thin film solar cell due to the rising need for low cost and renewable sources of energy. A variety of semiconductor materials like Ge, Si, Al, GaAs, CuInSe₂, have been employed in fabrication of thin film solar cells. Cu₂O and aluminum doped ZnS thin films are promising materials for the development of future generation low cost and higher efficiency thin film solar cells. Cu₂O thin film has a low band gap and high absorption co-efficient while ZnS:Al has good optical transmission in the visible spectral range. However, very little data in literature is available on Cu₂O-ZnS:Al p-n junction. Therefore in this work, Cu₂O and ZnS:Al thin films were coated on glass slide by DC reactive sputtering and evaporation methods, respectively using Edward Auto 306 evaporation system. Cu₂O- ZnS:Al p-n junction was fabricated by DC reactive sputtering evaporation methods on a glass substrate. Transmittance and reflectance of both Cu₂O and ZnS:Al thin films were measured using Spectrophotometer 3700. Absorption of the thin films was calculated from the transmittance and reflectance data. The transmittance data was analyzed by scout software models to obtain band gap. Transmission of Cu₂O films decreased from 43% to about 30% for films with thicknesses 50 nm to 250 nm. All the films showed high absorption of above 50% within the visible region. Absorption of Cu₂O films increased with thickness, with highest absorption of about 60% for thin films of thickness 200 nm. For ZnS:Al, transmission increased from 68% for undoped ZnS to 85% for Al dopant concentration of 6 at% dopant concentration. The band gap of Cu₂O decreased from 2.452 eV to 2.402 eV for film thicknesses range 50 nm to 250 nm. Electrical properties of Cu₂O and ZnS:Al thin films, at room temperature were measured using four point probe method whereby measurements were made using Keithley 2400. The electrical resistivity of ZnS:Al thin films decreased from $1.54 \times 10^5 \Omega\text{cm}$ for undoped ZnS thin film to 69 Ωcm for Al concentration of 6 % dopant concentration. Resistivity of Cu₂O films increased from 7 Ωcm to 53 Ωcm with increase in thicknesses from 50 nm to 250nm. The I-V measurements were obtained using Solar Simulator. From I-V characteristics of Cu₂O- ZnS:Al p-n junction, fill factor (FF) was found to be 0.629, conversion efficiency (η) was 0.62%, Short-circuit current (I_{sc}) was $1.0 \times 10^{-2}\text{A}$ and open circuit voltage (V_{oc}) was 0.592V. ZnS:Al and Cu₂O thin films are therefore

suitable for making solar cells. In addition to optical and electrical characterization of Cu₂O and ZnS:Al thin films, studies on the morphology of the glass used for the slides and its effects on the efficiency of the solar cell also need to be done

ANTIBACTERIAL ACTIVITIES OF DICHLOROMETHANE: METHANOLIC LEAF AND STEM BARK EXTRACTS OF PSIDIUM GUAJAVA LINN AGAINST SELECTED BACTERIA

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Antibiotics have been very effective in the management of microbial infections. However they are expensive and have many side effects. Additionally, the menace of antimicrobial resistance has resulted to the inactivity of various conventional antibiotics. Medicinal plants are used in herbal medicine to control microbial infections since they are considered cost effective and have shown less side effects. Plant extracts with medicinal value have been used to treat many diseases that can either be bacterial, fungal or parasitic among many others. Plants with medicinal value produce certain chemical elements known as phytochemicals that have antimicrobial activity. They include secondary metabolites such as flavonoids, tannins, and saponins which are the main chemical structural classes. *Psidium guajava* Linn is a plant which has been used in traditional medicine to manage various conditions including toothache, malaria, gastroenteritis and vomiting. This research focused determining the antibacterial activities of dichloromethane: Methanolic extracts of *Psidium guajava* stem bark and leaf extracts against selected microorganisms *Staphylococcus aureus* ATCC 25923, *Escherichia coli* ATCC 25922, *Salmonella typhi* ATCC 19430 and *Bacillus cereus* clinical isolate. These microbes are normally associated with illnesses that are characterized with vomiting, enteric fevers, diarrhea and abdominal pain. The plant's leaf and stem bark were collected from Bonchari Sub-county of Kisii County and transported to Kenyatta University. The samples were extracted using 1:1 mixture of DCM and methanol. The plant extracts antibacterial activities was established by taking measurements of the zones of inhibition in millimeters, MIC and MBC. The collected data was then analyzed using Minitab 17 statistical software, Student's Test (T-test), one way ANOVA with P . 0.05 being considered significant, followed by Tukey's post hoc test. Both plant parts analyzed had antimicrobial activity against all the tested microorganisms. However the extracts did not exhibit any bactericidal activity (MBC) on all the tested microorganisms. The leaf extracts had MIC levels of 25mg/ml, 100mg/ml, 25mg/ml and 100mg/ml against *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhi* and *Bacillus cereus* respectively. The stem bark showed an MIC dose of 50mg/ml against all the tested bacteria. The phytochemical analysis showed the presence of all the phytochemicals tested; saponins, alkaloids, terpenoids, flavonoids, steroids and phenolic in the stem bark, while steroids were not present in the leaf extract. The results provides an enlightenment concerning the antimicrobial activities of the plant extracts and their use in the treatment of several bacterial infections.

FRUIT CHARACTERISTICS AND GENETIC VARIATION OF PUMPKINS (*Cucurbita* spp) FROM SELECTED COUNTIES OF WESTERN KENYA

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Pumpkins (*Cucurbita* spp) are among the neglected and underutilized crops in Kenya in farming, consumption and research. In rural parts of Western Kenya, communities still cultivate them for food and medicine though their production is hindered by lack of genetically improved seeds. This puts them at a risk of facing genetic erosion. Conservation, proper utilization and improvement of pumpkins need understanding of their diversity. Currently, knowledge on diversity of pumpkins in Kenya is scanty. This study aimed to characterize and estimate the diversity of 80 pumpkins collected from Western Kenya using fruit morphological characters and simple sequence repeat (SSR) markers. Morphological data was described using 8 qualitative and 5 quantitative fruit characters based on International Plant Genetic Resources Institute (IPGRI) minimum descriptor for Cucurbitaceae as a scoring guide. Analysis of variance (ANOVA) of the morphological data was carried out in R software V 3.6.1 then Principal component analysis (PCA) and cluster analysis were conducted using XLSTAT 2017 software. Subsequently, DNA was extracted from the samples and amplified using 5 fluorescently tagged SSR markers followed by capillary electrophoresis. Gene Mapper V. 4.1 was used for calling and scoring allele sizes, Power Marker V 3.25 used to calculate numbers and frequencies of alleles, gene diversity, polymorphic information content (PIC) and genetic distances. Cluster analysis was performed on the genetic distance matrix using neighbor joining method in DARwin software V.6.0.12 while F statistics, AMOVA and PCoA were carried out in GenAlEx V.6.41. ANOVA showed that some of the morphological traits varied in Kakamega, Busia, Homabay, Bungoma and Vihiga counties. PCA revealed that the first four principal components (PCs) were the most significant accounting for 73.85% of the total variation. In a scatter plot of the first two PCs, majority of the samples were densely scattered implying that they were highly similar. Cluster analysis of the morphological data grouped the samples into 5 clusters in the similarity dendrogram where most of the samples grouped in clusters 1 and 2. The most effective characters for discriminating the pumpkin fruit samples were diameter of the fruit, fruit width, fruit length and length to diameter ratio. These fruit yield characters may be considered among priority characters for selection and diversity studies. A total of 31 alleles were detected in the 5 SSR loci. Kakamega county had high observed heterozygosity and was found to be highly out crossing (FIS -0.282) while Kisii, Bungoma and Nyamira counties had low observed heterozygosities and high inbreeding of FIS 0.500, 0.409 and 0.282 respectively. The rest of the counties were within Hardy Weinberg's equilibrium. Levels of inbreeding seemed to be mostly determined by the farming systems used by the farmers. The highest interpopulation genetic distance of 0.423 was between pumpkin samples collected from Busia and Nyamira counties while the lowest of 0.208 was between Homabay and Kakamega samples. Most of genetic variations were found within and among individual samples rather than among populations which suggested that there was exchange of seeds among the counties. In the study, both morphological characters and molecular markers have proved to be useful tools for assessing genetic diversity of pumpkins. The findings of this study are useful to future breeding programs, effective conservation programs, better selection and utilization of resources in *Cucurbita* spp germplasms.

IN VIVO ANTIDIABETIC EFFECTS AND SAFETY OF FIVE MEDICINAL PLANTS TRADITIONALLY USED TO MANAGE DIABETES MELLITUS IN EMBU COUNTY, KENYA

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Diabetes mellitus is a glucose metabolism disorder that has become an issue of public health concern in Kenya today. Conventional drugs used in management of the disease are unaffordable to the general populace and are associated with many undesirable side effects. Locally made herbal extracts are cheap and readily available but proper scientific study has not been conducted on most medicinal plants to validate their efficacy and safety. *M. indica*, *E. schlechterianum* (Loes.) Loes., *L. bussei* (Harms), *A. mossambicensis* (Oliv.) Wild and *A. adscensionsis* L. have been used for a long time in management of diabetes mellitus and many other ailments. The efficacy and safety of these extracts on long term use has not been evaluated. The aim of this study is to determine the hypoglycemic activity and safety of their aqueous extracts. In vivo hypoglycemic activity was assayed by orally and intraperitoneally administering the aqueous extracts in alloxan induced diabetic Swiss albino mice. The study plan involved dividing the diabetic animals into four groups which were orally and intraperitoneally administered with the plants extracts doses at 50, 100, 200 and 300 mg/kg body weight, 1 IU/kg of insulin and 4.6mg of glibenclamide (200 mg/kg body weight) were used as the standard drug. The results obtained on administration of the extracts were compared with those of the standard drug, the normal, positive and the negative control groups which also consisted of five mice each. Blood glucose levels in all the groups for both routes of administration were measured at the start of the experiment and after 1, 2, 3, 4, 6 and 24 hours from the time of administration of the drugs. Toxicity studies involved administration of the extracts to Swiss albino mice at 450, 670 and 1000 mg/kg body weight daily for 28 days. The animals were then exsanguinated and blood drawn from the heart. Haematological and blood biochemistry parameters were determined. Intraperitoneal and oral administration of the five extracts at the said dosages daily for 28 days caused a significant decrease in weekly body weight gain and an increase in the relative percent organ to body weights of the brain, liver, kidney, heart, lungs, spleen and the testes for both oral and intraperitoneal routes. Also, there were notable changes in the level of RBC, WBC, Hb, PCV, PLT, and MCV, MCHC, neutrophils, lymphocytes, eosinophils, basophils, monocytes and biochemical parameters: AST, ALT, GGT, CK, α -AMY, LDH, T-BIL, D-BIL, I-BIL, TG, TC, LDL-C, HDL-C UA, urea and creatinine. Quantitative phytochemical analysis of extracts revealed presence of tannins, flavonoids, saponins, alkaloids and phenols. TXRF analysis showed presence of Fe, Ni, V, Cr, Mn, K, Hg, Cu, Rb, Se, Br, Ti, Zn, As, Pb and Ca at varied levels. All the five plant extracts showed strong hypoglycemic activity due to presence of phytochemicals and minerals that have been found to exhibit strong hypoglycemic and antioxidant properties. The study confirmed the ethno pharmacological use of the five plants and also established their efficacy and safety at the tested doses. Data obtained can be used as a guide on their proper use in management of diabetes mellitus. Future studies and should be considered but in higher animals like apes before commencement of preclinical trials. Organic solvent extraction in vivo studies should be considered so as to compare their efficacy with the aqueous extracts.

GEOTHERMAL PROSPECTING OF OLKARIA DOME AREAS IN NAIVASHA, NAKURU COUNTY KENYA USING GRAVITY METHOD

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The survey used Autograv.C.G 5 type Gravimeter over short wavelength by marking stations 310m intervals. The data was processed to remove all other effects independent of the subsurface changes in density. The complete bouguer anomaly was computed and Surfer 11 software has been used to draw contour anomaly map of the study area. Quantitative analysis of the contour map indicates regions of

gravity highs which were analysed as bodies of high density within the earth's crust. Four profiles were drawn. The gravity anomaly was interpreted by inspection of profiles and separating the residual anomaly from the regional gravity field. 2D Euler deconvolution was done on the data profiles, indicated subsurface bodies and faults at depth between 10m and 50m. A 2D gravity model along the four profiles were generated by the computer application based on algorithm in the Grav. 2dc. The obtained results revealed presence of dense body intrusions with the contrasting density ranging from 0.22g/cm³ to 0.50g/cm³. These bodies were interpreted as intrusive dykes that have higher density than surrounding rocks and probably are conduits of heat from the geothermal reservoir imaged at bottom depth of between 500m – 1000m below the surface. Advance methods of gravity data analysis such as Tensor Euler deconvolution is recommended to be carried out in Olkaria Domes to verify the results since this technique honours responses from many dimensions and deconvolution without gridding. Collection of more gravity data over steep and wild animal habitat areas is also required for deeper probing on longer profiles.

COMPARISON OF MINERAL NUTRIENT LEVELS AND GROWTH PARAMETERS IN VEGETABLES GROWN USING ORGANIC WATER HYACINTH COMPOST AND INORGANIC FERTILIZERS

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Inadequate supply of macro and micro nutrients causes nutrition related diseases all over the world. Most of the vegetables consumed by both urban and rural populations are from inorganic farming while a small percentage is from organic farming. It is not clear which category contains significant levels of mineral nutrients to alleviate or reduce micronutrient malnutrition. Inorganic fertilizers are formulated with specific mineral nutrients in specific amounts for major nutrients required by plants (Potassium, nitrogen and phosphorus). Organic composts on the other hand contain several mineral nutrients and other nutrients must first be converted by micro-organisms in the soil in order to be used by the plants. The levels of mineral nutrients in vegetables especially african indigenous vegetables that are planted using water hyacinth composts are unknown. Comparison of the levels with those planted using inorganic fertilizers has not been established. The objective of this study therefore is to assess the variation of mineral levels in vegetables grown using organic water hyacinth composts and those grown using inorganic fertilizers. The growth parameters on application of organic composts and inorganic fertilizers are also studied. The plants studied are; *Vigna unguiculata* (cowpeas) and *Amaranthus hybridus* L. (amaranthus). The experiment was carried out in the greenhouse in the Department of Plant Sciences, Kenyatta University, Nairobi. After maturity, 70 days, the samples were oven dried to constant weight at 60 degrees centigrade before being ashed for potassium, sodium and calcium analysis using flame photometry; manganese, magnesium, iron and zinc analysis using AAS and UV-Vis for Phosphorus analysis after sodium molybdate complexation. The growth parameters determined were dry weight, fresh weight, leaf number and plant height at maturity. The treatments with highest mean levels of different mineral nutrients is: iron, em/hyacinth amaranthus at 13.11±1.11mg/100g; zinc, em/hyacinth amaranthus at 0.64±0.16mg/100g; phosphorus, untreated soil (control) amaranthus at 7.89±0.01mg/100g; copper, molasses/hyacinth cowpeas at 3.38±0.00mg/100g; magnesium, em/hyacinth amaranthus at 15.81±0.06mg/100g; calcium, cow/hyacinth cowpeas at 183.33±0.64mg/100g; sodium, em/hyacinth cowpeas at 13.11±0.01mg/100g; potassium, untreated soil(control) amaranthus with 37.21±0.04mg/100g and manganese, inorganic fertilizer cowpeas at 21.58±1.10mg/100g. The mean growth rate for amaranthus; height was highest in cow manure/hyacinth

treatment with 101cm at week 10 translating to 10.1cm/week. The treatment with highest plant leaves was em/hyacinth with 97 leaves at week 10 with an average of 9 leaves/week. The fresh weight was highest in em/hyacinth with 139.25g at week 10 and dry mass was also highest in em/hyacinth treatment with 45.70g at week 10. The mean growth rate for cowpeas; height was highest in cow/hyacinth treatment with 43cm at week 10 translating to 4.3cm/week. Plant leaves was high in cow/hyacinth treatment with 113 leaves at week 10, an average of 11 leaves/week. The fresh weight was highest in inorganic treatment at 34.0g at week 10 and dry mass was highest in inorganic treatment cowpeas at 7.68g at week 10. It was established that plants grown using water/hyacinth composts contain high content of mineral nutrients and high growth rate compared to those grown using inorganic fertilizers. The public should therefore be sensitized and encouraged to consume vegetables grown using water hyacinth composts especially effective micro-organisms composts. This would provide adequate minerals to consumers as well as help in productively utilizing water hyacinth weed from our water bodies.

KHAT (*Catha edulis*) EXTRACT USE AND ITS EFFECTS FOLLOWING WITHDRAWAL ON ENDOCRINE AND GONADAL FUNCTION IN MALE RABBITS

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Gonadal and endocrine effects following withdrawal from sub-chronic to chronic khat (*Catha edulis*) use remains scanty. Most literature available, though contradictory, highlights on effects of khat on functional systems of the body including the reproductive system in humans and experimental animals during khat exposure. This information, to a large extent, does not provide insights into the possible recovery of „khat addicts“ from the vice. The aim of this study was to investigate effects of khat extract during sub-chronic exposure and accompanying effects on reproductive function in male rabbits following withdrawal from use. Fresh leaves and shoots of khat were weighed, crushed with mortar and pestle, and dissolved in distilled water in a conical flask for extraction. The working volume of the stock solution for each dose was obtained by factoring in the body weight of the rabbits. The final volumes were standardised by adding normal saline. Sixteen male rabbits were grouped into four groups of 4 rabbits each. The first group (G1) were controls and administered normal saline while the other three groups (G2, G3 and G4) were administered 1.0 g/kg, 10 g/kg and 20 g/kg body weight of khat extract respectively. The test animals were administered the doses of khat extract via oral gavage on alternate days of the week (Monday, Wednesday and Friday) for 12 weeks. Thereafter two animals from each group were sacrificed for histological evaluation of testis, epididymis and kidney. The remaining 2 animals from each group were taken through the withdrawal period of 4 weeks before sacrifice. Blood samples were collected, processed and plasma stored at -20oC until assayed for FSH and testosterone levels for treatment groups as well as controls. Hormonal data and data on clinical observation for difference in means among groups and over the experimental period were analysed by two- way ANOVA at 95% confidence interval followed by Tukey"s multiple comparison for post hoc test. Intergroup analysis was done using paired t test. The relationship between weight and levels of testosterone was done using spearman rank correlation analysis at 5% significance level. Khat extract at low dose increased plasma levels of testosterone and FSH while at high dose and over experimental time significantly suppressed testosterone production but the FSH levels were only slightly reduced. This was reversed during withdrawal period where plasma testosterone and FSH in both controls and treatment groups showed no significant difference in their measurements. Histological data on testis during sub-

chronic exposure showed vacuolation in germinal epithelium of moderate and high dose treatment groups over experimental period. The same was observed in the epithelial lining of proximal convoluted tubules of kidney nephrons of high dose treatment groups at sub-chronic exposure. However, histological sections of the epididymis appeared unaffected at all doses of khat extract. Following withdrawal from sub-chronic exposure, testicular, epididymal and kidney histology of all treatment groups appeared to regenerate from cellular damage when compared to controls. These results in rabbits have demonstrated for the first time that structural alterations on reproductive system reported variously in literature on khat addicts are reversible following withdrawal from heavy and long-term use in man.

NOVEL COMPARATIVE STUDY AND CHARACTERIZATION OF PLANT DYES IN TiO₂ MATRIX FOR DYE SENSITIZED SOLAR CELLS APPLICATIONS

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A good energy mix is desirable for sustainability of the energy needs of many countries. Currently, electricity, including that sourced from photovoltaic cells is widely used for not only homesteads but also for industries. The desire to develop a cost-effective source of energy has motivated the development of dye sensitized solar cells. This technology has motivated a lot of research owing to its improved efficiency. This work has utilized plant extracts using a binder to develop a solar cell from locally available materials. Sieved extracts were obtained from carrot tubers, orange fruits and French marigold leaves. The juices extracted from each plant were stored in individual containers ready for sensitization. Ruthenium inorganic binder was used as a control. Screen printing technique was used to deposit titanium dioxide paste on the fluorine doped tin oxide glass slides. The developed thin films were annealed at a temperature of 450°C in a furnace after which they were removed and allowed to cool ready for optical and electrical characterization. Using a DUV 3700 spectrophotometer, optical transmittance peak results indicated that ruthenium dye was transmitting at a peak of 47%, orange dye was transmitting at a peak of 30%, and French marigold dye was transmitting at a peak of 11% while the carrot dye was transmitting at a peak of 8%. On mixing different combinations of dyes in the ratio 1:1 by volume, the optical transmittance peak results indicated that the combination of carrot dye and French marigold dye was transmitting at peak of 27%, carrot dye and orange dye was transmitting at peak of 40% while French marigold dye and orange dye was transmitting at peak of 42%. These were higher than the transmittance peak values for single dyes. This was attributed to surface interaction. For reflectance characterization, orange dye peak reflectance was 24%, carrot dye peak reflectance was 14% while French marigold dye peak reflectance was 8% and the control dye was 15%. For absorption characterization (still in the range using DUV), French marigold dye absorption peaked at 91%, carrot dye absorbed at a peak of 92%, orange dye absorbed at a peak of 85% while the ruthenium dye absorbed at a peak of 84%. Electrical characterization of the solar cell was based on open circuit Voltage (Voc) which was 0.482V for carrot dye, 0.433V for orange dye, 0.469V for French marigold dye and 0.565V for ruthenium dye. Short circuit Current (Isc) was 0.0092 mA for carrot dye, 0.0099 mA for French marigold dye, 0.010 mA for orange dye, and 0.195mA for Ruthenium dye. The fill factor was 69.0% for carrot dye, 69.35% for French marigold dye, 67.1% for Orange dye while ruthenium dye had 58.1%. The obtained efficiency showed that carrot dye had an efficiency of 0.10%, French marigold dye

had 0.097%, and orange dye had 0.087% while the control dye had 1.032%. From the study it was concluded that of the organic dyes Carrot dye gave a better efficiency of 0.100% and the least efficiency by orange dye. Ruthenium dye had the best efficiency of 1.032%. This was attributed to its wide spectral absorption. In conclusion therefore, a dye made of carrots juice could be more reliable as it has a higher efficiency. We recommend the purification of carrot dye before use to improve its efficiency.

MICROENCAPSULATION OF AN OPTIMIZED 4-COMPONENT TSETSE-REPELLENT BLEND INTO β -CYCLODEXTRIN AND LABORATORY ASSESSMENT OF ITS EFFICACY

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Microencapsulation and nano-encapsulation techniques have been applied in pharmaceutical industry for more than half a century to facilitate controlled-release of drugs in the body. It is a novel and vital technique that aims to deliver active ingredients over extended periods. In addition, microencapsulation can prevent degradation and premature losses as a result of exposure of the active ingredients to the environment. Thus, other fields have also embraced nanotechnology, including cosmetic industry, biotechnology, fluid science, molecular physics and mechanics, energy science and technology. Tsetse flies (*Glossina* spp.) are amongst the chief stern vectors of parasites of trypanosome origin that threaten over 60 million individuals with Human African Trypanosomiasis (sleeping sickness/ HAT) and 45-50 million livestock with Animal African Trypanosomiasis (Nagana/ AAT) yearly in the sub-Saharan Africa. It is projected that at least 50,000 persons and three million livestock perish from trypanosomiasis ailment yearly in this region. Research on development of vaccine for the control of this parasite has proved futile owing to antigenic variations of the trypanosome parasite. A superior eco-friendly alternative to control both HAT and AAT is substantial reduction of vectors, such as in the use of attractant blends to trap the flies and repellent blends to protect the hosts, and integration of the two in 'push-pull' tactics. Previous studies have led to the characterization of odour blends from tsetse-refractory bovids like waterbuck (*Kobus defassa*) that are repellent to these vectors. An optimized 4-component tsetse-repellent (4-cTRB) blend (δ -nonalactone, heptanoic acid, 4-methylguaiaicol and geranylacetone) in the ratio of 6:4:2:1, showed high efficiency in protecting cattle and other host animals from tsetse. In an effort to come up with an effective controlled-release downstream deployment of the 4-component blend, microencapsulation of the blend into β -cyclodextrin (β -CD) was undertaken using four different techniques (kneading, co-precipitation, heating in a sealed container and freeze-drying). The microcapsules, based on UV-Visible spectroscopy results, showed successful incorporation of the repellent blend into the β -CD in all the four methods. This was also confirmed by Fourier Transform-Infra Red spectroscopy. Gas chromatography with a flame ionization detection (GC-FID), showed that kneaded microcapsules had highest levels of the blend constituents; with heptanoic acid having significantly higher release rate (1.2×10^{-5} mgml⁻¹s⁻¹) as compared to δ -nonalactone (8.2×10^{-6} mgml⁻¹s⁻¹), 4-methylguaiaicol (9.7×10^{-6} mgml⁻¹s⁻¹) and geranyl acetone (5.7×10^{-6} and 4.4×10^{-6} mgml⁻¹s⁻¹). Behavioral responses of tsetse flies carried out in a wind tunnel reported a range of 87.04-89.67 % repellency. This is approximately 5 % higher than the earlier reported, 84.77 % repellency. The tsetse responses to the inclusion compounds of different methods were not significantly different ($p > 0.05$) to those of the un-encapsulated blend (89.02 %). β -Cyclodextrin matrix did not affect the aversive behavior of tsetse. Thus, encapsulation of the 4-cTRB blend into β -cyclodextrin does not negatively affect its release and its repellence to tsetse. The findings of this study provides a method for controlled release of tsetse and other ectoparasite's repellent blends which is useful in large-scale controls. Therefore,

microencapsulation should be embraced in control of ectoparasites and their related diseases in livestock and humans.

CHARACTERIZATION OF Cu₂S / SnO₂: F P-N JUNCTION FOR SOLAR CELL APPLICATIONS

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Due to industrialization and increase in population, there is need for clean, green and renewable source of electrical energy. Traditional sources of electrical energy like fossil fuels are getting depleted, on the other hand silicon based solar cells are expensive hence the need for low cost and reliable alternative source of energy. Photovoltaic is a reliable energy source which is renewable. Photovoltaic is a process of conversion of solar energy to electricity directly using solar cells. For this study Copper (I) Sulphide (Cu₂S) thin films were deposited on glass substrates by Chemical Bath Deposition (CBD) technique. Copper sulphate (CuSO₄) was used as a source of copper ions, thiourea (CS (NH₂)₂) as a source of sulphide ions and tartaric acid as a complexing agent, ammonia solution was used to regulate the pH. SnO₂: F thin films were deposited using spray pyrolysis technique (SPT) on glass substrates at substrate temperature of 3500 C using pentahydrated stannous chloride (SnCl₄·5H₂O) and ammonium fluoride (NH₄F) as precursors. Optical transmittance and reflectance of all film samples prepared in the range of 200 nm-1100 nm were measured using UV-VIS-NIR spectrophotometer. The optical measurements were simulated using SCOUT software to obtain optical constants. Cu₂S deposited at 0.15 M Cu²⁺ exhibited low average transmittance of 20.91 %, high average absorbance of 51.29 % and narrow optical band gap of 2.33 eV hence a good absorber material to be used as p-type layer in solar cells applications. On the other hand, SnO₂: F had high average transmittance of 79.94 % and wide optical band gap of 4.04 eV at 4 % concentration of fluorine. This shows that SnO₂: F is a suitable n-type layer for solar cell applications. Cu₂S had lowest refractive index of 1.44 at 0.15 M Cu²⁺. The four point probe was used to measure the sheet resistivity of all thin films. SnO₂: F had lowest resistivity of 40.3 Ω cm at 4% concentration of fluorine while Cu₂S had low resistivity of 0.40x10³ Ω cm at 0.15 M Cu²⁺. The Cu₂S/SnO₂: F p-n junction was fabricated in phases. First the n-type layer of SnO₂: F was deposited onto the glass substrate by spray pyrolysis method and then the p-type layer of Cu₂S thin films was deposited onto SnO₂: F thin film to form a p-n junction. The solar simulator was used to measure the I-V characteristics of the fabricated cell. The fabricated cell had open circuit voltage (V_{oc}) of 0.4075 V, short circuit current (I_{sc}) of 0.00219 A, fill factor (FF) of 0.61 and efficiency (η) of 0.303 %. Therefore, Cu₂S and SnO₂: F thin films are suitable materials for fabrication of Cu₂S/SnO₂: F p-n junction solar cell.

PREVALENCE OF ANTIMICROBIAL RESISTANT GENES IN ESCHERICHIA COLI AND SALMONELLA SPECIES FROM CHICKEN DROPPINGS IN SELECTED LOCATIONS IN NAIROBI COUNTY, KENYA

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Increase in antimicrobial resistance is a worldwide health problem in human and veterinary medicine. Emergence of antimicrobial resistance is driven by interplay of humans, pathogen and environmental related factors. As a result, resistant strains are widely distributed and are currently considered as emerging pollutants. Spread and emergence of antimicrobial resistance is aided by several factors. Among the factors are those associated with use of antibiotics, clonal expansion of the resistant bacteria and spread of resistant clones. To minimize development of antimicrobial resistance, it is important to assess potential reservoirs of antibiotic resistant bacteria to contain the existing resistant bacteria and genes. Poultry farming is widespread and antibiotics are used for prevention and treatment of diseases in poultry. However, there is limited information about antimicrobial resistant bacteria and resistant genes associated with poultry keeping. This study investigated prevalence of *Salmonella* sp. and *E. coli*, their antimicrobial resistance patterns, prevalence of antibiotic resistant genes and class 1 integrons in the isolates from chicken droppings in Nairobi County, Kenya. A cross sectional study was carried out and a total of 150 chicken households were randomly selected in 6 locations within Nairobi County. Fresh chicken droppings samples were aseptically collected in plastic containers and transported to the Kenyatta University Microbiology laboratory for analysis. *Salmonella* sp. and *E. coli* were isolated using standard procedures. Antimicrobial susceptibility test of the isolates against 6 antibiotics was carried out using Kirby-Bauer disc diffusion technique. The presence of *bla*TEM, *bla*OXA, *bla*SHV and *bla*CTX-M and class 1 integrons was screened among isolates, which were resistant to amoxicillin using Polymerase Chain Reaction. The prevalence of *Escherichia coli*, *Salmonella* sp. and antimicrobial resistant genes was calculated as the percentage of positive samples of total samples analysed. Difference in prevalence of *Escherichia coli*, *Salmonella* sp. and antimicrobial resistant genes was analysed using sample t-test with minitab computer software version 13.0. To determine clonal relatedness of the resistant isolates, cluster analysis was carried out using GelCompar II software using UPGM. In the 150 samples, 85 *E. coli* and 18 *Salmonella* sp. were isolated. These represented 57 % and 12 % of the total samples respectively. Most of isolates were sensitive to all antibiotics tested except 53 % resistance to amoxicillin. Of the isolates that were resistant to amoxicillin, 25 (46 %) carried the *bla*TEM gene, 10 (18 %) carried *bla*CTX-M while 14 (25 %) carried class 1 integrons. Some of the resistant isolates that carried *bla*TEM gene were closely related. The results revealed that extended spectrum beta-lactamase genes are present in isolates from chicken droppings. It also showed that class 1 integrons are common in *E. coli* and *Salmonella* sp. from chicken droppings. In addition, the resistance is likely associated with the presence of class 1 integrons and beta-lactamase. It further provides additional knowledge useful in developing strategies in control of spread of antibiotic resistant genes. There is need to assess other potential reservoirs of resistant bacteria to minimize spread of existing resistant genes.

ANALYSIS OF FARMERS' SOIL CONSERVATION PRACTICES IN CIRHANYOBWA CATCHMENT, SOUTH-KIVU PROVINCE, DR CONGO

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The livelihood of majority of south-Kivu population in Eastern DRC depends on agriculture. However, in many catchments within the province, especially where hillsides have been cultivated, land productivity is threatened by erosion leading to soil nutrient loss and water pollution. The main objective of this study was to analyze farmers' soil conservation practices in South-Kivu Province. Specifically this study estimated annual soil loss from the Cirhanyobwa catchment, evaluated soil conservation practices being used by farmers and determined factors and challenges affecting the adoption of SCP in the watershed. To achieve the above objectives, Revised Universal Loss Equation was used to estimate annual soil loss, random sample of 200 households complemented by 3 Focus Group Discussions were used to analyze farmers' soil conservation practices, factors and challenges influencing the adoption of Soil Conservation Practices. Data was analyzed by use of descriptive statistics (means, percentages and frequencies), chi-square, T-test and multinomial logit model. The results showed that the areas having the natural forest show minimum soil erosion rate while areas having intense human intervention show high soil erosion rate ($>30t\ h^{-1}\ y^{-1}$). The study identified the following Soil Conservation Practices: mulching, field trench, hedges, fanyajuu terraces, contour ploughing, minimum tillage operation and keeping the land fallow. Among those practices, mulching (50% of adoption level), hedges (15% of adoption level) and field trench (25% of adoption level) were more used by the farmers. Although the bench terrace was not more practiced in the catchment due to the lack of financing to use it, it was more preferred by farmers for its effectiveness in soil conservation. Critical factors affecting the adoption of SCP include lack of implementation of government regulation in farming system, insecure land tenure, lack of credit, small farm sizes as well as lack of knowledge or training on soil conservation practices. The study recommended the adoption of bench terraces for reduction of soil erosion and improving soil productivity in the catchment.

REFERENCE INTERVALS FOR SELECTED BIOCHEMICAL PARAMETERS FOR ADOLESCENTS IN KILIFI COUNTY, KENYA

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Reference intervals are useful in making informed clinical decisions. They help in diagnosis, screening and monitoring of diseases. The reference values are dependent on several factors including age, sex, nutrition, altitude and genetics among others. Reference intervals are governed by the Clinical and Laboratory Standards Institute and the International Federation for Clinical Chemists and Laboratory Medicine, both of which recommend the establishment of reference intervals for every laboratory. In Kenya there is no national data for adolescent reference intervals and laboratories rely on reference

values which come with reagent kits for assaying the parameters or text book values, all of which belong to overseas populations. The purpose of this study was to establish reference intervals for selected biochemical tests in adolescents in Kilifi County, Kenya. The study design was cross-sectional and a total of 340 healthy adolescent participants containing equal numbers of males and females were recruited. After donation of blood samples, serum processing and screening for pregnancy for the females, hepatitis B surface antigen, Hepatitis C virus, syphilis and human immunodeficiency syndrome, 332 samples (170 females and 162 males) qualified to be included in the study. Eight hemolyzed male blood samples were excluded from the study. Exclusion criteria for the study included chronic illness, pregnancy, over 17 and less than 13 years of age and less than 6 months residency in the area. Blood was collected by venous puncture and the serum processed. Sixteen selected biochemical tests were determined using BS-800 Modular Chemistry Autoanalyzer. The obtained data was subjected to non-parametric analysis using MedCalc software to construct reference intervals for the various parameters following the recommendations and guidelines of the CLSI at 90% confidence interval and using the central 95% of values of the 2.5th and 97.5th percentiles. Mann-Whitney test was used for testing statistical significant differences between sexes. Parameters, which showed no statistical significant differences between sexes ($p > 0.05$) included total protein, albumin, globulin, total bilirubin, glucose, calcium, sodium and potassium had a combined reference intervals. Parameters which showed statistical significant differences between sexes ($p < 0.05$) included alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase, γ -glutamyltransferase, direct bilirubin, inorganic phosphorous, blood urea nitrogen and creatinine had separate reference intervals for each sex. This study demonstrated the need for region specific adolescents reference intervals for liver and kidney functions tests due to the many differences, which manifested in study findings of similar populations in different world regions. In conclusion the study established adolescent reference intervals for selected liver and renal function tests for use in Kilifi County, Kenya. The study recommends the adoption by the Ministry of Health of these reference intervals for use in Kilifi County Kenya and establishment of similar and other biochemical parameters reference intervals for adoption and use in other Counties of Kenya.

A COMPARATIVE STUDY ON GENETIC PROFILES AND REPELLENT EFFECTS OF MURRAYA KOENIGII FROM FOUR REGIONS IN KENYA ON ANOPHELES GAMBIAE S.S.

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Ethnobotanical analyses highlight therapeutic and chemotypic variations of geographically and ecologically diverse *Murraya koenigii* (Spreng) samples. However, the genetic correlation of this observation remains obscure. The present study aimed at studying the intraspecific genetic variation of *Murraya koenigii* and the possible effect on the bioactivity of volatiles of plant samples collected from four different geographical locations of Kenya. Genomic DNA isolated from various plant samples were screened for plastid maturase K (matK) gene polymorphisms within and among populations to estimate

genetic diversity and phylogenetic relationships. Further, oils from the plant samples were tested for repellent activity against *Anopheles gambiae* s.s using a WHO established protocol. A total of 5 unique haplotypes that exhibited relatively moderate genetic variations were established. The overall nucleotide (π) and haplotype (Hd) diversities were estimated to be 0.04162 and 0.613, respectively. Despite relatively high non-synonymous substitutions in non-synonymous segregating sites, dN/dS ratio of 0.8924 (< 1) depicted evolutionary influences of purifying selection. Phylogenetic analysis revealed close genetic relations (less than 0.01) separate from the GenBank accession sample. There was a significant variation in mosquito repellency of oils obtained from *Murraya koenigii* collected from the four geographical locations. At 0.1g/ml, Malindi extract and Kibwezi extract had complete repellence at 100%, followed by Makindu extract at 97.6% and Mombasa extract at 72.7%. At 0.01g/ml, the percentage of effectiveness declined to 84.6% for Malindi extract, 97.5% for Kibwezi extract, 56.6% for Makindu extract, and 33.3% for Mombasa extract. Samples from Kibwezi maintained their effectiveness at the rest of the concentrations (45.2% at 0.001g/ml, 52.1% at 0.0001g/ml, and 35.9% at 0.00001g/ml). Malindi samples' percentage effectiveness was 55.6% at 0.001g/ml and 25.5% at 0.0001g/ml while Mombasa samples' percentage effectiveness was 17.1% at 0.001g/ml. Lowering concentration reduced the repellent effect of the extract in a varying manner with Mombasa extracts showing the highest reduction in repellency with reducing concentration. These findings suggest that irrespective of geographical origin, evolutionary forces of purifying selection on matK nucleotide sequence influenced the Kenyan *Murraya koenigii* genetic variation and bioactivity of plant volatiles.

PREVALENCE OF INTESTINAL PARASITES AND THEIR TRANSMISSION RISK FACTORS AMONG INMATES OF NAIVASHA AND KISII PRISONS IN KENYA

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Intestinal parasites cause significant morbidity and mortality in endemic countries. These parasites and particularly tropical diseases shorten lives, reduce the ability to work and impose a lifelong burden on the country's potential for advancement. The prison facilities are faced with the problem of overcrowding, inadequate sanitation, lack of constant supply of clean water and lack of footwear. All these factors potentially predispose inmates to infection and transmission of intestinal parasitic infections. Very little has been done to establish the prevalence of intestinal parasites among institutionalized and neglected groups of the population. The objective of this study was to determine parasitic infections among prison inmates in Kisii and Naivasha Prisons in Kenya. The target population was inmates aged 18 to 60 years both male and female who met the inclusion criteria from these two prisons. A cross sectional survey was applied where 403 stool samples were collected from inmates for examination of the presence of intestinal parasitic infections. Prison inmates were stratified based on jail terms and from each strata they were selected by simple random sampling. Wet mount and Formal ether concentration technique were used to process stool for identification of helminths eggs and cysts of protozoa while direct wet mount using saline and iodine was used in microscopic examination of

loose stool for identification of trophozoites of protozoa. Demographic information on the parasite predisposing factors was collected using structured questionnaire and focus group discussion. The prevalence rate of intestinal parasites for both protozoa and helminths for the two prisons was 84(20.84%). Intestinal protozoa infections were higher (12.4%) than helminths (10.4) but only 1.5% were mixed infections. Intestinal protozoa identified were *Entamoeba histolytica* 30(7.4%) and *Giardia lamblia* 20(4.9%) while the intestinal helminths were *Ascaris lumbricoides*, 22(5.5%) *Strongyloides stercoralis* 2(0.5%) and hookworms 4(1.0%). More females were infected than males which was statistically significant at $\chi^2 = 12.53$, $P=0.016$, $df = 2$. Intestinal parasitic infections were significantly higher among inmates of 18-27 years old in both prisons ($\chi^2 = 9.36$, $P=0.007$, $df = 28$). Protozoa infections were found to be significantly higher among inmates carrying out farming activities ($\chi^2 = 10.82$, $p= 0.011$, $df =28$). Increased rate of infection was associated with lack of footwear (OR 2.68, CI 0.94-3.41), failure to wash hands before meals (OR 2.88, CI 0.93-3.36) and after using the toilet (OR 2.19, CI 1.02-4.44). The age of the respondent, their sex, their level of education and their duties while in prison had a significant contribution to the high prevalence of intestinal parasitic infections. The officers in charge in collaboration with the ministry of health should provide health education on personal and environmental sanitation, sufficient footwear, more pit latrines with enough water points for hand washing to help reduce the transmission of intestinal parasites.

MAGNETIC STUDIES OF IRON ORE MINERAL DEPOSITS IN BUKURA AREA, KAKAMEGA COUNTY, KENYA

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Local deposits of iron ore have been identified at various parts of the country but not much has been done to determine whether the deposits are viable in quantity and quality for commercial exploitation. The location and delineation of iron deposits and formation in Bukura area appraises the potential of such mineralization. Ground magnetic survey of Bukura area was conducted to investigate subsurface geology on the basis of the earth's magnetic field resulting from the magnetic properties of the underlying rocks. The total magnetic field data were recorded, corrections done and the data qualitatively analyzed and interpreted. The results gave values for the total magnetic field intensity of the region. Magnetic anomalies were qualitatively discerned from the magnetic intensity contour map obtained. The geomagnetic field was calculated using the mathematical model of earth's magnetic field called International Geomagnetic Reference Field (I.G.R.F) model 2000-2015 using Potent software at each station and subsequently subtracted. Qualitative analysis of the Total Magnetic Intensity map and magnetic anomaly map revealed a highly magnetic region trending represented by distinct positive magnetic anomaly highs. These may be due to presence of ferromagnetic material or iron bearing minerals within the basement rocks and sediments. Modeling of selected profiles was done revealing the presence of bodies of high magnetic anomaly. Chemical analysis was done on rock samples collected from different parts of the study area. Out of the ten samples collected, five samples had percentages that are more than 25% which is the point at which a magnetite bearing rock becomes economical.

Therefore the region may be rich in ferromagnetic mineral content and more detailed geochemical, geological and geophysical investigation need to be done with regard to mining prospects of iron in the area.

ESTABLISHMENT OF REFERENCE RANGES FOR BIOCHEMICAL PARAMETERS IN CHILDREN AND ADOLESCENTS OF AGES 1-17 YEARS IN MERU COUNTY, KENYA

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Clinical Biochemistry (Clinical Chemistry/Chemical Pathology) is the study of the biochemical basis of disease, and the application of biochemical and molecular techniques in diagnosis. An understanding of the biochemical mechanisms of disease provides modern medicine with a rational basis for diagnosis and therapy. A reference range is a set of values used by a health professional to interpret a set of medical test results. The range is usually the set of values in which 95% of the normal population falls. Clinical chemistry reference ranges vary due to factors such as age, sex, diet, race, climate, altitude and genetics. As a result, International Federation of Clinical Chemistry (IFCC) recommends that every laboratory establishes its own reference intervals for biochemical parameters and not rely on those obtained from a different population. There is little information in the literature on biochemical reference values for children in Kenya and in particular those from Meru County. This study was aimed at determining age and sex-based reference ranges for thirteen routinely analyzed biochemical parameters for liver and renal function for the children population in Meru County. This was a population based cross-sectional study carried out at the Meru Level Five Hospital. 768 healthy males and females were recruited in this study and only 740 whose serum samples tested negative for HIV, hepatitis B, syphilis were used in the final analysis; 380 males and 360 females. 28 samples were excluded, out of which 6 were HIV positive and 22 were hemolyzed. DRI-CHEM NX 500I Clinical Chemistry analyzer (Fujifilm, Europe) was used to analyze thirteen clinical chemistry parameters including serum proteins, bilirubin, tissue enzymes and electrolytes. Clinical and Laboratory Standards Institute (CLSI) guidelines were followed to create study consensus intervals. Determination of reference ranges was done in order to estimate the lower 2.5 and upper 97.5 percentiles of distribution by use of parametric methods. The determined percentiles were considered as the lower and upper reference limits respectively. There were significant differences in relation to sex in children reference values for potassium ($p = 0.009$), total protein ($p = 0.039$) and sodium ($p = 0.003$). Other parameters did not show significant differences across the age groups and by gender. In conclusion, the findings of this study provide sex and age specific reference range values for children from Meru County in Kenya. From the study findings, recommendation is made to health care practitioners and facilities in Meru County to adopt the new reference values developed, particularly for the three parameters that exhibited significant differences in sex and for other regions in Kenya to carry out a similar study to determine their own reference values.

ANTIINFLAMMATORY, ANTINOCICEPTIVE AND ANTIPYRETIC ACTIVITIES OF ACETONE STEM BARK EXTRACTS OF *Pappea capensis* (Litchi) IN ANIMAL MODELS

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Persistent inflammation, pain and fever are sensory afflictions that lead to emotional discomfort and unnecessary suffering to human beings thereby, affecting all the daily life activities. These disorders are usually suppressed with anti-inflammatory, analgesic and antipyretic drugs. However, conventional medications are arguably associated with a number of side effects. It is thus necessary to develop alternative agents, which are more effective, cheaply available, and with insignificant side effects. Currently, herbal agents are becoming popular due to the reduction of the efficiency of conventional medicine. *Pappea capensis* has been used locally by the Embu community as folklore remedy for various common ailments including inflammation, pain and fever. However, no data has been documented on acetone stem bark extracts of *Pappea capensis* in the management of these conditions. Therefore, this study examined anti-inflammatory, antinociceptive and antipyretic activities of acetone stem bark extract of *Pappea capensis* in mice and rat models. The plant samples were obtained from Mbeere North, Embu County, Kenya. Active components were extracted using acetone solvent. Experimental animals were grouped into four, the normal control group, reference control group, negative control group and three experimental groups. The pain was stimulated experimentally using formalin, 20% turpentine was used to induce fever whereas inflammation was induced using carrageenan. Diclofenac sodium was used as reference drug to treat pain and inflammation, while aspirin was used as reference drug for pyrexia. All treatments were administered intraperitoneally. Data were expressed as mean \pm SEM. Difference between the means of different groups was analyzed using one-way ANOVA followed by Tukey's post hoc test. Unpaired student t-test was used to compare the mean activities of pain inhibition between the two phases. Values of $P \leq 0.05$ were considered significant. The *P. capensis* extract reduced the paw edema by between 97.34% - 84.47%. Diclofenac reduced the paw edema by between 94.64% - 86.79%. The stem bark extract of *P. capensis* inhibited pain by between 48.9% - 63.4% in the early phase and between 25.48% - 52.88% in the late phase. The reference drug reduced pain in the two phases by 51.5% and 54.8%, respectively. The *P. capensis* extract lowered pyrexia by between 99.66%-92.90%, while aspirin, reduced pyrexia by between 97.15% - 91.75%. Phytochemical bio-screening results revealed that the acetone extracts of *P. capensis* had phenolics, flavonoids, terpenoids, steroids, alkaloids and saponins that have been associated with anti-inflammatory, antinociceptive and antipyretic properties. This study, therefore, showed potent anti-inflammatory, antinociceptive and antipyretic activities of acetone extract of *P. capensis*. Hence, *P. capensis* can be explored as a possible bio-resource for generating herbal formulation that may be effective in the management of inflammation, pain and fever.

ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES OF METHANOL EXTRACTS OF *Pistacia aethiopica* (Kokwaro) and *Warbugia ugandensis* (Sprague) IN MICE MODELS

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Inflammation and pain are symptoms associated with many pathological conditions. These symptoms cause distress to the victims. Management of pain and inflammation is done by conventional drugs such as non-steroidal anti-inflammatory drugs (NSAIDs) which may be expensive, not easily available and cause adverse effects. Traditional medicines provide viable alternatives in the management of pain and inflammation. Traditional medicines are easily accessible, cheap with minimal side effects. *Warbugia ugandensis* Sprague and *Pistacia aethiopica* Kokwaro are medicinal plants, which have for long been used by people in Embu County as analgesic and anti-inflammatory drugs. In spite being in use for long, no scientific study has validated their use. This study was therefore designed to establish the claimed analgesic and anti-inflammatory effects of these plants. Fresh leaf samples of *Warbugia ugandensis* and fresh bark samples of *Pistacia aethiopica* were collected in Embu County, Kenya. The plant samples were then air dried after which they were transported to the Department of Biochemistry, Microbiology, and Biotechnology, Kenyatta University. The dry plant materials were then pulverized by electric mill. Crude methanol extracts were prepared using 1 litre methanol per 200g powder. Male albino mice were divided into six groups of 5 animals each; normal control, negative control, positive control and three experimental groups for extract dose levels of 50, 100 and 150mg/kg body weight. Analgesic studies used formalin model while anti-inflammation studies used carrageenan-induced acute edema model. Diclofenac was used as the positive control in analgesic and anti-inflammatory studies. Stem bark extracts of *P. aethiopica* inhibited paw licking in mice by between 47.24-55.13% in the early phase and by between 30.69-52.12% in the late phase. *W. ugandensis* leaf extracts inhibited paw licking by between 38.45-51.85% in the early phase and by between 43.48-65.61% in the late phase. Diclofenac inhibited paw licking by between 30.33-30.36% in the early phase and by between 62.93-77.08% in the late phase. For anti-inflammatory effects *P. aethiopica* extract suppressed carrageenan induced paw edema by between 4.6-7.6% while *W. ugandensis* suppressed paw edema by between 6.08-7.59%. Diclofenac suppressed carrageenan induced paw edema by between 8.86-9.57%. Qualitative phytoconstituents screening revealed presence of phenols, saponins, flavonoids alkaloids and terpenoids which have been previously linked to analgesic and anti-inflammatory effects. Therefore the current study has validated folkloric use of *P. aethiopica* and *W. ugandensis* as remedies for pain and inflammation

EFFECTS OF LAND USE AND LAND COVER CHANGES ON THE DISCHARGE OF RAGATI RIVER, TANA BASIN, NYERI / KIRINYAGA COUNTIES, 1990-2010, KENYA

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Changing land use and land cover have affected the terrestrial surfaces. This change has affected the stream flow patterns in various watersheds. Land use and land cover changes have affected

the discharge of Ragati River. It is one of the many rivers in Kenya that are considered as hot spots due to over abstraction especially during the dry season. This study aimed at evaluating the effects of land use and land cover changes which are important in ensuring sustainable use of the water resource. This study aimed at achieving the following objective: i) To determine land use activities and land cover changes within Ragati River catchment area from 1990 to 2010; ii) To identify the drivers of land use and land cover change in the catchment; iii) To evaluate the measures taken to mitigate negative effects of land use and land cover changes on the Ragati catchment. Satellite data was integrated in GIS to examine the extent of land-use and cover change in the sub-catchment. Both quantitative and qualitative data were used in this study. Various data types such as socio-economic data, land-use data, rainfall data and river flow data were collected in order to supplement information from landsat images. Analysis of land use and landcover was done using classified landsat images of the years 1988, 2000 and 2009. SPSS and Ms Excel were used to analyse descriptive data. Linear regression was used to establish the relationship between discharge and stage. This study revealed that between 1988 and 2000 the dense forest decreased by 15%, land under perennial crops increased by 4.26 %, cropland increased by 11%, settlement increased by 45.30 % while closed woodland decreased by 4.6%. The results also show increase in forest cover between 2000 and 2009. This can be attributed to increased campaign on reforestation of Mt. Kenya forest. Land under perennial crops decreased by 57%, crop land further by 4.04 %, settlement increased by 49.41% while closed woodland decreased further by 3%. Over abstraction of water and river bank encroachment are some of the causes of changes in the volume of water flowing in the river. This study recommends that water users should be made aware of the importance of sustainable use of the water resource.

DESIGN AND ANALYSIS OF MICROSTRIP ANTENNA FOR 2.4 GHz APPLICATIONS

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Communication systems require development of low cost, low profile and minimal weight. Microstrip antennas (MSA) are capable of maintaining high performance over a wide spectrum. Technological trends have focused much effort on the design of the microstrip patch antennas. In this study, square, circular and rectangular patches were designed and analyzed using two different substrates. High Frequency Structure Simulator (HFSS) software was used to simulate, model and analyze the MSAs. Simulation was done using FR4 substrate on square, rectangular and circular patches at a frequency of 2.4 GHz. At the same frequency, RT Duroid 5880 was used in the simulation of the square, circular and rectangular patches. The thickness of the substrate was kept constant at 1.6 mm. Simulation results that include bandwidth, efficiency, return loss curves and radiation patterns of all the MSAs from the software were compared. The resonant frequency for all simulated microstrip antenna was 2.4 GHz. A circular microstrip antenna on RT Duroid 5880 had the highest efficiency of 97.012% and front to back ratio of 77.74. The same MSA also had the highest realized gain hence it was considered for fabrication. Fabrication was done through a process of photolithography and wet etching on a printed circuit board

using parameters of the results that were optimized. Testing of the fabricated MSA was done using scalar network analyzer. The resonant frequency of the fabricated microstrip antenna was 2.3966 GHz and the return loss was -24.965 dB. The measured data was validated with the simulated data. The measured data from the fabricated MSA deviated slightly from the simulated data. It was ascertained that the MSA can work efficiently at 2.4 GHz. Other than the shapes used in the research different shapes can be tried for example elliptical quarter circle can be studied. Substrates with lower directivity can be used which can give higher gain. To reduce the size of microstrip antenna a substrate with high dielectric constant like silicon can be tried. Array of antenna patches of these shapes should also be studied because they produce the higher overall gain.

USE OF SIMPLE SEQUENCE REPEATS (SSR) MARKERS FOR GENETIC DIVERSITY STUDIES IN CUCURBITA SPP (PUMPKINS) GROWN IN CENTRAL AND EASTERN KENYA

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Cucurbita spp (pumpkin) belongs to Cucurbitaceae family, an economically important food crops such as squash, cucumbers and watermelons. Pumpkins grow fast and are rich in many nutrients. Farming of pumpkin in Kenya is not extensive and is only grown as subsistence crop in many households. In spite of recent increased demand for pumpkins, production is still low. There are no improved seeds in the market and farmers rely on their own seeds preserved from previous seasons or on farmer-to-farmer seed exchange. There is therefore need to improve the yield and qualities of local pumpkin germplasm. To develop a suitable pumpkin germplasm, proper understanding of genetic diversity available in the pumpkins cultivars is needed. In this study, microsatellite molecular markers were used to assess the genetic diversity of pumpkins grown and consumed in east and central Kenya. Different landraces of mature healthy pumpkin fruits were collected from farmers' fields and local markets in the two regions. The pumpkin fruits were then graded at Kenyatta University. Seeds were extracted from the selected fruits and air-dried for two weeks in plastic plates. Seeds were selected from each fruit and were germinated separately in a greenhouse and grown up to four-leaves-stage. Leaves were harvested from each seedling and dried in separate snap top bags containing silica gel. DNA was extracted from these leaves using the SDS extraction method. Five SSR primers pairs developed for pumpkins were tested for polymorphism on 80 genotypes. Polymorphic products were resolved on the ABI 3730[®] sequencer and allele sizes scored using GeneMapper[®]. The data generated was analysed using the Power marker and DARwin molecular analysis packages to reveal the genetic diversity of the different cultivars and the level of genetic differentiation among the cultivars. All the fruit samples produced 13 groups based on morphology. The 5 SSR primer pairs used on 80 landraces of pumpkin revealed a total of 47 alleles, a mean MAF= 0.5189, the heterozygosity ranged between 0.0405 to 0.7414, mean PIC was 0.6067 and a mean allele number of 9.400 per loci. Cluster analysis showed that pumpkins from these regions are classifiable in to three distinct groups which do not correlate with their source or morphology. The analysis of molecular variance, AMOVA at p 0.001 showed 97% among population variation and only 3%

between population variations. In general, the study showed presence of genetic diversity that can be exploited by plant breeders for improving pumpkins.

DETERMINATION OF ILLEGAL BUSH-MEAT AVAILABILITY IN RANDOMLY SELECTED BUTCHERIES IN NAIROBI AND ITS ENVIRONS USING CYTOCHROME B MITOCHONDRIAL DNA MARKER

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Kenya's invaluable wildlife is under threat from wildlife crime, which has been on the increase in the recent past. With up to 70% of wildlife living outside protected areas either seasonally or permanently, protecting them from poaching has continued to be a great challenge. In the year 2012, KWS reported recovery of 7515kg of bush-meat in Kenya. Currently, prosecuting wildlife offenders, especially in bush-meat cases, has become nearly impossible due to the fact that poachers use highly sophisticated methods. They slaughter cleanly and de-bone the poached animal, taking only the red meat. The processed bush-meat product becomes difficult to distinguish from livestock meat based on near similar morphological features. Immunological methods such as ELISA and ochterlony have been used in bush-meat identification but they have some limitations. Recent advances in DNA-typing enable bush-meat to be identified beyond reasonable doubt and yield results that are admissible in court for purposes of prosecution. This study aimed at evaluating the putative occurrence and prevalence of bush-meat in butcheries within Nairobi and its environs. A simple randomized survey was carried out in which 138 meat samples of approximately 250 g were purchased from various butcheries. The DNA was extracted from these samples using the high pure PCR template preparation Kit (Roche, Germany) following the manufacturer's protocol and a partial region of the mitochondrial DNA was amplified using Mcb398 and Mcb869 markers. The resulting PCR products were sequenced on the big Dye terminator sequencing platform. The contigs were assembled and BLAST searches conducted against the Genbank database. The results revealed that no bush-meat was present in the sampled markets and that 86.96% of the purchased meat originated from cattle (*Bos taurus*), 10.87% from goat (*Capra hircus*) and 2.17% from Sheep (*Ovis aries*). Curiously, in 11.6% of the purchased samples, the meat was identified wrongly by the traders. Phylogenetic analysis using maximum likelihood method based on 32 haplotypes posted three clades corresponding to *Bos taurus*, *Capra hircus* and *Ovis aries*; an affirmation of blast results. This study therefore did not detect any overt bush-meat trade in the areas sampled within Nairobi and its environs

EFFECTS OF SELECTED CARRIER MATERIALS AND STORAGE TEMPERATURES ON SURVIVAL, VIABILITY AND EFFICACY OF RHIZOBIA BIOFERTILIZERS

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Biofertilizers offer commercially feasible and environmentally sound means for supplementing nutrient supply to crops. The basic problem in acquiring quality rhizobia biofertilizers is the low number of efficient cells. The major limitations affecting the quality of rhizobia biofertilizers are; short storage duration, unavailability of appropriate carrier materials, and susceptibility to high temperature. The present study evaluated the effects of selected carrier materials and storage temperatures on survival, viability and efficacy of selected rhizobium strains used in rhizobia biofertilizers. Four selected carrier materials (peat, filter mud, cassava peels and Yeast Extract Mannitol (YEM) broth, five storage temperatures (-20 °C, 4 °C, 25 °C, 30 °C and 40 °C) were used to study the survival of two rhizobium strains (*Bradyrhizobium* Spp. USDA 110 and 532c). Biological and physicochemical properties of the carrier materials were determined before inoculating them with a known amount of rhizobium CFUs. The inoculated carrier materials were stored in different temperatures for six months. Samples from the carrier materials were taken after every two weeks and CFUs determined. The viability of rhizobia inoculants for the best carrier material after six months was determined under greenhouse conditions using soybean as the test crop. Presence of both fungal (except in peat) and bacterial contaminants was observed in the carrier materials hence the carriers were sterilized before being used. The rhizobia population decreased over time regardless of carrier material and storage temperature. The population reduction was highest at 40 °C and lowest at 4 °C except in peat and YEM where reduction was lowest at -20 °C. The initial cell population and the cell population at the end of experiment (6 months) were significantly different ($P < 0.05$). After six months storage, results revealed that rhizobia CFUs were retained above the required threshold of 107 CFU/g at -20 °C and 4 °C across all carriers. At 25 °C, strains populations were retained above threshold for about 5 months. Similarly, at 30 °C and 40 °C both strain population were retained above required threshold for about 4 months. The effect of storage temperature between the two strains on nodule fresh weight was significantly different ($P < 0.05$). Nodule effectiveness across storage temperatures was higher than that of control, although, inoculation did not have significant difference on nodules effectiveness across all temperatures and storage duration. The average %Ndfa for soybean ranged between 33.37 and 49.84 for 532c and 32.31 and 52.57 for USDA110. These values were higher ($P > 0.005$) than that of control across all treatments which averaged at 23.25. Nodule occupancy across the storage temperature ranged between 73-100% and 70-100% for 532c and USDA110, respectively except for 532c fulltime (40 °C) which was 30%. The result showed that a bigger number of nodules analyzed were occupied by the rhizobium strains inoculated indicating viability of both 532c and USDA110 after storage for six months. Selection of the best rhizobia inoculants formulations, specific storage temperatures, and rhizobia strains adaptable to local conditions are essential. The findings of this study showed filter mud and cassava peels were able to retain the highest rhizobia number. Moreover, sterilization of carrier materials is essential and the shelf life of biofertilizers in the market should be based on availability of storage conditions at farm level.

CHARACTERIZATION AND EFFICACY OF LACTOBACILLUS SPECIES AS BIOCONTROL AGENT AGAINST LATENT FUNGAL ENDOPHYTE IN BEANS

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Latent fungal endophytes cause significant crop losses both locally and worldwide. Therefore, there is need to control the fungi to ensure quality and high crop yield. In the past, farmers have been relying heavily on the use of fungicides to control fungal plant diseases. However, these pesticides have many detrimental effects on the environment due to over-use. Alternatives for disease control such as use of bio-control agents (BCA) are increasingly being pursued. Lactic acid bacteria isolated from fermented milk (cow's milk) and yogurt and a lyophilized lactobacillus were tested for their effectiveness against latent fungal endophytes in protection of bean plants. In vitro and in vivo assay for antifungal activity of lactic acid bacteria (LAB) against latent fungal endophyte was determined. The assays were triplicates and data analyzed for significant differences by one way ANOVA. Comparison of mean was performed using Tukey's pos hoc test at $P \leq 0.05$. Morphological and biochemical characterization identified LAB as member of Lactobacillus species and latent fungal endophyte to belong to phylum Ascomycota. Molecular characterization confirmed LAB as being Lactobacillus acidophilus and latent fungal endophyte as Amphelomyces spp. High inhibition in the in vitro test was observed with LAB 1 which had 30.19%, with lowest inhibition shown by LAB 2 at 18.43% as at day 10 of incubation. In vivo test for seed treatment using mean of triplicates showed shoot length of LAB 1 at 51.00cm, LAB 2 at 48.33cm and LAB 3 at 60.30cm to be longer than that of the control at 42.33cm though there was no significant difference $P > 0.05$, while soil treatment showed shoot length of LAB 2 at 61.30cm and LAB 3 at 54.67cm to be longer than that of the control at 42.33cm though there was no significant difference $P > 0.05$. Total fresh weight of treated seed showed LAB 1 at 52.30g, LAB 2 at 51.57g and LAB 3 at 37.50g to be heavier than control at 36.27g though there was no significant difference $P > 0.05$, whereas for soil treatment LAB 1 at 52.17g, LAB 2 at 41.93g and LAB 3 at 38.90g were heavier than control at 36.27g and there was no significant difference $P > 0.05$. Results showed improved plant growth and increased total fresh weight compared with the control, which confirms potential of LAB to act as bio-control agent against latent fungal endophyte. Effects of LAB against latent fungal endophyte under both in vitro and in vivo test are attributed by metabolites produced such as lactic acid. Conclusion was that LAB are promising bacterial group for use in biological control of fungal diseases. Future research should be done to confirm mechanism of inhibition and determine other inhibition substances for application of LAB as bio-control agent.