MAKERERE UNIVERSITY INTERNATIONAL RESEARCH AND INNOVATIONS DISSEMINATION CONFERENCE
APRIL 20-21, 2015 - HOTEL AFRICANA

BOOK OF ABSTRACTS

THEME: COMMUNITY TRANSFORMATION THROUGH RESEARCH, INNOVATIONS AND KNOWLEDGE TRANSLATION
# CONFERENCE PROGRAMME

## DAY 1 – MONDAY APRIL 20, 2015

**VENUE: NILE HALL**

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>08.00 – 09.00</td>
<td>Registration of participants</td>
</tr>
<tr>
<td>09.00 – 09.30</td>
<td>Welcome Remarks, Chairperson, Conference Organising Committee</td>
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<tr>
<td>09.30 – 10.30</td>
<td><strong>Session 1: Plenary: Invited Papers</strong></td>
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<tr>
<td></td>
<td>Chairperson: Prof. George Nasinyama, Makerere University</td>
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<td></td>
<td>Special Paper 1: Viral Haemorrhagic Fevers (VHFs) by Dr. Monica Musenero Masanza, Assistant Commissioner, Epidemiology and Surveillance, Ministry of Health</td>
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<td></td>
<td>Special Paper 2: The future of food security in Africa by Prof. George William Otim-Nape, African Innovations Institute AFRII</td>
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<tr>
<td>10.30 – 11.00</td>
<td>HEALTH BREAK</td>
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<tr>
<td>11.00 – 12.00</td>
<td><strong>OPENING SESSION:</strong></td>
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<tr>
<td></td>
<td>CHAIRPERSON: Prof. Charles Kwesiga, Executive Director, Uganda Industrial Research Institute, Nakawa-Kampala</td>
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<td></td>
<td>The Uganda National Anthem</td>
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<td>East African Community Anthem</td>
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<td>Anthem of the Government of Sweden</td>
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<td>Makerere University Anthem</td>
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<td>Remarks by the Vice Chancellor, Makerere University – Prof. John Ddumba-Ssentamu</td>
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<td>Remarks by the Chairperson Makerere University Council, Eng. Dr. Charles Wana-Etyem</td>
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<td>Remarks by the Ambassador of Sweden to Uganda, H.E Urban Andersson</td>
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<td>Remarks by the Chancellor Makerere University, Prof. George Mondo Kagonyera</td>
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<tr>
<td>12.00 – 12.30</td>
<td>Keynote paper by Prof. Love Ekenberg, Professor of Mathematics, Stockholm University, Sweden</td>
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<tr>
<td>12.30 – 12.45</td>
<td>Discussion</td>
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<tr>
<td>12.45 – 14.00</td>
<td>LUNCH BREAK</td>
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**BREAKOUT/PARALLEL SESSIONS**

### SUB-THEME 1: HEALTH AND HEALTH SYSTEMS

**CHAIRPERSON: Dr. Jaran Eriksen, Department of Laboratory Medicine, Karolinska Institutet**

**VENUE: ORANGE HALL**

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>14:10 – 14:45</td>
<td>Key Paper: by Prof. John David Kabasa, College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University</td>
</tr>
<tr>
<td>14:45 – 15:05</td>
<td>OP 101: Cerebral palsy in Children in Kampala, Uganda: Clinical subtypes, Motor function and Comorbidities by Angelina Mwesigwa Kakooza</td>
</tr>
<tr>
<td>15:25 – 15:45</td>
<td>OP 103: Prevalence And Factors Associated With Low Birth Weights Among Teenage Mothers In New Mulago Hospital by Louis Bayo</td>
</tr>
<tr>
<td>15:45 – 16:05</td>
<td>OP 104: Maternal near misses from two referral hospitals in Uganda: a prospective cohort study on incidence, determinants and prognostic factors by Dan. K. Kaye</td>
</tr>
<tr>
<td>16:05 – 16:25</td>
<td>OP 105: Symptom-based approach for diagnosis of acute asthma and pneumonia among young children in Uganda by Rebecca Nantanda</td>
</tr>
<tr>
<td>16:25 – 16:45</td>
<td>OP 106: Vitamin D Receptor fok I Gene polymorphism and vitamin D status in pulmonary TB patients at Mulago National Referral Hospital Uganda by Ester Acen L.</td>
</tr>
<tr>
<td>16:45 – 17:00</td>
<td>TEA BREAK</td>
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<tr>
<td>17.00 – 17.30</td>
<td>Viewing Posters</td>
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</table>
### SUB-THEME 2: NATURAL RESOURCE UTILISATION, CONSERVATION AND ENVIRONMENTAL SUSTAINABILITY

**CHAIRPERSON**: Prof. Christine Dranzoa, Vice Chancellor, Muni University  
**VENUE**: KAFU HALL

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<th>Time</th>
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<tr>
<td>14:10 – 14:45</td>
<td>Key paper : by Dr. Andrew Seguya, Executive Director, Uganda Wildlife Authority, Kampala</td>
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<tr>
<td>14:45 – 15:05</td>
<td>OP 201: Trends of climate extremes and farmers perceptions in the cattle corridor of Uganda by Brian Owoyesigire</td>
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<tr>
<td>15:05 – 15:25</td>
<td>OP 202: Analysis Of Future Climate Scenarios Over Central Uganda Cattle Corridor by Alex Nimusimsa</td>
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<tr>
<td>15:25 – 15:45</td>
<td>OP 203: Improved access to climate information as a pre-requisite to increased production and welfare for rural farmers by Goretti Linda Nassanga</td>
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<tr>
<td>15:45 – 16:05</td>
<td>OP 204: Dissolution kinetics of natural halite from Lake Katwe (Uganda) in aqueous salt solutions by Hillary Kasedde</td>
</tr>
<tr>
<td>16:25 -16:45</td>
<td>OP 206: Historical Deposition Of Persistent Organic Pollutants In Three Equatorial Lakes From East Africa: Insights Into Atmospheric Deposition From Sedimentation Profiles by Kenneth Arinaitwe</td>
</tr>
<tr>
<td>16:45 – 17:00</td>
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### SUB-THEME 3: FOOD SECURITY, SAFETY AND VALUE ADDITION

**CHAIRPERSON**: Prof. Ulf Magnusson, Department of Clinical Sciences, Swedish University of Agricultural Sciences (SLU)  
**VENUE**: ZAMBEZI HALL

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<tr>
<td>14:10 – 14:45</td>
<td>Key paper : by Assoc. Prof. George W. Byarugaba-Baziraake, Kyambogo University, Kampala</td>
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<tr>
<td>14:45 – 15:05</td>
<td>OP 301: Barriers faced by urban farmers when seeking for agricultural information in Kampala Capital City Authority in Uganda by Hellen Musanabera Byamugisha</td>
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<td>15:05 – 15:25</td>
<td>OP 302: Influence of finishing duration of supplemented grazing animals on meat quality of selected beef breeds in Uganda by Kanifa Kamatara</td>
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<td>15:25 – 15:45</td>
<td>OP 303: A big data approach to management and analysis of a large crop disease surveillance dataset by Grace Kamulegeya Bugembe</td>
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<tr>
<td>15:45 – 16:05</td>
<td>OP 304: Evaluation of the Performance of different Organic fertilisers on Maize Yield in Kampala Uganda by John Allan Komakech</td>
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<td>16:05 – 16:25</td>
<td>OP 305: Solving the invisible hunger crisis among school children through service learning by Donald Rugira Kugonza</td>
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<td>16:25 -16:45</td>
<td>OP 306: Makerere University Transforms the Soybean Sector in Uganda through development and release of high yielding-rust resistant soybean varieties by Tony Obua</td>
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<tr>
<td>16:45 – 17:00</td>
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### SUB-THEME 4: CULTURE, SOCIO-ECONOMIC TRANSFORMATION, SOCIAL JUSTICE, GOVERNANCE, CONFLICT AND DISASTER MANAGEMENT

**CHAIRPERSON**: Prof. Joy Contance Kwesiga, Vice Chancellor Kabale University  
**VENUE**: SEZIBWA HALL

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<tr>
<td>14:10 - 14:45</td>
<td>Key paper : by Mr. Gideon Badagawa, Uganda Private Sector Foundation</td>
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</table>
# SUB-THEME 5: ADVANCES IN EDUCATION, SCIENCE AND TECHNOLOGY

**CHAIRPERSON:** Prof. Charles Kwesiga, Executive Director, Uganda Industrial Research Institute (UIRI)

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<tr>
<td>14:10 – 14:45</td>
<td>Key paper: by Prof. A. B. Kasozi, Associate Fellow, Makerere Institute for Social Research</td>
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<tr>
<td>14:45 – 15:05</td>
<td>OP 501: Experimental study on the performance of gas burner for producer gas based on swirl flow and continuous air staging by Joseph Ndemere Arietwe</td>
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<tr>
<td>15:45 – 16:05</td>
<td>OP 504: Operational Characteristics of Passing Zones on Two-Lane Rural Highways in Uganda by Godfrey Mwesige</td>
</tr>
<tr>
<td>16:05 – 16:25</td>
<td>OP 505: Individual, Organizational Factors and Teacher Turnover Intentions among Primary Schools, in Mbarara District by Mary Gyezaho</td>
</tr>
<tr>
<td>16:25 – 16:45</td>
<td>OP 506: Copyright Infringement for Academic Authorship in Uganda: Implications on Exemptions of Fair Use for educational purposes in Universities by Elisam Magara</td>
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<td>17.00 – 17.30</td>
<td>TEA BREAK</td>
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# DAY 2 – TUESDAY APRIL 21, 2015

**MORNING SESSION 9.00 – 12.00**

**SUB-THEME 1: HEALTH AND HEALTH SYSTEMS**

**CHAIRPERSON:** Prof. James Tumwine, College of Health Sciences, Makerere University

**VENUE:** ORANGE HALL

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<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>09:00 – 09:20</td>
<td>OP 107: The One Health Residency Program: Philosophy and Lessons Learnt at Makerere University by Francis Ejobi</td>
</tr>
<tr>
<td>09:20 – 09:40</td>
<td>OP 108: Integrated Community Case Management of Malaria and Pneumonia in Eastern Uganda: Care-seeking, Adherence, and Community Health Worker Performance by Joan N. Kalyango</td>
</tr>
<tr>
<td>09:40 – 10.00</td>
<td>OP 109: Community perceptions on integrating animal vaccination and health education by veterinary and public health workers in the prevention of brucellosis among pastoral communities of South Western Uganda by Catherine Kansime</td>
</tr>
<tr>
<td>10.00 – 10.20</td>
<td>OP 110: Brucella sero-prevalence and modifiable risk factors among predisposed cattle keepers and consumers of unpasteurized milk in Mbarara and Kampala districts, Uganda by George W. Nasinyama</td>
</tr>
<tr>
<td>10:20 – 11:00</td>
<td>TEA BREAK</td>
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<tr>
<td>11:00 – 11:20</td>
<td>OP 111: Reducing contamination Rate of LOWNSTAIN JENSEN Sputum Culture Media by Use of PANTA Antimicrobial Panel by Godfrey Ekuka</td>
</tr>
<tr>
<td>11:20 – 11:40</td>
<td>OP 112: Prospects of extracts from Peltophorum africanaum Sond. (Fabaceae) against human immunodeficiency virus (HIV) and AIDS by Edmund Bizimyera</td>
</tr>
<tr>
<td>11:40 – 12.00</td>
<td>OP 113: Total anti-oxidant capacity and acute toxicity of selected indigenous nutri-medicinal plants used in the management of HIV/AIDS Opportunistic ailments in Wakiso, Uganda by M.M. Nakibuuka</td>
</tr>
<tr>
<td>12.00 – 12.20</td>
<td>OP 114: Antimicrobial and toxicological evaluation of nutri-medicinal plant species used in the management of HIV/AIDS opportunistic infections by Savina Asiimwe</td>
</tr>
<tr>
<td>12:20 – 14:00</td>
<td>LUNCH BREAK</td>
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**SUB-THEME 2: NATURAL RESOURCE UTILISATION, CONSERVATION AND ENVIRONMENTAL SUSTAINABILITY**

**CHAIRPERSON:** Prof. Maud Kamatenesi Mugisha, Vice Chancellor, Bishop Stuart University Mbarara

**VENUE:** KAFU HALL

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<tbody>
<tr>
<td>09:00 – 09:20</td>
<td>OP 207: The prospects and challenges of promoting efficient biomass energy diffusion in the east African Lake Victoria basin communities by Wilson Okaka</td>
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<tr>
<td>09:20 – 09.40</td>
<td>OP 208: Life cycle assessment of biodegradable waste treatment systems for sub-Saharan African cities by John Allan Komakech</td>
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<tr>
<td>09.40 – 10.00</td>
<td>OP 209: Vermicomposting as manure management strategy for urban small-holder animal farms - Kampala case study by Cecilia Helena Laplander</td>
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<tr>
<td>10.00 – 10.20</td>
<td>OP 210: Agro-diversity in a commercial sugarcane cultivation land matrix in a subsistence economy by Edward Mwavu</td>
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<tr>
<td>10:20 – 11:00</td>
<td>TEA BREAK</td>
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<tr>
<td>11:00 – 11:20</td>
<td>OP 211: Screening soybean genotypes for symbiotic association with Bradyrhizobium spp. to establish promiscuous lines by Eric E. Agoyi</td>
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<td>11:20 - 11:40</td>
<td>OP 212: Proximate nutrient composition of some wild nutraceutical plants from Nebbi, Uganda by Godwin Anywar</td>
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<tr>
<td>11:40 – 12:00</td>
<td>OP 213: Legacy and currently used pesticides in the atmospheric environment of East Africa by Kenneth Arinaitwe</td>
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<tr>
<td>12.00 – 12.20</td>
<td>OP 214: Effect of protein supplementation on the performance of Ankole x Friesian crossbred calves grazed on natural pastures by Sylvester Katuromunda</td>
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<tr>
<td>12:20 – 14:00</td>
<td>LUNCH BREAK</td>
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**SUB-THEME 3: FOOD SECURITY, SAFETY AND VALUE ADDITION**

**CHAIRPERSON:** Prof. Bernard T. Bashaasha, College of Agricultural and Environmental Sciences, Makerere University

**VENUE:** ZAMBEZI HALL

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<tr>
<td>09:00 - 09:20</td>
<td>OP 307: Optimal plans for adopters of Okra, French beans and Hot pepper: A quadratic risk programming approach using Portfolio Theory by Stephen Lwasa</td>
</tr>
<tr>
<td>09:20 – 09.40</td>
<td>OP 308: Indigenous innovations used in primary processing and storage of selected food legumes under smallholder farming system in Uganda: Implications to food safety and storage bruchids management by John Bosco Muhumuza</td>
</tr>
<tr>
<td>09.40 – 10.00</td>
<td>OP 309: Effect of intercropping Brachiaria cv Mulato with forage legumes on dry matter yield and chemical composition of fodder grasses in Uganda by Stephen Kayiwa</td>
</tr>
<tr>
<td>10.00 – 10.20</td>
<td>OP 310: Utilisation of the elderly women’s lived knowledge in the management of Aflatoxin in groundnuts by Ruth Muwesa</td>
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<tr>
<td>10:20 - 11:00</td>
<td>TEA BREAK</td>
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<tr>
<td>11:00 - 11:20</td>
<td>OP 311: Contribution of root to drought resilience in low phosphorus common bean by Margaret Namugwanya</td>
</tr>
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<td>11:20 - 11:40</td>
<td>OP 312: Effectiveness of Community Based Seed Multiplication in Enhancing Farmers’ access to Improved Bean Seeds (Phaseolus Vulgaris L.) In Kamwenge District, Uganda by Mastula Nateebwa</td>
</tr>
<tr>
<td>11:40 – 12:00</td>
<td>OP 313: Production methods and microbiological studies on bongo, a traditionally fermented milk product from Pallisa district, Eastern Uganda by Norah Gulaita</td>
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<td>12.00 – 12.20</td>
<td>OP 314: Financial losses associated with Foot and Mouth Disease along the cattle marketing chain in selected districts in Uganda by Sylvia Baluka Angubua</td>
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<td>12:20 – 14:00</td>
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**SUB-THEME 4: CULTURE, SOCIO-ECONOMIC TRANSFORMATION, SOCIAL JUSTICE, GOVERNANCE, CONFLICT AND DISASTER MANAGEMENT**

**CHAIRPERSON:** Prof. Edward K. Kirumira, College of Humanities and Social Sciences, Makerere University

**VENUE:** SEZIBWA HALL

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<tr>
<td>09:00 - 09:20</td>
<td>OP 407: Unshackling women's sexuality? Miniskirts, the law, and sexual explicitness in the media by Amanda Tumusiime</td>
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<tr>
<td>09:20 – 09.40</td>
<td>OP 408: Gender and Post Conflict Policy Making and Reconstruction in northern Uganda: A Case of the Health Sector by Helen Kezie-Nwoha</td>
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<tr>
<td>09.40 – 10.00</td>
<td>OP 409: Assessing the success and Challenges of Government Interventions under the Peace, Recovery, and Development Plan in Post Conflict Reconstruction in Northern Uganda: Evidence from the field by Tom Ogwang</td>
</tr>
<tr>
<td>10.00 – 10.20</td>
<td>OP 410: Factors Associated With Willingness to Utilise Female Sterilisation Contraception among Married Women in Tororo District, Uganda by Gloria Nserek</td>
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<tr>
<td>10:20 - 11:00</td>
<td>TEA BREAK</td>
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<tr>
<td>11:00 - 11:20</td>
<td>OP 411: Protection of the “Traditional Heterosexual Family”? The State and Anti-homosexual Legislation in Uganda by Angelo Kakande</td>
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<td>11:20 - 11:40</td>
<td>OP 412: Social behavior, Corruption and the Culture of Riddling in Uganda by Cornelius Wambi Gulere</td>
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<td>11:40 – 12:00</td>
<td>OP 413: Life After Disease outbreak: experiences of Ebola Survivors in Kibaale and Luwero Districts in Uganda by Laban Musinguzi Kashaija</td>
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<td>12.00 – 12.20</td>
<td>OP 414: A theoretical approach to the compilation of thesauruses in less documented languages by Celestino Oririmiza</td>
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<td>12:20 – 14:00</td>
<td>LUNCH BREAK</td>
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**SUB-THEME 5: ADVANCES IN EDUCATION, SCIENCE AND TECHNOLOGY**

**CHAIRPERSON:** Prof. Henry Alinaitwe, College of Engineering, Design, Art and Technology, Makerere University
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<tr>
<td>09:00 - 09:20</td>
<td>OP 507: Space weather effects on satellite communication by Florence Mutonyi D’Ujanga</td>
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<tr>
<td>09:20 - 09:40</td>
<td>OP 508: Electricity theft in Kampala: Causes and Interventions by Ruth Mbabazi Mutebi</td>
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<td>09:40 - 10:00</td>
<td>OP 509: The potential of <em>Cymbopogonardus</em> in the production of pulp for paper industry by Omar Lwako Kamoga</td>
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<td>10:00 - 10:20</td>
<td>OP 510: Effect of TMT Bar Lugging on Steel Reinforcement Failure Mode under Monotonic Loading by Christopher Sentfuka</td>
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<td>10:20 - 11:00</td>
<td>TEA BREAK</td>
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<tr>
<td>11:00 - 11:40</td>
<td>OP 511: The Practice of Using Emerging Technologies for Teaching Large Classes: A Case At Makerere University by Michael Walimbwa</td>
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<td>11:40 - 12:00</td>
<td>OP 512: Requirements for a seamless collaborative and cooperative m-learning System by Paul Muyinza Birevu</td>
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<td>12:00 - 12:20</td>
<td>OP 513: Orality, writing and visuality for innovations by Simon Peter Ongodia</td>
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**DAY 2 – TUESDAY APRIL 21, 2015**

**AFTERNOON SESSION 14.10 – 17.00**

**SUB-THEME 1: HEALTH AND HEALTH SYSTEMS**

**CHAIRPERSON**: Prof. Isaac Okullo, College of Health Sciences, Makerere University

**VENUE**: ORANGE HALL

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<td>14:10 - 14:30</td>
<td>OP 115: Human leukocyte antigen class 1 phenotype distribution and analysis in persons from Central Uganda with active tuberculosis and latent <em>Mycobacterium tuberculosis</em> infection by Hellen Buteme</td>
</tr>
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<td>14:30 - 14:50</td>
<td>OP 116: Upper gastrointestinal bleeding in rural sub-Saharan Africa where schistosomiasis is endemic by C.K. Opio</td>
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<td>14:50 - 15:10</td>
<td>OP 117: Internationalisation of Health professionals’ education and quality of education by Susan Nassaka Byekwaso</td>
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<td>15:10 - 15:30</td>
<td>OP 118: Determinants of access to healthcare by older persons in Uganda: A cross-sectional study by Stephen Wandera Ojiambo</td>
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<td>15:30 - 15:50</td>
<td>OP 119: Inhibitory Effects of Essential Oil from Aromatic Ugandan Medicinal Plants on Oral Bacteria by Ocheng Francis</td>
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<td>15:50 – 16:20</td>
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<td>16.20 – 17.00</td>
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<td>17.00 – 20.00</td>
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**SUB-THEME 2: NATURAL RESOURCE UTILISATION, CONSERVATION AND ENVIRONMENTAL SUSTAINABILITY**

**CHAIRPERSON**: Prof Mary Okwakol, Vice Chancellor, Busitema University

**VENUE**: KAFU HALL

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<td>14:10 – 14:30</td>
<td>OP 215: Human activities negatively impact chimpanzee populations in forest reserves by Samuel Koojo Mugume</td>
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<tr>
<td>14:30 – 14:50</td>
<td>OP 216: Utilization and conservation status of indigenous woody Plants in pastoral production systems of south western Uganda by Dina Nabasumba</td>
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<tr>
<td>14:50 – 15:10</td>
<td>OP 217: Natural gastro-enteric properties of <em>Ficus natalensis</em>, <em>Rhuss natalensis</em> and <em>Harrisia abyssinica</em> in native East African goats by Dorothy Nampanzira</td>
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<tr>
<td>15:10 – 15:30</td>
<td>OP 218: Exploration Of Gravel Roads Erosion Data In Uganda by Twaib Semwogerere</td>
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<td>OP 219: Gender, Displacement and Rights: the case of the Climate Change Refugees in Kiryandongo by Dr. Tabitha Mulyampiti</td>
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**CHAIRPERSON:** Prof. Ruth Mukama, College of Humanities and Social Sciences, Makerere University

**VENUE:** SEZIBWA HALL

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**CHAIRPERSON:** Prof. Eli Katunguka, Vice Chancellor, Kyambogo University

**VENUE:** MAYANJA HALL

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**COORDINATOR:** Professor David Okello Owiny, Directorate of Research and Graduate Training, Makerere University  
**VENUE:** FOYER

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PP504 Behind the Curtains: Factors Influencing the Uptake of Technology for Teaching at Makerere University by Ruth Nsibirano
MAKERERE- Sida INTERNATIONAL RESEARCH & INNOVATIONS DISSEMINATION CONFERENCE

20TH - 21ST APRIL 2015

HOTEL AFRICANA, KAMPALA - UGANDA

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Ms. Florence Birabwa
FOREWARD

The Directorate of Research and Graduate Training is pleased to share with you some of the research outputs from the Third phase of the Makerere-Sida bilateral research programme, 2010–2015. The Swedish research cooperation with Uganda was initiated in 2000 and consisted of institutional research capacity strengthening. There has been three consecutive agreement periods, which have amounted to SEK 315 million and the current agreement period 2010-2015 amounts to SEK 215 million (total support 520M SEK).

The programme was built around international research collaboration, principally with Swedish universities. The programme aimed to support MaK towards its goal of becoming a vibrant, internationally competitive research university. During the current research agreement 2010-2015, four other public universities entered the cooperation: Kyambogo, Busitema, Gulu and Mbarara University of Science and Technology, but the support to those universities has been channelled through MaK.

The current agreement 2010-2014 entails support to 105 PhD students, 42 MA students and 20 Post-Doc researchers in 12 different units. Institutional support has gone to libraries, laboratories, the Iganga/Mayuge Demographic Surveillance Site, academic quality assurance, gender mainstreaming and to MaK’s research, administrative and financial reform.

It is gratifying to note that Swedish support has significantly enhanced academic sustainability at MaK. More staff have completed their Ph.D.’s, Post Doc researchers are trained and provided research opportunities, relevant and promising research has been conducted and infrastructure for research has been strengthened.

Ostensibly, the Swedish investment in researcher training and research has contributed to building research capacity, research structures and not least a culture of research at MaK. The consistent, long-term and predictable funding and support provide a model for capacity strengthening focusing on training individuals and building necessary support structures (ICT, libraries, management, etc.). However, even such a well-intended programme has its non-intended consequences for which the DRGT has designed a management plan.

Owing from the satisfactory achievements from the third phase of research cooperation 2010-2015, preliminary arrangements have been made for the fourth phase of Sida support, and this will run for a period of 5 years, starting from September 2015 (2015 – 2020). We remain committed to reducing poverty and disease, to improving agricultural production, and cause community transformation through research, Innovation and local community engagements.

We are grateful to the Royal Government of Sweden for the financial support extended to the researchers and students. We thank the staff at the Embassy of Sweden in Kampala for the guidance and resourceful contribution to the bilateral programme.

We hope you will find this book of Abstracts a resourceful mirror of the wide research spectrum at Makerere University.

Give us a feedback whenever possible as we together, Build for the Future!

Professor Mukadasi Buyinza
Director & Overall Coordinator Mak-Sida research programme
DIRECTORATE OF RESEARCH AND GRADUATE TRAINING
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Cerebral palsy (CP) is a common chronic childhood disorder worldwide. There is limited information about the CP panorama in sub-Saharan Africa. Our aim was to describe the clinical subtypes, gross and fine motor functions and presence of co-morbidities in a group of children with CP attending a tertiary hospital in Uganda. Children with CP in the age range of 2-12 years visiting the pediatric CP clinic at Mulago Hospital, Kampala, were enrolled. Screening and inclusion were based on a three-stage procedure: i) Two screening questions from the Ten Question Screen; ii) Clinical assessments adapted from the Surveillance for Cerebral Palsy in Europe (SCPE); iii) Clinical examinations and diagnoses of subtype, severity level and co-morbidities. Caregivers were interviewed using questionnaires to provide information on child’s medical history and co-morbidities. Co-morbidity scores were calculated for each child. One hundred and thirty five children with CP were enrolled (72 males, 63 females, median age 3 years 5 months, IQR 2 years 4 months-5 years 6 months). Bilateral spastic type was commonest (45%); moderate impairment in gross motor function was present in 43%, with comparable numbers (37%) in the mild and severely impaired fine motor function groups. The severe gross and fine motor function levels were seen in the bilateral spastic and dyskinetic CP subtypes. Signs of learning disability (75%) and epilepsy (45%) were the commonest co-morbidities. Higher co-morbidity scores were obtained in children with dyskinetic CP and severe levels of gross and fine motor function. There was a significant difference in distribution of the co-morbidity scores between the CP subtypes, gross motor and fine motor function levels (p<0.001). Signs of speech and language impairments were associated with bilateral spastic CP and severe gross and fine motor dysfunction (p<0.05). Bilateral spastic CP was the main clinical subtype, with signs of learning disability and epilepsy as major causes of co-morbidity. The severity of gross and fine motor function levels was related to severity of clinical CP subtypes. Our findings imply a higher occurrence of birth asphyxia or postnatally acquired infections. Improvement in emergency obstetric and postnatal care may reduce this burden.

The development of malaria immunity still remains a mystery and as to why malaria episodes occur more frequently in some children as compared to others raises further questions. The aim of this study was to determine the relationship between the presence of mutations in one factor important for a proper immune response, RANTES, with incidence of malaria in a cohort of children living in a malaria endemic area of Uganda. This was a longitudinal study comprising of 423 children aged between 0.5 and 9 years, who were actively followed up for one year. Malaria episodes were documented among the study cohort and treated accordingly. Mutations in the RANTES gene were determined by PCR-RFLP method and the frequency of mutations thereof calculated. A multivariate negative binomial regression model was used to estimate the impact of RANTES mutations on malaria incidence. In all statistical tests, a P – value of <0.05 was considered as significant. The frequency of the -403 A and In1.1C allele was 53.7 % and 19.2 % respectively. No mutations were found at the -28 locus. After adjustment of incidence rates for age, blood group, ITN use and malaria history, heterozygotes and homozygotes for both 403G/A and In1.1TC polymorphisms showed a non significant trend towards higher incident rates as compared to those without mutations. This study showed that the -403A mutation occurs in nearly half the study population and In1.1C allele occurs in 1 in every 4 children. Despite the high frequency of these mutations, there was no clear association with malaria incidence. Other studies evaluating more markers that could potentially modulate RANTES gene transcription along side other genetic modifiers of malaria susceptibility may provide further explanations to these less dramatic findings.
The World Health Organization defines low birthweight (LBW) as a newborn having a weight of less than 2500gms at birth. Low birthweight is one of the major determinants of perinatal survival; infant morbidity and mortality as well as the risk of developmental disabilities and illnesses in future life. WHO estimates that about 30million low birthweight babies are born annually (23.4% of all births) and they often face short and long term health consequences. Whereas the global prevalence of LBW is slightly dropping, the rate in many developing countries is still quite high. In Uganda, low birth weight among teenage mothers is still a problem. Our objectives were to estimate the prevalence of low birthweight in new Mulago and identify the factors that are associated with low birthweights among teenage mothers (below 20 years) in new Mulago hospital. Little literature is present concerning the influence of mother’s age on the weight of the baby with most researches done in Uganda being focused more on the socio-economic, demographic, nutritional, and maternal infections. The MoH policy objective on health care package, number 5.2.1 (a) is to ensure provision and increase utilization of UNMHC (Uganda National Minimum Health Care Package) consisting of promotive, preventive, rehabilitative and curative services for all diseases and conditions especially in vulnerable populations to all peoples of Uganda. One of the strategies is to implement the roadmap for reducing maternal and neonatal morbidity and mortality. Our study is inline with this because some of the factors that affect LBW which lead to neonatal mortality can be prevented. We conducted an analytical cross sectional study among women delivering at new Mulago Hospital Complex from August 2013 to August 2014. We trained interviewers to administer pre-tested questionnaires to consecutive teenage mothers to obtain information on socio-demographic characteristics, obstetric history and child factors. Data collected was coded and thereafter analyzed using statistical methods, chi-square tests and P-Value were performed to determine the relationship between independent and dependent variables. We also used descriptive statistics for the quantitative data. The prevalence of LBW among our study population was high 24%. Pre-term delivery ($\chi^2=20.9\ P=0.0001$) and multiple pregnancies ($\chi^2=9.1\ P=0.003$) were associated with LBW. Marital status ($\chi^2=3.9\ P=0.048$) was marginally associated with LBW. Malaria was not associated with LBW. 93.6% attended ANC however only 38.4 completed the recommended 4 visits. Prevalence of LBW was high, 24%. Factors associated with LBW were pre-term delivery and multiple pregnancies with marital status marginally associated. Health professional’s need to address teenage maternal health. Health workers should encourage teenage mother to attend focused antenatal care as recommended by the Uganda ministry of Health. A specialized maternal facility centre that is friendly for adolescent/teenage mothers is advisable so as to improve on completion rates.

**OP 104: Maternal Near Misses From Two Referral Hospitals In Uganda: A Prospective Cohort Study On Incidence, Determinants And Prognostic Factors.**

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Maternal near misses occur more often than maternal deaths and could allow a more comprehensive analysis of risk factors, short-term outcomes and prognostic factors of obstetric complications in pregnancy and childbirth. The study determined the incidence, characteristics, and maternal outcomes of maternal near misses in two referral hospitals in Central Uganda. A prospective cohort study was conducted at two referral hospitals in central Uganda between March 1, 2013 and February 28, 2014. All cases of severe pregnancy and childbirth complications were included. Near miss cases were defined according to the WHO criteria. Multivariate logistic regression analysis was conducted to identify prognostic factors for severe maternal outcomes (near miss or maternal death). Severe pre-eclampsia was the commonest morbidity (incidence ratio 7.0%, case-fatality rate of 2.3%), followed by postpartum haemorrhage (incidence ratio 6.7%, case-fatality rate of 7.2%). Uterine rupture (incidence ratio 5.5%) caused the highest case-fatality (17.9%), followed by eclampsia (incidence ratio 0.4%, case-fatality ratio 17.8%). The commonest diagnostic criteria for maternal near miss were admission to the high dependency unit (HDU) or to the intensive care unit (ICU). Thrombocytopenia, circulatory collapse, referral to a more specialized unit, intubation unrelated to anaesthesia, and cardiopulmonary resuscitation were predictive of maternal death ($p<0.05$). Parity (ARR 1.4, 95%CI 1.0-1.2); elevated serum lactate levels (ARR 4.5, 95%CI 2.3-8.7); intubation unrelated to anaesthesia (ARR 2.6, 95%CI 1.2-5.7), cardiovascular collapse( ARR 4.9, 95%CI 2.5-9.5) ;multiple transfusions (ARR 1.9, 95%CI 1.1-3.1); referral (ARR 2.6, 95%CI 1.2-5.6); and need for cardiopulmonary resuscitation (ARR 6.1, 95%CI 3.2-11.7), were prognostic factors. The analysis of near misses is critical in investigation of severe maternal morbidity, as it reveals risk and prognostic factors in women with obstetric complications.
Acute respiratory infections cause significant morbidity and mortality among ‘under-fives’ in Uganda. Bacterial pneumonia is over-diagnosed while acute asthma is under-diagnosed. We aimed to develop a simple question-based tool for distinguishing acute asthma from bacterial pneumonia in ‘under-fives’. The secondary objective was to determine the sensitivity and specificity of the asthma-pneumonia questionnaire for detecting asthma in young children. A cross sectional study of 614 children with cough and/or difficult breathing, at the paediatric emergency unit of Mulago hospital was done. We took a history of the child’s current and previous symptoms, family history and environment factors related to respiratory disease (referred to asthma-pneumonia questionnaire-APQ). The physical examination, radiological and laboratory findings to define asthma/pneumonia were also considered. The items in the APQ were compared to the standard definition of asthma according to the GINA guidelines. Children with asthma or bronchiolitis were collectively referred to as “Asthma syndrome”. The sensitivity and specificity of APQ items for identification of children with asthma and pneumonia was determined using the Classification and Regression Tree method. To distinguish asthma syndrome from bacterial pneumonia, the best items were; wheezing, shortness of breath, and past history of waking up because of wheezing, with a misclassification error of 40.0%. To detect asthma syndrome, the best items were; cough, wheezing, difficulty in breathing and having previously been at a healthcare centre because of breathing difficulties with a sensitivity of 80.8% (95% CI 77.6 - 84.0), specificity of 84.7% (95% CI 81.8 - 87.6) and misclassification error of 16.9%. The sensitivity and specificity of the tool for detection of children with asthma are acceptable and may provide a simple and rapid way of screening for asthma in ‘under-fives’. A symptom-based approach to distinguishing asthma and pneumonia among children less than five years remains a big challenge. We recommend more research to develop diagnostic gold standards for asthma and pneumonia in young children.

**OP 106: Vitamin D Receptor Fok I Gene Polymorphism And Vitamin D Status In Pulmonary TB Patients At Mulago National Referral Hospital Uganda**

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*Mycobacterium Tuberculosis* (TB) is still a major problem globally more so in Africa. An estimated 40 to 70 % of the world is vitamin D deficient and is largely undiagnosed yet is associated with diseases including TB. Vitamin D antimicrobial activity may play a role in prevention of such diseases. Due to its functional transcriptional activity *fok* / VDR has extensively be examined in TB patients and findings have been inconclusive. Additionally studies have shown that patients presenting with active TB have significantly lower vitamin D serum concentration than their contacts from the same ethnic location. This study investigated the relationship between VDR *fok* / gene polymorphism, vitamin D status and susceptibility to pulmonary TB. An analytical cross sectional study was done in 41 newly diagnosed TB patients and 41 non TB healthy workers enrolled between April and June 2013 at Mulago hospital. Vitamin D levels, PTH, calcium and phosphate were analysed by electrochemiluminescence using cobas 6000. Genotyping of *fok* / gene was done by Polymerase chain Reaction (PCR) – direct sequencing method using the ABI sequencer. Nucleotides queries were sent to blast for confirmation and a bioinformatics DNA baser program was used to detect genetic polymorphism Hypovitaminosis D of TB patients and normal healthy subjects n=21 was 25.6%. The Prevalence of hypovitaminosis D in the TB patients n = 10 was 24.4% and more in the normal healthy subjects n = 11 was 26.8%. Vitamin D deficiency in TB patients was 9.7% and more severe vitamin D deficiency was only found in the TB patients. There was no significant difference between vitamin D status among the *fok* / gene variants (p=0.78).There was no significant association between vitamin D receptor *fok* / gene polymorphism and vitamin D status in the Ugandan TB patients though 95.2% of them having dominant FF genotype which has been linked with high utilization of vitamin D.
In February 2013, Makerere University College of Veterinary Medicine, Animal Resources and Biosecurity innovated and launched a One Health residency program. This is a two-year program premised on a “residency paradigm”, where graduate veterinary, nursing, public health and other health professionals gain practical, hands-on experience from working with industry, government and non-governmental organizations. The program requires residents to spend 25 per cent of their time working on a Masters degree program and 75 per cent working on real world projects contracted from industry, government, and academic research programs. This program reflects an increasing global awareness of the need for preparing veterinary, medical, nursing and other health professionals to work together in addressing emerging One Health challenges. In developing and operationalizing this program, Makerere University partnered with the University of Minnesota in the US. The pioneer cohort of three One Health residents (1 nurse and 2 veterinarians) successfully completed the program in January 2015, and will earn terminal One Health Residency certificates. The residents gained core capacities in the fields of Infectious Disease Management, Health Systems, Food Safety, Epidemiology/Biostatistics, One Health Leadership, and Ecosystem/Environmental Health. They participated in responding to real world public health challenges including floods in Kasese district, assessment of occupational hazards in abattoirs, sensitizing communities on the One Health approach in Hoima district, assessing health risks in food value chains in Kampala district, analysis of livelihood of smallholder farmers in Gulu district, among others. This paper presents the driving philosophy of the One Health residency program, key success stories of pioneer residents, and the key lessons learnt. The paper advocates for international adoption and deepening of the One Health Residency program as an alternative model for building requisite One Health workforce required to effectively detect, plan and respond to ravaging public health challenges of the 21st century.

OP 108: Integrated Community Case Management of Malaria and Pneumonia in Eastern Uganda: Care-seeking, Adherence, and Community Health Worker Performance

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Malaria and pneumonia are major killers of under-five children. Integrated community case management of childhood illnesses (ICCM) by lay persons called community health workers (CHWs) is recommended to manage malaria, pneumonia, diarrhea and neonatal conditions. This study aimed to assess care-seeking and quality of care in integrated community management of malaria and pneumonia in under-five children. Four sub-studies (I-IV) were nested in a cluster randomized trial in Iganga-Mayuge demographic surveillance site in eastern Uganda. In this trial CHWs treated malaria and pneumonia (intervention arm) or malaria alone (control arm) in children. Performance of CHWs (I) was assessed using questionnaires (with knowledge tests, case scenarios), record reviews, observations, and focus group discussions. Adherence to treatment (II); receipt of prompt and appropriate antibiotics for pneumonia and treatment outcomes (III) were assessed among children treated by CHWs. Care-seeking and management of malaria and pneumonia were assessed among children and through key informant interviews (IV). CHWs’ performance on malaria symptoms was similar in the intervention and control arms (I). More children treated by CHWs received prompt and appropriate malaria treatment compared to other health providers (37% vs 9%, p<0.001) (IV). CHWs had high scores in prescribing for pneumonia but had lower: overall knowledge of pneumonia (40%), and scores on eliciting pneumonia signs and symptoms (25%). Only 35% of CHWs counted respiratory rates within ±2 of rates counted by the physician (I). Adherence to combined antimarialars and antibiotics was similar to adherence to antimarialars alone (mean 99% both groups) (II). Children treated by CHWs in the intervention arm were more likely to receive prompt and appropriate antibiotics for pneumonia compared to the control arm (RR=3.51, 95%CI=1.75-7.03) (III). There was also a higher reduction in the proportion of children with fast breathing in the intervention (9.2% vs 4.2%, p=0.01) (III). Care-seeking from CHWs was higher in intervention than control arm (31% vs 22%, p=0.01) (IV). CHWs' performance on malaria was not affected by additional roles of pneumonia management, but they had challenges in assessment of pneumonia. CHWs should be supported with continued training, adequate supervision and provision of drugs, diagnostics and other supplies.
Brucellosis is a zoonotic disease of veterinary, public health and economic significance in most developing countries, yet there are few studies that show integrated human and veterinary health care intervention focusing on integration at both activity and actors levels. The aim of our study, therefore, was to explore community perceptions on integration of animal vaccination and health education by veterinary and public health workers in the management of brucellosis. This study used a qualitative design where six Focus Group Discussions (FGDs) that were homogenous in nature were conducted, two from each sub-county, one with the local leaders, and another with pastoralists and farmers. Five Key Informant Interviews (KIs) with two public health workers and three veterinary officers from three sub-counties in Kiruhura district were conducted. All FGDs were conducted in the local language and tape recorded with consent from the participants. KIs were in English and later transcribed and analyzed using latent content data analysis method. All the groups mentioned that they lacked awareness on brucellosis commonly known as brucella and its vaccination in animals. Respondents perceived improvement in human resources, facilitation of the necessary activities such as sensitization of the communities about the brucellosis, and provision of vaccines and diagnostic kits as very important in the integration process in the communities. The FGD participants also believed that community participation was crucial for sustainability and ownership of the integration process. The study reported limited knowledge of brucellosis and its vaccination in animals. The community members believed that mass animal vaccination in combination with health education about the disease is possible if it involves government and all other stakeholders such as wildlife authorities, community members, local to national political leaders, as well as the technical personnel from both veterinary, medical and public health sectors since it affects both humans and animals.

OP 110: Brucella sero-Prevalence and Modifiable Risk Factors among Predisposed Cattle Keepers and Consumers of Unpasteurized Milk in Mbarara and Kampala Districts, Uganda

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Brucellosis is an important zoonotic disease in developing countries yet it is often not recognized, goes unreported and does not attract public health action by these governments including Uganda. This study sought to estimate the sero-prevalence and assess modifiable risk factors associated with brucellaseropositivity in cattle keepers and consumers of unpasteurized milk in Uganda. The study comprised of two groups - one group of 161 individuals randomly selected from households living on farms that had brucella sero-positive cattle and /or goats in Mbarara district obtained from an earlier survey; the second group comprised 168 randomly selected individuals attending an HIV voluntary counseling and testing clinic in Kampala district. Sera samples were obtained from the study participants and tested using Rapid Plate Agglutination Test, Standard Tube Agglutination Test and cELISA. Results showed the sero-prevalence of brucellosis among exposed cattle keepers in Mbarara and consumers of unpasteurized milk in Kampala districts to be 5.8% (95%CI: 3.3%, 8.3%) and 9% (95% CI: 4.7%, 13.3%), respectively. Consumption of unboiled milk was significantly (p=0.004) associated with sero-positivity in Mbarara district. There was no association between brucella sero-positivity with age, sex, and awareness of human brucellosis. This study has clearly shown that human brucellosis is prevalent among livestock rearing communities and consumers of unpasteurised/unboiled milk. The continued consumption of unboiled or unpasteurized milk is a major health risk.
OP 111: Reducing Contamination Rate of LöWNSTAIN JENSEN Sputum Culture Media by Use of PANTA Antimicrobial Panel
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Most Tuberculosis (TB) control programs face the challenge of preventing multi-drug resistant Tuberculosis (MDR-TB) and extensively drug resistant Tuberculosis (XDR-TB) by early diagnosis using Lowenstein Jensen (LJ) culture. However, the growth of Mycobacterium tuberculosis (MTB) on LJ is always suppressed by growth of non-Tubercle bacterial and fungal contaminants. This increases the turn-around time of culture results, delays diagnosis and treatment initiation. This pitfall enhances the spread of TB disease in the community. Our objective was to isolate, identify and establish susceptibility pattern of these contaminants to Polymixin B, Amphotericin B, Nalidixic acid, Trimethoprim and Azlocillin (PANTA) using routine bacteriological culture media and Biochemicals for identification. The sputum were cultured on LJ media and observed for contamination. All contaminated slants were sub-cultured on Blood Agar, MacConkey agar and Sabaroud agar plates. Gram staining was done on the isolates and Susceptibility test performed using Kirby Bauer disc diffusion method. Of 250 contaminated slants, 55% were caused by Bacteria, 38% no growth and 7% by fungi. Of the 154 isolates, 46% were Gram negative rods, 37% were Gram positive cocci, 11% were Gram positive yeast cells and 6% were Gram negative cocci. The study revealed that 9 bacterial species are the most common causes of LJ culture contamination with Pseudomonas aeruginosa leading (16%). From the study 64% were resistant to routine concentration of PANTA, 31% sensitive and 5% intermediate. The most resistant group were Gram positive organism 54% thus staphylococcus 29%, streptococcus 12% and Candida 12 %. The use of double concentration of PANTA reduced percentage resistance from 64% to 12%. The double concentrated PANTA is more effective at suppressing non-tubercle bacterial and fungal contaminants in the sputum. Since majority of the sputum contaminants were Gram positive that were also resistant to PANTA, a combination of Vancomycin, Amphotericin B and Nalidixic acid (VAN) should be tested as another option.

OP 112: Prospects Of Extracts From Peltophorum africanumsond. (Fabaceae) Against Human Immunodeficiency Virus (HIV) And AIDS
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Acquired immunodeficiency syndrome (AIDS) is a world pandemic immunosuppressive disease caused by a retrovirus designated human immunodeficiency virus (HIV), and particularly widespread in poor developing countries. There is ample scientific and empirical evidence supporting the use of plant-derived compounds in the chemotherapy of human immunodeficiency virus (HIV) infection. An oxidative stress in HIV-seropositive patients, through a cascade of processes, leads to apoptosis, a pathway of immune cell loss in patients with HIV infection. The extracts and compounds (betulinic acid, catechin and gallotannin) from Peltophorum africanum (weeping wattle), a deciduous plant common in tropical areas, have shown inhibitory properties against HIV-type 1 reverse transcriptase and integrase, as well as antibacterial activity. Evaluations have been made of the antioxidant potential of P. africanum. Dried leaves, bark and root were extracted with solvents of varying polarity. Chromatograms were made on silica gel plates, and sprayed with 0.2% 2, 2-diphenyl-1-picryl hydrazyl (DPPH) for qualitative screening of antioxidants. Quantification was done spectrophotometrically, in comparison with Vitamins C and E. Acetone extracts of the root and bark of P. africanum had higher antioxidant activity than Vitamins C and E and Ginkgo biloba extract (EGb 761). The respective EC50 values for the root, bark, Vitamin C and Ginkgo biloba extracts were 3.82, 4.37, 5.04, 40.72 µg/ml. Clinical trials with extracts of P africanum in HIV/AIDS patients are set to be undertaken. Continued work on P africanum extracts as anti-AIDS agents is crucial.
OP 113: Total Anti-Oxidant Capacity And Acute Toxicity Of Selected Indigenous Nutri-Medical Plants Used In The Management Of HIV/AIDS Opportunistic Ailments In Wakiso, Uganda

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Life-threatening opportunistic ailments have been and are still being managed by indigenous nutri-medicinal plants in most rural communities of Africa. The use of foods from natural sources such as plants, and vegetables rich in micronutrients and antioxidants are herbal remedies that prevent oxidative stress and slow down the progression of HIV/AIDS. In most cases the indigenous plants used for medicinal purposes in the rural communities are used as self-medication hence their action, effectiveness and safety needs to be ascertained. This study documented the nutri-medicinal plants used in the management of opportunistic ailments affecting communities in Wakiso District, Central Uganda. Secondly, the total anti-oxidant capacity of selected indigenous nutri-medicinal plants and the acute toxicity of three screened nutri-medicinal plants (Amaranthus lividus, Solanum aethiopium and Bidens pilosa) was determined. Focus group discussions followed by household surveys using semi-structured interviews were conducted to screen plants used in the management of mal nutritional conditions and HIV/AIDS opportunistic ailments. Total anti-oxidant capacity was determined using UV spectroscopy assays of 1,1-diphenyl-2-picrylhydrazyl radical (DPPH) and Ferric Reducing Ability of Plasma (FRAP). Acute toxicity was measured using the monius operandi assay based on disease free Swiss albino mice for each plant extract and a limit dose test of 2,500 and 5,000 mg/kg body weight. Nutri-medicinal plant species (194) were in use to manage various ailments & opportunistic infections. The DPPH range was 1.5 to 30.6% with Annona muricata L registering 30.6% and FRAP range of 0.08 to 9.9% with Amaranthus hybridus registering 9.9%. Aqueous extract of B. pilosa (2.83%) registered the highest yield followed by S. aethiopium (2.18%) and A. lividus (1.48%). Both aqueous and ethanolic extracts of B. pilosa were found to be of limited toxicity with LD50 (3.559 mg/kg). Aqueous and Ethanolic extracts of S. aethiopium were found to be of boundless toxicity with both LD50 values above 5,000 mg/kg. A. lividus ethanolic extract was found to have LD50 below 5,000 mg/kg, with the aqueous extract having a relatively higher LD50 value of 5,754 mg/kg. These screened nutri-medicinal plants represent a strategic contribution to healthcare action and management of nutritional disorders opportunistic ailments.

OP 114: Antimicrobial and toxicological evaluation of four nutri-medicinal plant species used in the management of HIV/AIDS opportunistic infections

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Infectious diseases caused by multiresistant microbial strains are considered a major threat to human health and account for half of all deaths in tropical countries, particularly among people living with HIV/AIDS. Fighting these diseases with natural products may be more efficacious. The aim of this study was to investigate the in vitro antimicrobial activity of essential oil fractions of four medicinal plants (Crassocephalum vitellinum, Erlangea tomentosa, Ipomea hildebrandtii and Plectranthus amboinicus), against 6 opportunistic bacterial and fungal microorganisms. This study may be a starting point for the production and preparation of traditional medicines as formulated products that can be safely used to treat HIV/AIDS related ailments, thus adding value to natural medicines. The agar well-diffusion and the microdilution methods were used for the determination of inhibition diameters (ID) and Minimum Inhibitory Concentrations (MIC) respectively, on 4 bacterial species including two Gram positive species (Staphylococcus aureus, Streptococcus pneumoniae), two Gram negative (Klebsiella pneumoniae, Pseudomonas aeruginosa) and two fungal isolates (Candida albicans, Cryptococcus neoformans). The essential oil and fractions were screened for their chemical composition using GC/MS analysis. The chemical components of each plant’s extract varied according to the solvent used, and they were found to contain alkaloids, flavonoids, polyphenols, terpenes, sterols, tannins, coumarins, glycosides, cardiac glycosides and reducing sugars. The essential oil of all the plant species presented antimicrobial activities against all tested microorganisms with internal diameter varying from 9mm to 49 mm and Minimum inhibitory concentrations from 50 to 1.56 mg/ml. The in vivo acute toxicity study carried out on the ethanolic and aqueous extracts of the plant species indicated that these plants are not toxic. There was no incidence of mortality from acute toxicity test (LD50 above 5000 mg/kg) implying that the extracts are relatively safe with low risk of acute intoxication.
The Human leukocyte antigen (HLA) region encodes several molecules that play key roles in the immune system. HLA class I and II molecules are highly polymorphic and have been shown to be an important host genetic risk factor in infectious disease. The association of HLA polymorphisms with over one hundred diseases has been reported. The purpose of this study was to determine the distribution of HLA class I phenotypes in a Ugandan population of persons with active tuberculosis (TB) or with latent TB infection (LTBI) and establish the relationship between class I HLA types and MTB infection or disease. Blood samples were drawn from HIV negative individuals with active TB and HIV negative individuals with latent MTB infection. DNA was extracted from blood samples and DNA samples HLA typed by the polymerase chain reaction-sequence specific primer method. The allelic frequencies were determined by direct count. HLA-A*02, B*15, C*07, C*03, B*58, C*04, A*01, A*74, C*02 and A*30 were the dominant phenotypes in this Ugandan cohort. There were differences in the distribution of HLA types between the individuals with active TB and the individuals with LTBI with only HLA-A*03 allele showing a statistically significant difference (p=0.0136). However, after FDR computation the corresponding q-value is above the expected proportion of false discoveries (q-value 0.2176). We identified a number of HLA class I alleles in a population from Central Uganda which will enable us to carry out a functional characterization of CD8+ T-cell mediated immune responses to MTB. Our results suggest that there may be a positive association between the HLA-A*03 allele and TB implying that individuals with the HLA-A*03 allele are at a higher risk of developing active TB.


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Worldwide, upper gastrointestinal bleeding (UGIB) is a major cause of morbidity, substantial health cost, and death. There is paucity of data from rural sub Saharan Africa (SSA) where causes of UGIB like schistosomiasis and hepatitis are endemic. We described the clinical, laboratory, and radiological features of patients with UGIB at Pakwach Health Centre IV in rural Uganda. This was a cross sectional study. We included outpatients and inpatients 12 years and over with UGIB, and excluded pregnant mothers. The study outcome was number of episodes of UGIB. Data was obtained through anamnesis, physical examination, laboratory investigations, and an abdominal ultrasound. Data was analyzed as count data, and we generated appropriate statistics profiling the study population. Over 5 weeks, 107 patients were enrolled with UGIB and this was 3 to 7cases per 100 patients per year. Eighty-four participants were from outpatients and 23 from inpatients with acute UGIB. The total number of episodes of UGIB in the study was 323. Half of our study participants were age between 40-60 years, of female sex, had a previous laboratory diagnosis of Schistosoma mansoni infection, and experienced 2 or more lifetime episodes of UGIB. All reported frequent contact with the River Nile and 80% had ever received praziquantel or experienced an episode of UGIB within the last 5 years. Multivariable analysis identified a cluster of factors linked to the occurrence of increasing episodes of UGIB among those treated with praziquantel in the last 12 months. This included aged 40 years and older, female gender, previous hematochezia, previous blood transfusion, current complaints of problems when carrying out one’s usual activities, collaterals or any other fibrosis pattern other than C on ultrasound, hemoglobin<10 g/dL, a positive urine circulating cathodic antigen test, absence of Schistosoma eggs in stool, and thrombocytopenia <40,000/mcL. In conclusion, UGIB is very common in this part of rural SSA and is associated with recurrent episodes. These findings are important for patient care and future research in SSA.
OP 117: Internationalisation Of Health Professionals’ Education And Quality Of Education

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Defined as “all is all efforts made to incorporate global dimension into teaching and learning, research and service to the community”, Internationalisation has been embraced by institutions of higher education as a means to enhance quality. There is evidence that institutions in the MESAU consortium participate in student and faculty mobility programmes, undertake collaborative research as functions of internationalization, there is however paucity of data on the volume of students and faculty mobility. In addition, the extent to which internationalization impact on health professionals’ education at these institutions is unclear. There is no clear documentation on internationalisation policies and how it affects the quality of health professionals’ learning, research and service to the community. The main objective was to assess the existence of internalisation policies in the four Institutions in the MESAU Consortium and how internationalisation affects the quality of education, research and service to the community. The study was a cross section study design that utilized both quantitative and qualitative methods of data collection. Data was collected using self-administered questionnaires and Focus Group Discussions among students and Faculty. The participating institutions were Makerere University College of Health Science (MakCHS), Kampala International University (KIU), Gulu University and Mbarara University of Science and Technology (MUST). Quantitative data was analysed using SPSS while qualitative data was analysed manually. Majority of the participants were at Masters level and above (54%), Male (67%), Ugandans 87% and had been in service for more than 3 years. Although there were no clearly defined policies guiding internationalisation of health professional institutions, Institutions under MESAU consortium admit international students, have Joint degree programmes with other Universities across borders and student/teacher exchanges programmes with other Universities. Internationalisation of health professionals’ educations enhances the quality of Education, research and service to the community.

OP 118: Determinants Of Access To Healthcare By Older Persons In Uganda: A Cross-Sectional Study

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This paper aimed at investigating factors associated with older persons’ healthcare access in Uganda, using a nationally representative sample. We conducted secondary analysis of data from a sample of 1602 older persons who reported being sick in the last 30 days preceding the Uganda National Household Survey. We used frequency distributions for descriptive data analysis, chi-square tests to identify initial associations, and generalized linear model specifying poisson family and log link, to report prevalence risk ratios. More than three quarters (76%) of the older persons accessed healthcare in the last 30 days. Access to healthcare in the last 30 days was reduced for older persons from poor households (RR=0.91, 95% CI: 0.83-0.99); with some walking difficulty (RR=0.90, 95% CI: 0.83-0.97); or with a lot of walking difficulty (RR=0.84, 95% CI: 0.75-0.95). Conversely, the odds of accessing healthcare in the last 30 days for older persons increased for those who earned wages (RR= 1.08, 95% CI: 1.00-1.15) and missed work due to illness for 1-7 days (RR=1.19, 95% CI: 1.10-1.30); and 8-14 days (RR=1.19, 95% CI: 1.07-1.31). In addition, those who reported non-communicable diseases (NCDs) such as heart disease, hypertension or diabetes (RR=1.09, 95% CI: 1.01-1.16); were more likely to access healthcare during the last 30 days. In the Ugandan context, self-reported NCDs, severity of illness and mobility limitations and household poverty and earnings were the most important determinants of accessing healthcare in the last 30 days among older persons.
OP 119: Inhibitory Effects Of Essential Oil From Ugandan Aromatic Medicinal Plants On Oral Bacteria

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Dental Caries (DC) and Periodontal diseases (PD) are prevalent worldwide. In Uganda, most communities rely on medicinal plants for prevention and treatment of these diseases. Potentially, these medicinal plants could be developed into products for the prevention and treatment of DC and PD. The aim of this study was to investigate the growth inhibitory effects of essential oils extracted from ten Ugandan aromatic medicinal plants (Bidens pilosa, Helichrysum odoratissimum, Vernonia amygdalina, Hoslundia opposita, Ocimum gratissimum, Cymbopogon citratus, Cymbopogon nardus, Teclea nobilis, Zanthoxylum chalybeum, Lantana trifolia) used in traditional treatment of oral diseases, on oral bacteria associated with DC and PD. Essential oils from the plants were obtained through steam distillation process. Inhibitory effects of the oils were assessed on Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans bacteria (associated with PD) and Streptococcus mutans, Lactobacillus acidophilus (associated with DC), using broth dilution methods at concentrations of 1%, 0.1% and 0.01%. Inhibitory effects were expressed as percentage of the colony forming units (CFU) in the presence of the oils to the CFU in the control plate. The most sensitive organism was A. actinomycetemcomitans. Its growth was markedly inhibited by six of the plant oils and the chlorhexidine positive controls at all the three concentrations tested with \( p < 0.0001 \). Essential oil from C. nardus exhibited the highest activity with complete growth inhibition of A. actinomycetemcomitans, P. gingivalis at all the three concentrations tested. Most of the oils studied exhibited limited effect on the growth of L. acidophilus.

In conclusion, most of the oils in this study show marked growth inhibitory effects on PD associated A. actinomycetemcomitans and P. gingivalis, moderate inhibitory effect on DC associated S. mutans, and least effect on L. acidophilus. The most promising essential oils were from plants C. nardus, T. nobilis, H. opposita, O. gratissimum, B. pilosa as they markedly inhibited growth of at least two bacteria at all the three concentrations tested with \( p < 0.0001 \). Thus, the present study may constitute a basis for further investigation and development of these oils into products that can be used for prevention and treatment of DC and PD.
SUB – THEME 2: NATURAL RESOURCE UTILISATION, CONSERVATION AND ENVIRONMENTAL SUSTAINABILITY

OP 201: Trends of Climate Extremes and Farmers Perceptions In The Cattle Corridor Of Uganda

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This study aimed at establishing farmers perceptions to changes in climate extremes in order to inform the process of developing appropriate adaptation strategies to climate change. Daily rainfall and temperature data sets from 1970 to 2013 from Mbarara weather station were used. Rainfall and temperature data were subjected to timeseries analysis using RClimdex software to determine trends in extremes. Data to establish farmer’s perceptions were collected from 180 respondents through personal interviews and analyzed using descriptive statistics by SPSS. Total annual precipitation (PRCPTOT) index showed increasing non significant trends (P > 0.05). Frequency of heavy precipitation days (R95PTOT) showed decreasing non significant trends (P > 0.05). The number of consecutive wet days (CWD) was increasing while consecutive dry days, CDD were slightly increasing. Farmers’ perceived changes in rainfall patterns and temperatures were in close agreement with the observed trends. The observed increasing temperatures, coupled with declining CWDs and increasing CDDs will most likely result into increased heat stress to livestock, drying of most surface water sources and changes in pasture species composition. Key adaptation strategies included; fencing off grazable land, use of drought tolerant pasture species, and utilization of crop residues, excavation of individual shallow wells, water harvesting and conservation among others. Limited access to climate information and insecure land ownership rights were key barriers constraining adaptation of female farmers to climate change. Therefore policies that ensure secure land ownership rights while improving farmers’ access to climate information can effectively facilitate adaptation to climate change.

OP 202: Analysis Of Future Climate Scenarios Over Central Uganda Cattle Corridor


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The study employed a Regional Climate Model (RCM), Providing Regional Climates for Impact Studies (PRECIS), to examine the future climate scenarios over the central Uganda cattle corridor districts of Nakaseke and Nakasongola in the near future (2021-2050) and mid-century (2051-2080). The study was guided by two questions: what are the projected temperature and rainfall values for the central Uganda cattle corridor in relation to IPCC Special Report on Emission Scenarios (SRES) A2 and A1B Scenarios for the same periods; how do they compare with the new set of scenarios known as Representative Concentration Pathways (RCPs) in the same area for the same period? The scenarios were obtained using PRECIS software and delta methods using R software according to the AGMIP protocols for SRES and RCP; respectively. Results show both SRES A2 and A1B projecting temperature increases in average monthly, seasonal as well as annual for both near future and mid century periods with A2 showing a mean annual temperature increase of 2.5 to 4.4°C in the near future and 4.5 to 6.0°C in the mid century relative to the 1981-2010 average. The study results show a slight increase in annual rainfall in both SRES and RCPs. However, more rainfall is projected for the second rainfall season of September to November compared to the usual known season of March to May (MAM). The projections also show a shift in rainfall with the usual dry season of December to February (DJF) now becoming wetter than the 1980-2010 average. This shift is consistent in all the scenarios and has also been observed in other studies done in the region. From the results farmers should be advised to take advantage of the projected increases in rainfall especially.
OP 203: Improved Access To Climate Information As A Pre-Requisite To Increased Production And Welfare For Rural Farmers

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The research study highlights the key role information and communication play in empowering people to make informed choices on how they can use the resources in their environment sustainably. Uganda being an agro-based economy, climate change has affected the country adversely. Although the impacts of climate change cannot be predicted with precision, information on how these hazards can be mitigated or means of adaptation is available, but the rural population often lacks the resources, including information, to mitigate and adapt to these changes. The main objective of the study was to identify communication strategies that can enhance mitigation and adaptation to climate change in the Lake Victoria Basin. The study examined the access to communication channels and sources of information on climate change; the levels of knowledge and awareness about measures of mitigation and adaptation; and also analysed the treatment of climate issues in the media in Uganda. Findings showed there was general lack of information on mitigation and adaptation measures to climate change amongst farmers, which has contributed to reduction in agricultural production and increasing poverty levels. For the media, findings reflected that the coverage is event-driven and largely based on local sources with government officials as the key actors, while climate is framed as a local/national issue, where government has the responsibility for climate action, with climate change ranking low on the media's news agenda. The study called on government and district authorities to use multi-media communication strategies to supplement media sources with interpersonal channels like meetings of farmers' groups and LC1, as well as applying ICTs like using SMS on mobile phones that are accessible in the rural areas. Better information access on climate issues is essential for farmers' mitigation and adaptation that can lead to increased production and improved welfare, which should contribute towards realisation of good environment management and sustainable development in Uganda.

OP 204: Dissolution Kinetics Of Natural Halite From Lake Katwe (Uganda) In Aqueous Salt Solutions

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Large deposits of halite are present in the brines and evaporites of Lake Katwe. Presently, the mineral is extracted and processed based on traditional methods, hence small and impure yields. Recrystallization is a viable option to play a significant role in the production of high purity salt from the salt lake. Therefore, evaluation of halite dissolution kinetics is vital for the design and efficient operation of process equipment. In this study, the dissolution of natural halite from the lake deposit was investigated in a batch reactor. The effects of particle size, agitation speed, reaction temperature, and solid-to-liquid ratio were selected as experimental parameters. Results showed that the dissolution rate increased with increase in reaction temperature, agitation speed and decreased with particle size and solid-to-liquid ratio. Moreover, the experimental data was analyzed according to the heterogeneous and homogeneous reaction models. It was established that the dissolution rate describes the Avrami model and is controlled by a diffusion mechanism. Consequently, the apparent activation energy (Ea) for the process was calculated to be 33.3 kJ/mol over the temperature range from 303 to 323 K.
This study explored the community knowledge on prevalence and management of *Garcinia buchananii* in Lake Victoria Basin (LVB) countries of Uganda and Rwanda. Specifically, the study was conducted in Bugesera and Kirehe districts of Rwanda, and Buikwe and Masaka districts of Uganda. Household interviews, key informant interviews, focus group discussions (FGDs) and case studies were conducted to ascertain the availability status of *Garcinia buchananii*, their ecological niche(s), propagation and management practices, as well as the socio-demographic barriers to propagation of the species. In Rwanda, *Garcinia buchananii* was reported to be the most abundant indigenous fruit tree species and occasionally present in garden boundaries and scarce in Buikwe and Masaka districts respectively. The highly reported methods of propagating *Garcinia buchananii* in the two countries were by seeds (88.3% in Uganda and 86.2% in Rwanda) followed by use of wildlings (6.7% in Uganda and 10.3% in Rwanda). In Rwanda, none of the socio-demographic characteristics influenced the knowledge of on-farm propagation of *Garcinia buchananii*, while in Uganda the knowledge on on-farm propagation was influenced by occupation ($r^2 = 0.198; P=0.05$). The most common management practices of *Garcinia buchananii* included weeding, mulching, watering and pruning. The ripe fruits were reported to be mainly harvested by climbing and selectively picking the fruits, hooking the fruits using long sticks and shooting down the fruits using objects such as sticks and stones. Since, rural farming communities have always been exploiting indigenous fruit trees for their livelihoods, increased awareness and use of proper extension services plus provision of planting materials could lead to wise use and management of *Garcinia buchananii* in the LVB districts of Rwanda and Uganda.

There is a general lack of historical deposition of persistent organic pollutants (POPs) in the African lakes. In this study, we investigated the historical deposition trends and sources of POPs in sediment cores from Lakes Victoria (SC1), Bujuku (Buju2) and Mahoma (Maho2). The latter two lakes are equatorial mountain lakes situated high up in the Rwenzori mountain range along the border of Uganda and Democratic Republic of Congo. SC1 was taken from a pristine depositional part of the lake. The deposition profiles in Buju2 and Maho2 were a reference for historical atmospheric deposition in remote environments. For the post-1940 sediment deposits in SC1, the average focusing factor-adjusted fluxes (FFFs) of ΣDDTs, polychlorinated biphenyls (ΣPCBs), hexachlorocyclohexanes (ΣCHCs) and chlordanes (ΣCHLs) were 385, 226, 207 and 124 ng m$^{-2}$ yr$^{-1}$. Higher fluxes of ΣDDTs, ΣPCBs, and ΣCHLs were observed in Buju2 and Maho2. The average FFF of HCB in Buju2 was the highest while the values for Maho2 and SC1 were similar. The endosulfan FFFs in SC1 were lower than in the alpine lake cores. In general, Buju2 was a better reference for historical atmospheric deposition of POPs than Maho2 due to potential distortion of the latter’s profile by Lake Mahoma’s forested catchment. The deposition profiles of p,p'-DDE, ΣCHLs and HCB in SC1 were consistent with atmospheric deposition while the profiles of PCBs and HCHs were indicative of particle-bound loadings from other sources, in addition to atmospheric deposition. Profiles of endosulfans, DDTs, and chlordanes, among others, in SC1, were consistent with influence of other factors such as anoxia, and dilution. Further studies of spatial resolution of historical deposition, especially in near-shore deposition areas of the lake are recommended.
OP 207: The Prospects and Challenges of Promoting Efficient Biomass Energy Technology Diffusion in the East African Lake Victoria Basin (LVB) Communities

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This paper uses the findings of a collaborative east African inter-university research to present the prospects, issues, and challenges of efficient biomass energy adoption and diffusion in East Africa. Almost every family and local community living in East Africa are experiencing increasing challenges of acute wood fuels (biomass energy) needs on daily basis. The purpose of the paper is to present the prospects of sustainable use of biomass resources for increased energy access and community welfare in the Lake Victoria Basin; and give an overview of an innovation process which ensured. Objectives: to identify the types of biomass sources available for energy provision; to assess the types of biomass energy technologies currently in use, their limitations, and end-users’ recommendations for efficiency modifications, more accessibility and sustainability; to establish the unique socio-economic factors of the people affecting biomass energy resources consumption; and to examine the indicative factors (variables) of biomass energy consumption on the environment. Surveys were used to collect data in both urban and rural communities in the three east African community (EAC) states of Kenya, Tanzania, and Uganda. Findings are disappointing. There is slow adoption and diffusion of biomass energy cook stoves due to cultures effects, low household or family incomes, very poor local communities, and rapid environmental and natural resources degradation with implications on climate change loss and damage effects. There was an unprecedented overdependence on biomass (natural) resources of energy for domestic, institutional, and industrial needs. Biomass energy alone today accounts for well over 90% of the demand in households, institutions, micro and small scale industries; huge information gaps exist due to lack of public awareness of any innovations in biomass technology options; inefficient traditional cook stoves are preferred to improved cook stoves; slow rate of adoption and widespread diffusion of new technologies due to strong cultural attachments to traditional technologies; and the escalating environmental degradation. Public policy awareness of efficient deployment and enforcement of energy efficiency systems in the EAC sub-region is still very low. Interdisciplinary collaborative research programmes, North-South research cooperation, university community outreach activities, effective policy coordination, and international funding are crucial. It was highly recommended that prototypes or findings which show initial promise for technology innovations, should be approved, nurtured, fully funded, disseminated, and developed for mass commercial or marketing successes.

OP 208: Life Cycle Assessment Of Biodegradable Waste Treatment Systems For Sub-Saharan African Cities

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Most of the waste collected in sub-Saharan African cities is biodegradable but it is usually dumped in landfills, creating environmental and health challenges for residents. However, there are biodegradable waste treatment methods that could mitigate these challenges. This study analysed anaerobic digestion, composting, vermicomposting and fly larvae waste treatments using life cycle assessment (LCA). The impact categories assessed were energy use, global warming and eutrophication potential. The results showed that anaerobic digestion performed best in all impact categories assessed. However, management of the anaerobic digestion process is critical and methane losses must be kept very small, as otherwise they will cause global warming.
Inadequate organic waste management can contribute to the spread of diseases and have negative impacts on the environment. Vermicomposting organic waste could have dual beneficial effects by generating an economically viable animal feed protein in the form of worm biomass, while alleviating the negative effects of poor waste management. In this study, a low-maintenance vermicomposting system was evaluated as manure and food waste management system for small-holder farmers. A vermicomposting system using the earthworm species Eudrilus eugeniae and treating cow manure and food waste was set up in Kampala, Uganda, and monitored for 172 days. The material degradation and protein production rates were evaluated after 63 days and at the end of the experiment. The material reduction was 45.9%, while the waste-to-biomass conversion rate was 3.5% in the vermicomposting process on a total solids basis. A possible increase in the conversion rate could be achieved by increasing the frequency of worm harvesting. Vermicomposting was found to be a viable manure management method in small-scale urban animal agriculture; the return of investment was calculated to be 275% for treating the manure of a 450 kg cow. The vermicompost was not sanitised, although hygiene quality could be improved by introducing a post-stabilisation step in which no fresh material is added. The value of the animal feed protein generated in the process can act as an incentive to improve current manure management strategies.

Understanding the impacts of commercial agriculture on biodiversity in a landscape is critical for biodiversity sustainability and meeting natural resources dependent households' needs in the face of increasing human population and climate change. In this study, the level of agro-diversity and its contribution to rural household livelihood strategies within a commercial sugarcane cultivation landscape was assessed with a view to enhance our understanding of the impacts of commercial agriculture on agro-diversity conservation and household livelihood strategies. A total of 68 crop species from 27 families and 46 genera were recorded from 120 home-garden patches within a commercial sugarcane cultivation land matrix. Plant species richness within the home-gardens was low ranging from 6 to 19 species. The sampled home-gardens featured high species diversity with Alpha diversity based on a Shannon-Weiner diversity Index (H') ranging from 0.6 to 2.3 and 104 out of 120 sampled home-gardens having a Shannon's Index greater than 1. Agro-diversity differed significantly (F11,108=2.165, p<0.05; Global RANOSIM = 0.153, p<0.001) across study villages. The crops, which are most important and commonly maintained in the home-gardens, are the ones utilised for food and income generation. Commercial sugarcane growing is the major factor resulting in reduced land available for food crop. This is a threat to food crop availability and conservation consequently affecting household food security. Trees that provide fuel wood and food are those that are commonly maintained in the home-gardens. In conclusion, home-gardens continue to maintain crop diversity making their management very important for food security, biodiversity conservation and diversification of rural household livelihoods in the face of climate change and declining land availability and fragmentation.
OP 211: Screening Soybean Genotypes For Symbiotic Association With Bradyrhizobium SPP. To Establish Promiscuous Lines

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The low yield frequently experienced by African soybean production can be alleviated developing promiscuous soybean cultivars. Such cultivars will increase productivity and make unnecessary the application of fertilizer and biological nitrogen fixation (BNF), thus contribute to better management of the environment. A greenhouse experiment was conducted at Makerere University Agricultural Research Institute Kabanyolo (MUARIK). It aimed at establishing the soybean germplasm that are able to effectively nodulate with Bradyrhizobium spp., thus have potential to be used as parents to initiate a breeding program seeking the development of promiscuous soybean cultivars. A batch of 65 soybean germplasm from different origins was grown in a completely randomized design with two treatments and three replicates. Out of the set of control, Seeds were inoculated with cowpea-type rhizobium, Bradyrhizobium spp, and sown in five kilogram buckets filled with heat-sterilized, previously cultivating soil. TSP and MOP were used to supplement phosphorus and potassium, and data on nodules were collected six weeks after emergence. The analysis of variance showed significant difference among entries and treatments (P<0.001) among the 65 genotypes screened, 12 were shown to be highly responsive to Bradyrhizobium spp., with more than 10 nodules per plant, more than 50 mg as dry weight of nodules, and more than 50% of effective nodules, 22 genotypes were non-responsive, they showed less than 5 nodules per plant with less than 10% effective. Correlation analysis showed that the dry weight of nodules was highly correlated with fresh weight and nodules' number. This study provides information that can lead to the efficient choice of potential parents to be used in further breeding programs, to develop promiscuous soybean cultivars that carry desirable traits preferred by farmers.

OP 212: Proximate Nutrient Composition Of Some Wild Nutraceutical Plants From Nebbi, Uganda

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Six plant species commonly used as nutraceuticals from Nebbi district in northwestern Uganda Erythrococca bongensis, Grewia trichocarpa, Leptadenia hastata, Nymphaea lotus, Oxygonum sinuatum and Talinum portulacifolium) were analysed for their nutritional content. The plants were selected mainly because of their high frequency of use as food and medicine. Vitamin C, β-carotene, macronutrient and mineral (Ca, Fe, Mg and Na) compositions of the selected plant species were analysed using standard methods. The leaves T. portulacifolium and L. hastata had higher Fe (4.54±0.07 mg/100g), P (0.31±0.01 mg/100g), Mg (0.3±0.3 mg/100g), β-carotene (0.275±0.00 µg), crude ash (22.13±0.19%), contents and relatively higher amounts of vitamin C (10.96±2.01 mg/100g), than the rest of the plant species. The leaves and fruits of L. hastata also had the higher amount of crude fat and vitamin C (17.93±1.56 mg/100g), contents than the other plant species. All the plant species were richer in Iron than the common cabbage Brassica oleracea var capitata L. There were significant differences in the nutritional contents of the plants species analysed (Tukey’s, p<0.05). Consumption of these plants should be encouraged to because they not only supplement the local staples with much needed nutrients, but they also have proven medicinal properties.
OP 213: Legacy And Currently Used Pesticides In The Atmospheric Environment Of Lake Victoria, East Africa

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The Lake Victoria watershed has high agricultural activity with a history of pesticide use. There is very limited data on historical pesticide use and on levels in the lake’s environment. In order to contribute to bridging this data gap, high volume air samples from the Ugandan part of the lake’s watershed were collected in two campaigns and analysed for organochlorine pesticide residues. The first campaign consisted of samples collected over various periods between 1999 and 2004 inclusive (KAK 1999-2000, KAK 2003-2004, EBB 2008 and EBB 2004 sample sets). The second campaign consisted of air samples collected from 2008 to 2010 inclusive (EBB 2008, EBB 2009 and EBB 2010 sample sets). These samples were also analysed for currently used pesticides (CUPs) including chlorpyrifos, chlorthalonil, metribuzin, trifluralin, malathion and dacthal. During the second campaign, monthly precipitation samples were also collected and analysed for the same pesticide residues. Chlorpyrifos was the most abundant CUP in air samples with average concentrations of 93.5, 26.1 and 3.54 ng m⁻³ for the EBB 2008, 2009, 2010 sample sets, respectively. The average concentrations of total endosulfan (ΣEndo), total DDT related compounds (ΣDDTs) and hexachlorocyclohexanes (ΣHCHs) ranged from 12.3 – 282, 22.8 – 130 and 3.72 – 81.8 pg m⁻³, respectively, for all the sample sets. The results show increasing atmospheric prevalence of residues of persistent organic pollutants (POPs) characterized by fresh emissions of endosulfan, DDT and lindane. Other pesticides detected in the air samples include hexachlorobenzene (HCB), pentachlorobenzene (PeCB) and dieldrin. Transformation products pentachloroanisole, 3,4,5-trichloroveratrole and 3,4,5,6-tetrachloroveratrole were also detected. The five most prevalent compounds in the precipitation samples were in the order chlorpyrifos>chlorthalonil>ΣEndo>ΣDDTs > ΣHCHs with average fluxes of 1123, 396, 130, 41.7 and 41.3 ng m⁻² sample⁻¹, respectively. PeCB was higher than HCB in precipitation samples while the reverse was true for air samples. Backward air trajectory analysis showed high potential of transboundary and local emission source influence on the atmospheric profiles of the analytes. The results underscore the need for increased regional vigilance in agrochemical management along with regular environmental monitoring for trends in residue levels.

OP 214: Effect Of Protein Supplementation On The Performance Of Ankole X Friesian Crossbred Calves Grazed On Natural Pastures

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In the rangelands of southwestern Uganda, pastoralism is being transformed into an agro-pastoral system. In an effort to increase productivity, agro-pastoralists are crossing their Ankole cattle with Holstein Friesian to obtain crosses with higher milk production potential. However, nutritional requirements of the crosses are higher than those of Ankole cattle. Pastures which are the main source of feed may not supply the needed nutrients, especially during drought when the quantity and quality of forage drop, hence affecting milk yields. With low milk production and coupled with reduced forage quality, a deficiency in protein intake is likely to occur in calves, hence affecting their growth performance. The current practice is that calves are allowed to suckle after milking has been done and are then grazed on pastures. However, farmers lack well established calf paddocks. All these result in inadequate nutrient intake, which in turn adversely affects their growth rates. Yet, as part of herd management, good calf rearing is essential for ensuring availability of future replacement stock. The current calf feeding regimes in the rangelands where tropical grasses constitute the primary diet make it unlikely that calves get balanced nutrient supply that meets their requirements. Thus, the objective of this study was to determine the effect of laalab hay or home mixed concentrate supplementation on the growth performance of the Ankole x Friesian crossbred calves grazed on natural pastures. Forty five weaned crossbred calves aged six months from five farms were used. Nine calves on each farm were randomly
divided into three groups and assigned dietary treatments. The diets comprised: grazing calves on pasture only; grazing plus supplementation with 2kg DM/head/day of a home mixed concentrate (HMC); and grazing plus supplementation with a mixture of 2kg and 0.3 kg DM/head/day of lablab hay and maize bran, respectively. Daily live weight gain of calves that were supplemented with HMC was higher (P<0.01) than that of calves that depended entirely on grazing. No differences were observed between calves supplemented with lablab hay and HMC. In conclusion, supplementing crossbred calves grazed on natural pastures with protein improves their growth performance, and reach reproductive age quickly.

**OP 215: Human Activities Negatively Impact Chimpanzee Populations in Forest Reserves.**

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Worldwide ecosystems are being depleted so as to meet the insatiable human demand that has resulted from an exponential increase in global human population. Tropical forests have suffered most because they are considered to have unexploited diverse natural resources which include a number of animal species such as chimpanzees that are necessary for ecosystem equilibrium. The aim of this study was to contribute information on how human activities influence the status and distribution of chimpanzees in forest reserves. The study was conducted in four forest reserves in western Uganda that are a mosaic of an extensive forest area that once covered the whole of south western Uganda. We assessed the presence of illegal human activities and the potential impact of human activities on chimpanzees on a monthly basis for 20 months using nest counts along line transects. Three of the forest reserves were found to have chimpanzees, but only Itwara had a substantial number of resident chimpanzees which was estimated to be 34 individuals; a drop in population by 90 chimpanzees when compared to the 2000 National Chimpanzee census. Chimpanzees were found to be positively correlated to presence of pitsawying and pole cutting. In conclusion, chimpanzee population status and abundance in forest reserves is negatively affected by human activities in and around the forest reserves. Consequently we make the following recommendations: that proposed nature conservation areas within forest reserves be maintained for wildlife conservation only; law enforcement in all forest reserves be reinforced and legal human activities regulated; forest reserves such as Matiiri and Buhungiro which have been heavily encroached be reclaimed and encroachers evicted; conservation programs to raise awareness and ownership of forest reserves by the local communities around Itwara and Matiiri be introduced; Itwara forest that was found to have a sizeable number of chimpanzees be given a higher protection status; cause of drastic decline in Chimpanzee population be scientifically investigated in Itwara.

**OP 216: Utilization And Conservation Status Of Indigenous Woody Plants In Pastoral Production Systems Of South Western Uganda**

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Indigenous woody plant species are important for the livelihoods of pastoralists in various parts of the world. However, several of the species that occur in pastoral production systems are threatened by various biotic and abiotic factors, yet their conservation status remains unclear. This study investigated the utilization and conservation status of indigenous woody plant species by pastoralists of south western Uganda. The objectives were: i) to identify the indigenous woody species used by pastoralists; and ii) to determine the population structure and conservation status of target species. The methods of data collection included a survey of 100 households and an inventory of plant species in 55 nested plots of 50 m × 50 m in Ankole Ranching Scheme in Kiruhura district. The results show that 70 indigenous woody plant species are used by pastoralists. These belonged to 31 families with the family Fabaceae having the highest number of species utilized. The major uses include medicine for humans and livestock, firewood, fodder, food, poles, timber, shade and crafts. The major species were: *Vernonia ammygdalina, Acacia sieberriana, Acacia hockii, Carissa*
edulis and Albizia coriaria. An inverse J pattern of population structure showing a sustainable population of both trees and shrubs was obtained and most species were of least concern according to the IUCN Redlist criteria for conservation of taxa. Hence, pastoralism production lands have a high potential for conservation of indigenous woody plant species of local importance to the pastoralists. Establishment of community based conservation platforms among pastoralists is recommended. These should especially address conservation of mature plants of seed bearing age to enhance continuous natural regeneration of the plant species and ensure sustainable utilization of the plants.

OP 217: Natural Gastro-Enteric Properties Of Ficusnatalensis, Rhussnatalensis And Harrisoniaabyssinica In Native East African Goats
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The natural gastro-enteric properties of Ficusnatalensis, Rhussnatalensis and Harrisoniaabyssinica was evaluated by determining the rumen degradation and digestibility properties of their leaves. Prior, the chemical composition (during the wet and dry seasons) and DM intake of the leaves was also determined. Results showed that H.abyssinica presented the highest DM disappearance from the nylon bags throughout the different incubation times followed by F.natalensis and R.natalensis showed the lowest. The DM readily available soluble fraction (a), slowly degradable fraction (b), degradation rate (c), potential degradability (PD) and effective degradability (ED) differed significantly (P<0.05) across the three browse species. The CP a, b, PD and ED fractions differed significantly (P<0.05) across the three browse species. The CP c fraction was similar across the browse species. The NDF a, b, PD, and ED fractions differed significantly (P<0.05) across the browse species. The NDF c fraction was not different across the browse species. The DM intake, N retention and digestibility (DM, CP and OM) were not different between Ficusnatalensis and Harrisoniaabyssinica as well as the form in which the leaves were offered (fresh vs. wilted). Their N was poorly utilised by goats (only about 16 - 37% of the total N intake was retained). Results from preliminary studies showed that the average CP content ranged from 110 to 121 g/kg DM, and did not differ across the browse species. The CP content did not differ between seasons; except for Rhussnatalensis where the wet season had higher (P<0.05) CP content. Harrisoniaabyssinica had the lowest (P<0.05) NDF content (233 g/kg DM) than Rhussnatalensis (392 g/kg DM) and Ficusnatalensis (387 g/kg DM). NDF content was higher (P<0.05) during the wet season across the three browse species. Effective DM, CP and NDF degradability differed (P<0.05) across the browse species. Generally, the degradability of Rhussnatalensis was inferior compared to Harrisoniaabyssinica and Ficusnatalensis. The DM intake of Rhussnatalensis by goats was very low (goats lost weight), while that of Ficusnatalensis and Harrisoniaabyssinica ranged from 3 to 4% of body weight. In conclusion, Rhussnatalensis is of an inferior nutritive value for goats compared to Harrisoniaabyssinica and Ficusnatalensis.
OP 218: Exploration Of Gravel Roads Erosion Data In Uganda

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The road is one unique surface with various flow and deposition characteristics regarding the erosion process. Erosion on roads has effects that are detrimental to road designers, constructors, and users. The main objective for this study was to explore the erosion data from across Uganda gravel roads. Gravel/dirt/rural roads constitute a larger part of the total road networks in developing countries and are top-listed for accumulation of wealth for such countries like Uganda. Generally, quantitative methods through experimental designs were used. Data was generated from various experiments like sieve analysis, measurement of road rill/dune sizes, Atterberg tests, and dry-density tests were considered for the analysis and exploration. These were conducted to reflect the characteristics of road subgrades and sediments from these roads. A comparison of one of the original erosion models, USLE/RUSLE was done with the erosion model developed for the maintenance of gravel roads, EMMOGR and conclusions reached. Findings showed that the dry densities were average but not standard and comparable to those in other specific areas of the world. It was unique to engage these tests on sediments (eroded soils from road surfaces) and make conclusions therefrom. For example a small percentage difference between the two samples (sediment and borrow pit) was realized. It signified the fact that most soils used in the construction and maintenance are eroded. The data maps well to the erosion characteristics on these roads and data models could be used for future estimations. Finally, it was observed that the EMMOGR reflected the erosion/deposition characteristics better than the USLE/RUSLE. The study suggested that there was need to improve on the soils used in the construction/maintenance of gravel roads. There is also need to follow the actual design standards. Knowledge from this paper shall also help in road construction and maintenance designs.

OP 219: Gender, Displacement And Rights: The Case Of The Climate Change Refugees In Kiryandongo

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The integration of a gender-sensitivity and a human rights perspective in climate change research and responses is a key development concern for pro-poor planning. We attempt to localize the concept “climate refugees” and posit ourselves into the dearth of arguments of whether they have rights. The major goal of this study is to examine the human rights perspective of displacement as a result of climate change. We used both qualitative and quantitative methods using cultural specific analyses and feminist discourses. We adapted to the different ways of interviewing displaced women and men who fled from Bududa. We introduce debates on the nexus between gender, climate change, displacement and human rights. The social, economic and cultural rights of displaced persons are overly undermined by scarcity of resources, amongst other factors, which sometimes results from poor management of internally displaced persons (IDP). Access to land and security of tenure, rights to livelihoods and access to justice and the rule of law and form the key themes of our findings. We lay foundations for delivering to IDPs relevant and timely services in their situations of distress. Major recommendations include the proper application by Government and the international community of the guiding principles of human rights in consolidating migrants’ rights; understanding that migration could constitute an adaptation strategy to be supported; implementing legal frameworks and identifying protection gaps if IDPs; and that implementing gender sensitive programme is fundamental human rights principle. This study could inform and strengthen future strategies on resettling climate-change refugees.
SUB THEME 3: FOOD SECURITY, SAFETY AND VALUE ADDITION

OP 301: Barriers Faced By Urban Farmers When Seeking For Agricultural Information In Kampala Capital City Authority In Uganda

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In Uganda, many people move from the countryside to urban areas to seek for a better livelihood. Majority of them fail to find jobs, live in absolute poverty and often spend three quarters of their meager income to provide just one meal a day. In Kampala Capital City Authority, urban farming is hence practiced as one of the alternative survival strategies. Access to agricultural information helps farmers to make informed decisions in choosing alternatives to increase agricultural production. However, urban farmers in Kampala Capital City Authority encounter various barriers when seeking for agricultural information. Urban farming is hence characterized by low agricultural production leading to food insecurity and poverty particularly among the urban poor. The objective of this paper was to document the barriers that urban farmers in Kampala Capital City Authority encounter when seeking for agricultural information. A cross sectional study design using a mixed methods approach was adopted. The population included 380 urban farmers, 58 focus group participants and 32 key-informants. Face-to-face interview, focus group discussion and key-informant interview were the methods used to collect the data. Quantitative data analysis was done using the Statistical Package for the Social Sciences (SPSS) and the Pearson's Chi-square ($X^2$) test. Qualitative data analysis involved content analysis basing on themes that emerged from the data. Results indicate that lack of time (57.4%) and moving long distances (42.2%) were the major barriers urban farmers encountered. The paper concludes that urban farmers in Kampala Capital City Authority encounter various barriers (basing on their farming enterprises) when seeking for agricultural information. If these barriers were addressed and the farmers had access to agricultural information, they would improve the quality as well as the quantity of their agricultural production. Food and nutritional insecurity as well as absolute poverty among the urban poor would be reduced.

OP 302: Influence Of Finishing Duration Of Supplemented Grazing Animals On Meat Quality Of Selected Beef Breeds In Uganda

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The current study determined the influence of duration of supplementing grazing animals on pHsub4, collagen characteristics and shear force of beef from 5 selected cattle genotypes in Uganda. One hundred eighty bulls (36 each of Ankole, Boran, Ankole x Friesian, Ankole x Boran and Composite (Ankole x Boran x Bonsmara)) were allocated to two feeding systems, sole grazing (GZ) and grazing + supplementation (GZS) and slaughtered after 60, 90 and 120 days of feeding. pH readings were taken at 24hrs postmortem using a pH meter electrode (Knick, ElektronischeMageräte, GmbH & Co.). Boran and Composite bulls attained the highest and lowest pHsub4 respectively. Total collagen ranged from 2.91 (Boran) to 2.62mg/g wet tissue (Composite). Boran and AnkolexBoran had the highest percent thaw, cooking loss and shear force whereas Ankole, AnkolexFriesian and Composite bulls had the lowest percent thaw and cooking loss. pHsub4 declined with increasing time on feed across all genotypes in both feeding systems. Insoluble collagen increased linearly ($P < 0.05$) in grazed bulls while it decreased curvilinearly ($P < 0.05$) in supplemented bulls. Ankole, AnkolexFriesian and Composite bulls supplemented for 90 days attained peak forces below 55N at 2-days of ageing and there were no ($P > 0.08$) differences between 90 and 120 days durations in peak forces. Boran and AnkolexBoran bulls needed an extra feeding period up to 120days before they could attain peak forces below 55N, however, peak force increased linearly ($P < 0.01$) over the 120-days finishing period in grazed bulls. All sensory attributes panel ratings increased ($P < 0.01$) through 90days for supplemented Ankole, AnkolexFriesian and Composite bulls. Supplementing Boran and AnkolexBoran crossbreds up to 120 days improved panel ratings for all sensory attributes tasted. A 90-day supplementation period improved all meat and sensory attributes of grazing Ankole, AnkolexFriesian and Composite bulls while Boran and AnkolexBoran bulls needed to be supplemented up to 120 days.
OP 303: A Big Data Approach To Management And Analysis Of A Large Crop Disease Surveillance Dataset

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Uganda is an agrarian economy (38% of GDP) where household food security and incomes depend on subsistence farming. Small scale farmers produce 90% of all food crops. However, there has been a considerable decline in food production due to crop diseases. For food security, a number of households grow cassava because it can withstand the harsh unpredictable weather conditions. It is estimated that about 75% of farming households grow cassava and most for home consumption. Cassava is being ravaged by a number of diseases that include Cassava Mosaic Disease (CMD), Cassava Brown Streak Disease (CBSD), Cassava Green Mite (CGM), and Cassava Bacterial Blight (CBB) leading to reduced or loss of yields. To stem this, the National Crop Resources Research Institute (NaCRRI) undertakes yearly surveys to monitor cassava disease spread and intervene. These surveys are still manual leading to loss of time in data capture and reduced accuracy in analysis. In this paper, we review a semi-automated pre-processing protocol deployed to sort, filter and clean a large image dataset from a NaCRRI survey. During this survey mobile phone-based applications were used to capture both foliar and root data. Over 25,000 digital images were collected and are to be used in various cassava-disease surveillance applications that include feature extraction, mapping, predictive models, automated disease severity scoring and disease spread modeling. The survey data requires a pre-processing stage that involves sorting, filtering and cleaning to enable efficient processing by these applications. In this work, we leverage concepts in methodologies of handling big data to provide a protocol for data management of approximately 25000 crop disease surveillance images. We also provide some initial analysis and visualization of the data. We believe our work can be a basis for provision of timely, appropriately presented data from a crowd-source mobile-phone based system of disease surveillance.


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In Kampala city about 60% of animal manure generated is discarded leading to health and environmental challenges. However, this manure can be used as fertilizer in crop production and currently about 30% of generated animal manure is for this purpose mainly in the form of composted animal manure. The manure could also be vermicomposted or anaerobically digested and the vermicompost/digestate used in crop production. This study evaluated the performance of different organic fertilizers namely vermicompost, digestate and composted cattle manure on growth and yield of maize. The experiment was carried out at Makerere University Agricultural Research Institute Kabanyolo for two seasons (October 2013 to February 2014 and March to June 2014). No significant difference (P > 0.05) in the different organic fertilizers was noted in both the growth and yield of maize in each season. However, a significant difference (P < 0.05) in both crop growth and yield was noted in the different seasons with the performance in season two generally being better than in season one. The interviews conducted with farmer groups showed they generally preferred using composted manure over other organic fertilizers for a variety of reasons. It can thus be concluded that this fertilizer is best for Kampala thus should be promoted by the municipal authorities to address the rampant poor disposal of manure in Kampala.
OP 305: Solving The Invisible Hunger Crisis Among School Children Through Service Learning

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Universal primary education policies and the associated large school enrollment rates mean that most schools today need to focus on improving the quality of education. Among the biggest challenges are: poor quality teaching, unsanitary conditions, hunger which hinders the ability of children to learn. This hunger hits the young and virtually disables their brains, bodies (through stunting) and future. Our innovation to counter this scenario is termed “service learning (SL)”, an experiential learning mode, with participants in our case school children and university students learning by doing while also providing a service to community. School gardening and livestock keeping program highlights inter-disciplinary learning and inter-sectoral cooperation within agriculture and entrepreneurship. At each of five schools in Kamuli district, Uganda; SL program established model school gardens to produce food for pupils’ lunch at school; generate planting materials (seeds, cuttings and seedlings) that are distributed to pupils’ homes or to other start-up schools. Every recess term (June–August), university students offering agriculture-related degree courses spend 10 weeks doing field-attachment involving: helping improve the school gardens; teaching agriculture and related science subjects based on the national curriculum; working with the community on their agricultural and nutrition projects. The goal for the university students is to get exposed to real world issues such as food and nutrition security, soil fertility, access to water, health and sanitation and learning other cultures. The impact of SL program include: a) improved child nutrition by building children’s and parents’ awareness of nutrient-dense foods–fruits and vegetables; b) strengthened quality of existing lunch programs in three schools; c) transferred agriculture, health, sanitation knowledge and skills to children and their families; d) helped improve school children’s and leader’s attitudes about opportunities in agriculture; e) provided information on various crops and high yield production techniques that helped several children to develop gardens on their own, now helping them pay their secondary school fees; f) generated food for school lunches, planting materials for the children, and teaching about agriculture—all contributing to more sustainable school lunches and knowledge transfer to children and their families; g) sold high-value garden products to assist in purchasing inputs for school lunches.

OP 306: Makerere University Transforms The Soybean Sector In Uganda Through Development And Release Of High Yielding-Rust Resistant Soybean Varieties

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Since the introduction of Soybean (Glycine max) crop in Uganda in the early 1900s, systematic research only began in the late 1930s. These led to the release of 3 varieties (Kabanyolo 1, Kabanyolo 2 and Congo). However through the years, these varieties succumbed to the major pests and diseases making them obsolete. Soybean rust (Phakopsora pachyrhizi Syd.) disease; one of the most devastating diseases of soybean in the world was detected in Uganda in 1996. Yield losses of up to 100% were also recorded in the field. By 2000, farmers had lost interest in growing soybeans as it was no longer profitable. A number of management options have been recommended to mitigate the effects of soybean rust disease. Chemical control (fungicides), cultural practices and deployment of resistant varieties have been widely used in areas where the disease is prevalent. However use of fungicides and cultural practices are less effective compared to the use of resistant varieties. In the last ten years, Makerere University has developed and released five high yielding – rust resistant soybean varieties (Maksoy 1N, Maksoy 2N, Maksoy 3N, Maksoy 4N and Maksoy 5N). Impact studies showed Maksoy varieties were the most widely planted and accounted for 65% of soybean planted by Ugandan farmers. As a result, production per unit area (yield) has greatly increased. The national soybean production showed steady increase from 144,000 hectares in 2004 to 200,000 hectares in 2014. In parallel, soybean processing capacity increased from 300 tons in 2004 to over 600 tons per day in 2014. Soybean was observed to contribute ~ 1,920,000 Uganda shilling ha-1 to the farmers income and export value increased by 288%. Makerere University is currently producing 15-20 tons of foundation seed for these five varieties per year to support the soybean sector in Uganda.
Smallholder farmers in Uganda are adopting production of High-Value Non-Traditional Export Crops, a move they envisioned to improve their resource use efficiency and household incomes. This study sought to analyze the farmers’ plans which include Hot pepper, Okra and French beans among other traditional cash and food crops and whether their enterprise portfolio were optimal. The food crops included; Maize and Beans, while the cash crops were Coffee and Bananas. A quadratic risk programming model was used to determine the profit maximizing and risk minimizing outcomes of the farmers decisions. A total of 273 farming households were selected for this study and structured questionnaires were administered to cover farm events and physical resource availability between first season of 2007 to second season of 2008. Results show that the current farmers enterprise portfolios are sub-optimal being dominated in terms of area by Maize, Bananas and Coffee for both seasons 1 and 2. This was attributed to farmers’ risk-averse nature linked to yield and price volatility. Optimal portfolios show that French beans, bananas and coffee should be the dominant enterprises. By adopting optimal enterprises, profits will increase by 3.12 to 4.15 times for seasons 1 and 2 respectively. Policies that will stabilize prices, yields and cost of production and create awareness among farmers about the level of profitability of the High-Value Crops will increase their adoption and invariably resource use efficiency.

**OP 308: Indigenous Innovations Used In Primary Processing And Storage Of Selected Food Legumes Under Smallholder Farming System In Uganda: Implications To Food Safety And Storage Bruchids Management**

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Cowpea (*Vigna unguiculata*), Chickpea (*Cicer arietinum*) and Pigeon pea (*Cajanus cajan*) are among important food legumes in African small-scale agricultural systems and livelihoods of many rural poor people due to their drought tolerance. MBAZARDI and its partners promoted the production and utilization of these legumes for improved nutrition and food security within banana farming communities in South-western Agro-Ecological Zone, Uganda. High volumes of these food legumes are lost during storage, mostly to a group of beetles called bruchids. This continues to exacerbate food and nutritional insecurity among communities dependent on these food legumes in Uganda. The bruchid damage inflicted on these legumes frustrated farmers’ efforts to increase production and utilization of these targeted legumes in the dry lands of southwestern Uganda. To be able to develop safe, sustainable and effective practices of managing storage bruchids, it was critical to first understand farmers’ indigenous innovations of handling food legumes in major growing areas. A household survey to determine various indigenous innovations used in post harvest handling of food legumes was carried out in purposively selected areas in Southwest, Northern, and Eastern parts of Uganda. A total of 468 households were covered. There were observed differences in terms of innovations used by farmers in post harvet handling food legumes across the three sampled regions. Results revealed that these targeted legumes were mostly being dried on bare ground while in some cases were left to dry in the field. Over 63% of households in northern region were using synthetic pesticides to manage storage bruchids while in southwest and Eastern regions over 80% and 58% respectively were using local innovations. These were; use of wood ash, Cow dung ash, goat pellets, finely crushed burnt bricks, pesticidal plants, airtight created conditions, frequent sun drying of grains. It was noted that there was no standard procedure of using local innovations among households to achieve consistent results in storage of legume produce. Overall this study has evidenced a need for sustainable and easily adaptable innovations for improved post harvest handling of not only targeted grain legumes but also other food legumes under smallholder farming system in Uganda.
OP 309: Effect Of Intercropping Brachiaria Cv Mulato With Forage Legumes On Dry Matter Yield And Chemical Composition Of Fodder Grasses In Uganda

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Pastures are the cheapest source of animal feed in smallholder dairy systems. However very few fodder grass species are recommended for zero grazing production systems in Uganda. A study was conducted in Lake Victoria crescent, Lake Kyoga and Southern dry land agro-ecological zones (AEZ) of Uganda to investigate the productivity of Brachiaria cv mulato, when intercropped with forage legumes. There were four treatments: - 1. Mulato intercropped with Macroptilium atropurpureum, 2. Mulato intercropped with Centrosema pubescens, 3. Mulato intercropped with Desmodium uncinatum and 4. Mulato sole, in a RBD replicated three times. The biomass on re-growth was harvested every after two months for three years, the samples were oven dried hence DMY and chemical components on CP, ADF, NDF and total ash were determined. The treatments showed (P>0.05) on DMY. Season had (P<0.05) on DMY and a higher DMY (5042.1kg/ha/cut) was recorded during the wet season. The interaction between treatment and season in Lake Victoria crescent and Lake Kyoga AEZ had (P<0.05) on DMY. Lake Victoria crescent yielded the highest mean DMY 3817.9±2787.9Kg/ha/cut. Inclusion of forage legumes in Mulato increased CP significantly and the highest mean 9.42±2.76 was obtained in Lake Victoria crescent. Season had (P<0.05) on CP with higher CP was obtained in the dry season. The results suggest the quality of Mulato improved when intercropped with forage legumes.

OP 310: Utilization Of The Elderly Women’s Lived Knowledge In The Management Of Aflatoxin In Groundnuts (thesis)

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In groundnut growing areas in Uganda, it has been realized that there is a dearth of information about women’s knowledge, attitudes, practices, and constraints in relation to dealing with the Aflatoxin menace at each stage especially at the shelling and sorting of groundnut production. A case study of Basooka Kwavula Farmers’ Cooperative, Bugodi village of Baitambogwe Sub-county, Mayuge District in Uganda were 101 of which the elderly women were 56% and the remaining 44% were other household members. The main objective of the study was to examine the construction of the elderly women’s lived knowledge and its utilization in the management of Aflatoxin in groundnuts. These women are the repositories of traditional and lived knowledge, which may be worth looking at given the aim of the PEANUT Collaborative Research Support Program (CRSP) to bring scientific knowledge to the farmers. The research was informed by the Women’s Stand Point perspectives on construction of gendered knowledge and the gendered labour allocation, which has two arguments. Individual household questionnaires, focus group discussions and key informant interviews were used to obtain information. The observation, photography, and social mapping were used that enabled deeper examination of the utilization of the elderly women’s lived knowledge and mentoring other household members. Findings revealed that the elderly women’s lived knowledge is created and utilized in the tasks undertaken in the controlling of Aflatoxins in groundnuts; their experience is used in the gendered roles as they prepared groundnuts. Furthermore groundnuts shelling and sorting was gendered and is done any day any time when the need arises. The young children and the elderly women participated in manual shelling for domestic use, the men used machine for commercial purposes which should be improved in order to simplify their work.. It was noted that young children particularly girls valued the elderly women lived knowledge more and took it as the gospel truth while the men valued it but depended on science. Through mentoring, the elderly women pass on the knowledge by telling stories, sharing the information with household members. In conclusion, in order to control Aflatoxins in groundnuts, the scientific community should value the importance of the elderly women’s lived knowledge. This has a relationship with agriculture leading to the construction and utilization of their lived knowledge a key to development which is now valued and documented.
Limited plant-available phosphorus in soil and drought are major abiotic factors that severely constrain common bean (*Phaseolus vulgaris* L.) production in Sub-Saharan Africa. The two constraints frequently co-exist in soils; affecting over 60% of bean production worldwide. This study determined the contribution of roots to the ability of the bean plants to resist drought in soils deficient in plant-available P. An experiment was carried out in Nakasongola and Mukono districts, Uganda that represented drought-stressed and non-drought-stressed treatments, respectively. Four low P-tolerant genotypes; AFR703-1, AFR708, JESCA and MCM2001 using K131 as a check were planted in plots treated with 0, 60 and 160 kg P₂O₅ ha⁻¹. All treatments were triplicated and were organized in randomized complete block design. Rainfall, grains yields, root architectural variables; and the relations between yield and root architectural variables were determined. Throughout the experimental period, the drought-stressed site received below 450 mm of rainfall, the optimum for the bean growing season; while the non-drought-stressed received over 450 mm. The P treatments neither had significant influences on the yield nor root variables and no significant interactions with drought and genotypes were observed. The mean yield was not significantly affected by drought; the drought-stressed recorded 81.63g m⁻² compared to 93.09 g m⁻² in the non-drought stressed giving a yield reduction of 0.11. Contrastingly, mean yields varied significantly by genotypes (*P*<0.001). AFR708 registered the highest yield of 112.2 g m⁻², while JESCA recorded the lowest of 60.2 g m⁻² compared 88.4 g m⁻² harvested from K131. Although, there was no direct significant association between root variables and yield under drought-stressed conditions, adventitious roots, tap root length, lateral roots on the tap root and their lengths were promoted by the drought. AFR703-1 and AFR708 produced multiple root systems for exploitation of both P and moisture in soil with limited supplies of either. Therefore, the performance of the selected low P-tolerant genotypes in this study relative to the check has shown ability to survive where P and soil moisture are limiting. Hence, the genotypes seemed to be adaptable to climate changes, especially when the climate becomes drier.

**OP 311: Contribution Of Roots To Drought Resilience In Low Phosphorus Common Bean**

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The Common bean (*Phaseolus vulgaris*) is an important crop in Sub Saharan Africa yet its production in Uganda has declined over the last decade due the biophysical stress factors in farmers’ fields and the poor access to improved seeds by smallholder producers. In 2008, the National Agricultural Research Organisation (NARO) responded to the challenge by introducing Community-Based Seed Multiplication (CBSM) in Kamwenge District. This study was conceived to establish the effectiveness of CBSM in improving farmers’ access to improved bean seeds in the district and had four objectives, namely to: describe the key characteristics of the CBSM as implemented in Kamwenge; determine the effect of CBSM on farmers’ knowledge; determine the effect of CBSM on farmers’ access to improved bean seeds; and identify factors influencing farmers access to improved bean seeds. Data were collected from 249 households using a structured questionnaire and analyzed with SPSS version 16 for descriptive statistics like frequencies, percentages, means and standard deviations. Inferential statistics like the independent t-tests were used to compare two groups of CBSM members and non-members. Ordered probit model was employed using Stata 12. Findings showed CBSM in Kamwenge District was funded by Alliance for Green Revolution in Africa (AGRA), promoted by the National Agricultural Research Organization (NARO), and hosted by the District Local Governments, particularly the Production Departments which worked through Farmer Groups and their monitors. Findings also showed that 95.2% CBSM group members and 86.4% non-members said they had accessed improved bean seed through the CBSM. The farmers’ membership to CBSM groups, incomes obtained from beans and farmers distance to the nearest bean market were found to influence farmers’ access to improved bean seed. It was concluded that the CBSM effectively improved farmers’ access to and knowledge of improved bean seeds. Basing on the above findings, it is recommended that the CBSM should be adopted and scaled up for other parts of Uganda.
In Uganda, rural livestock farmers are increasingly using indigenous technologies for value addition as a strategy to maximize profits in livestock production. Improvement of such traditional technologies to produce standard products is important to address the prevailing market. The objective of this study was to explore in-depth the production methods and microbiological quality of bongo. The study employed focus group discussions with milk value chain actors and microbiological studies using standard methods. Two types of bongo were processed; beverage and vegetable bongo. The major steps for production of bongo included milk treatment, fermentation and churning. Microbiological results revealed that the mean total coliform counts were 2.11 ± 2.34 log cfu/ml and 4.83 ± 5.54 log cfu/ml for beverage and vegetable bongo respectively. The yeast and mold counts were 4.29 ± 4.25 log cfu/ml and 4.49 ± 4.35 log cfu/ml for beverage and vegetable bongo respectively. However, there was no significant difference (p >0.05) in the contamination levels between the two bongo types. The lactic acid bacteria (LAB) counts were higher than the non-lactic acid bacteria (NLAB) in the products. Three strains of lactic acid bacteria were identified in bongo belonging to genus Enterococcus (22), Streptococcus (3) and Lactobacillus (1). By implication, the study reported high microbial contamination of bongo indicating poor processing hygiene thus rendering the product unsafe for human consumption. Therefore, it is important to educate value chain actors about pre-harvest and post-harvest handling and storage of milk products to minimize cross contamination of bongo during its production. Further studies should be conducted to unveil the potential application of the lactic acid bacteria as starter cultures.

Livestock provide a potential pathway out of poverty for rural producers and actors along the marketing chain in Sub-Saharan Africa. Animal disease outbreaks and their mitigation measures increase the cost of animal production; reduce milk and beef yield as well as the farmers’ incomes, cattle sales and profitability. Foot and Mouth Disease (FMD) outbreaks affect cattle owning households and actors along the marketing chain by threatening their assets and making their incomes insecure. Despite 75% of the global cattle population residing in low and middle income countries, exports from these countries account for less than 15% of the global value. Case studies were conducted to determine the financial impact of FMD along the cattle marketing chain in Isingiro. Financial losses associated with FMD were estimated to represent its economic importance. During FMD outbreaks, bulls and cows were salvage sold at 83% and 88% less market value respectively, amounting to a loss of USD 196.1 in small cattle herd sized farms and USD 1,553 in medium farms annually. There were no mortalities and no cattle were salvage sold in the large case study herds. There were marked financial losses caused by reduction of milk sales during FMD quarantine periods. About 52% of losses (USD 244,215) were due FMD in Isingiro (2006-2010). FMD outbreaks were more wide spread and vaccination against FMD should be done in all districts. There was a very highly negative correlation of reported FMD prevalence with the cattle herd size (r = -0.832, p < 0.001). Average reported herd prevalence of FMD was 23.6%. The FMD control costs and annual economic cost per head of cattle was highest in small herds. Farmers with small and medium herds incurred higher control costs whereas those with large herds experienced the highest milk losses during FMD outbreaks. Smallholders disproportionately bear the costs of controlling FMD. Overall, treatment costs were higher than vaccination costs. Farmers ought to invest more in vaccination against FMD than to wait and incur higher costs in treatment. Government of Uganda must retain the responsibility for prevention and control of these diseases to achieve eradication of these diseases in the long term.
OP 315: Hygiene Practices And Food Contamination In Managed Food Service Facilities In Uganda

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A longitudinal study was conducted to examine individual worker and institutional hygiene practices and bacterial contamination in food service facilities at Makerere University. Questionnaires regarding food service knowledge, attitudes, and practices were administered to 94 individual and institutional respondents from 16 facilities through in-person interviews. A total of 48 samples (3 per facility) were analyzed for evidence of contamination (total aerobic mesophilic bacteria, coliforms, Escherichia coli, Salmonella). Respondents with higher education levels had better knowledge and attitudes regarding food safety, but knowledge in specific areas were varied. The majority of individual workers used safe food handling practices, but the majority of institutions did not practice good environmental hygiene. The majority of food samples tested had APC and total coliform levels higher than acceptable, but only two tested positive for Salmonella. Food service worker training and managerial improvement of environmental hygiene are needed to improve food safety in these facilities.

OP 316: Current Status Of Banana Xanthomonas Wilt (BXW) Prevalence In South Western Agro-Ecological Zone Of Uganda

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South Western Agro ecological zone of Uganda is the leading producer of all the banana types for the country and the neighboring countries. Despite it being a banana food herb it has not been spared by the devastating Banana Xanthomonas Wilt (BXW) caused by Xanthomonas campestris pv. Musacearum. This disease is threatening food security and livelihood of farmers. BXW reduces banana production, erodes banana genetic diversity and disrupts the ecological stability in banana plantations. Since 2010 there has been conflicting information by District Naads Coordinators (DNCs) and therefore no substantial information regarding the prevalence of BXW in SWAEZ. The objectives of this study were two-fold: (1) to determine the prevalence and incidence of BXW in the zone (2) assess the Impact of BXW management practices in the Zone. A field and household survey was conducted in six randomly selected administrative districts in the zone Random selection was also done to select the sub counties, Parishes, Villages and households from which a total of 720 farmers' were chosen for the study. Results revealed highest prevalence in Lyantonde 40%, followed by Ntungamo 38.9%, Isingiro 26.1%, Rubirizi 20%, Mbarara 16.7% and Ibanda 0.0% respectively. Mean prevalence for the zone was found at 25.2%. Mean Incidence for the zone was found to be at 3.24% with Lyantode having the highest incidence mean of 8.83%, Ntungamo 4.07%, Rubirizi 2.44%, Isingiro 1.88%, Mbarara 0.93% and Ibanda 0.0%. BXW prevalence has been reduced through the use cultural practices disseminated by NAADS and District extension workers with Ibanda district reducing prevalence level by 100%, Mbarara 79.3%, Rubirizi 79.3%, Isingiro 70%, Lyantode 52.9% and Ntugamo 41.7%. In conclusion BXW is still the biggest challenge in Banana production although prevalence has been reduced, more work needs to be done to further reduce the BXW prevalence to less than 1%. 

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OP 317: Physical And Chemical Characteristics Of Garcinia Buchanannii Fruits From Lake Victoria Basin Districts In Uganda And Rwanda

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Garcinia buchananii (Baker) is one of the indigenous fruit tree species with enormous food and medicinal uses among local communities of Lake Victoria Basin (LVB) districts in Uganda and Rwanda. Ripe fruits of Garcinia buchananii were harvested from Masaka and Bugesera Districts in Uganda and Rwanda, respectively and the physical and chemical characteristics assessed. Fruit weight, length, width, pulp percentage, number of seeds per fruit, seed weight, length, width and breadth ranged from 6.3-9.5g, 2.2-2.5cm, 2.1-2.4 cm, 54-81%, 2.2-2.3, 0.5-0.7g, 1.2-1.3 cm, 0.7-0.8 cm and 0.8-0.9 cm, respectively. The chemical characteristic of the pulp (pH, titrable acidity, moisture content, crude protein, ash content, dietary fibre, crude fat, total carbohydrates, vitamin C and β- carotene) ranged from 2.7-3.0, 1.1-7.1 mg/100 g, 77.0-86.0 g/100 g, 4.3-6.8 g/100 g, 1.6-2.4 g/100 g, 12.0-23.6 g/100 g, 1.0-2.7 g/100 g, 4.8-15.5 g/100 g, 32.8-242.0 mg/100 g and 0.6-0.9 mg/100 g, respectively. The minerals: Na, K, Ca, Fe, Cu, Zn and Mg ranged from 1.9-11.6, 212.9-702.7, 1.3-14.2, 4.8-6.5, 0.1-0.2, 1.1-2.5 and10.9-52.9 mg/100 g. With the exception of the number of seeds per fruit and seed breadth, the fruit weight, length and width and the seed weight, length and width of Garcinia buchananii from Uganda and Rwanda were significantly different (p ≤0.05). Similarly, the pH, titrable acidity, crude protein, dietary fibre, crude fat and total ash for moisture content, vitamin C, and β- carotene and the minerals (Na, K, Ca, Fe, Cu, Zn and Mg) of fruits from Uganda and Rwanda were significantly different (p ≤0.05). Although Garcinia buchananii fruits from Rwanda and Uganda contain essential food nutrients that are important for nutritional and food security, variations in the nutritional contents of the fruits indicate that the influence of local environmental conditions should be taken into account when promoting on-farm domestication of the species for both food and nutritional security.

OP 318: Food Bank: Institution Of Emergency Food Or Food Security?

Watuleke Joseph

Debates on global food security have increased lately following the 2008 global food price crisis and the FAO prediction of the world’s population hitting 9.1 billion by 2050, requiring a rise in annual cereal production to about 3 billion tons. This has put world food security at crossroads given that currently; about 842 million people around the world suffer from chronic hunger. Literature reveals that food waste in the form of failure to harvest, post-harvest losses, product disposal due to expiration, market and other factors play significant role in causing food insecurity. Food banks in developed countries collect the would-be wasted food from industries, supermarkets, and farmers and supply to the hungry as relief food. It was not clear however, how food banks in Uganda intervene in food security situation since there was nothing in the literature about food banks in developing countries; justifying this study. The study objectives included establishing the degree to which food banks address food insecurity among smallholder farmers in Uganda; and whether food banks could be a means for improving smallholder farmers’ livelihoods. Qualitative methods like in-depth interviews, focus group discussions and visual assessments were used for data collection. 80 respondents comprising farmers, food project staff and technical staff from four sub-counties in Mbale district, were involved. Findings reveal that the food bank is used daily and considered a necessary community resource, especially for food storage after harvest, source of improved seeds; and technical knowledge and skill. The study shows that food banks in Uganda different significantly from those in developed countries. They have greatly impacted on food security and livelihoods of smallholder households. Farmers however, faced challenges of distance to the centralized food bank; access to farm credit, and poor quality seeds on market. Thus policy recommendations for the government and food security institutions include: investing in establishment of community-managed food banks; rain water harvesting and management; local seed saving; initiating community-supported agriculture; establishing food bank–University partnership; and policy regulations on food waste and post-harvest handling.
Information on the nature and magnitude of genetic variability, heritability and correlations between yield components and nutritional quality traits are important for designing an effective improvement program for yam bean (Pachyrhizus species) accessions in Uganda. The aim of this study was to estimate genetic parameters for twelve traits in twenty six (26) yam bean accessions for improvement through selection. A randomized complete block design with two plot replications were used across two ecogeographical locations during two early 2012-2013 cropping seasons. Near-infrared reflectance spectroscopy (NIRS) technology was used to determine nutritional quality of root samples. Accessions differed significantly for all traits studied except protein content an indication of the potential variation in the studied germplasm. The $\sigma^2_G$ variance was significant for all traits while $\sigma^2_F$ was significant for all traits except starch content. The $\sigma^2_{GxE}$ ratios were high for Fe, SRFY, SRDM, Starch and Zn respectively. Conversely, the low $\sigma^2_G$, $\sigma^2_{GxE}$ and $\sigma^2_E$ ratios for protein and P are extreme for quality traits. Moderate to high broad sense heritability estimates ($h^2_B$) were obtained for all traits except HI, protein and P content. Significant ($P < 0.001$) and positive correlation between SRFY and SRDY, FBY suggest a reliable indirect improvement of the latter through selection for higher yields. These findings show that the yam bean studied constitutes germplasm with substantial genetic variation for effective selection and significant genetic progress in a breeding program.

Ensuring that milking cows get their dietary requirements for optimum milk yield all year round is a major challenge for livestock owners in pasture based dairy systems. The objective of this study was to evaluate the effect of season and seasonal variation in pasture dry matter yield and composition on milk yield and composition of crossbred cows on agro pastoral farms. In order to increase milk productivity of cows in rangeland agro pastoral systems it is essential to plan for supplementation at the appropriate times of the year thus the need to identify the factors that affect milk yield and composition at different times of the year. Milk yield and composition data was collected in a longitudinal study of 10 farms in the small, medium and large categories based on land acreage in Kiruhura district, south western Uganda from February 2012 to February 2013. Milk samples from five cows per farm were collected monthly and analyzed for butter fat%, crude protein%, total solids%, Phosphorous % and Calcium%. Milk yield of individual cows was also recorded once or twice a month for 8 to 10 cows in addition to the daily recordings of total herd yield including number of cows milked per farm. Pasture dry matter yield and composition did not significantly affect milk yield and composition during the study period. Season was shown to significantly influence milk yield, milk butterfat, milk total solids but not milk composition of cross bred dairy cows in the rangeland agro pastoral system of south western Uganda. The rain season was also shown to lead to significant increases in crude protein and calcium percentage of pasture but not neutral detergent fibre (NDF), acid detergent fibre (ADF), Phosphorusor metabolizable energy (ME). The study has shown that lactation stage exerted the greatest influence on milk yield and composition than any other factor therefore it is advisable for livestock owners to invest in supplementation of cows in early lactation at all times of the year in order to improve milk composition and overall milk yield per cow during each lactation.
Soil organic carbon (SOC) is a major indicator for soil fertility in the tropics and underlies variability of crop response to mineral fertilizers. Critical SOC concentrations that interact positively with N fertilizer for optimal crop yield are less understood, yet can be targeted for soil fertility restoration and management. A study was conducted on Ferralsol in sub-humid Uganda to explore critical range of SOC concentrations and associated fractions for optimal maize (Zea mays L.) yield response to applied mineral N fertiliser. Maize grain yield response to N rates applied at 0, 25, 50, 100 kg N ha\(^{-1}\) in 30 fields of low fertility (SOC < 1.2%), medium fertility (SOC = 1.2 - 1.7%) and high fertility (SOC > 1.7%) was assessed. Soil was physically fractionated into sand-sized (63-2000 µm), silt-sized (2-63 µm) and clay-sized (<2 µm) particles, and SOC content determined. Low fertility fields (<1.2% SOC) resulted in the lowest responses to N application. Fields with >1.2% SOC registered the highest agronomic efficiency and grain yield. Non-linear regression models predicted critical SOC range as 1.9-2.204% for different N rates. The critical range of SOC concentrations corresponded to 3.5-5.0 g kg\(^{-1}\) sand-sized C and 9-11 g kg\(^{-1}\) for clay-sized C. Overall, fields with SOC concentrations >1.2% registered the highest agronomic efficiency, and 2.204 % was the critical amount for optimal maize yield at 50 kg N ha\(^{-1}\) application. Targeting a Ferralsol with critical SOC concentrations results in higher yield benefits to applied N fertilizer compared to soils with low SOC (<1.2%). Farmers need to adopt use of SOC as a guide in soil fertility management in order to achieve high returns from the application of fertilizers.
This change project dealt with building capacity of selected actors in Local government to enhance inclusive service delivery that addresses women and youth energy needs in ways that respond to challenges of climate change in Nansana, Wakiso District Local government, Uganda. Inclusive service and resource provision is a multi-sector concern, especially in energy provision, has been a challenge at Local government level as it requires action from various sectors including energy and environment, agriculture, health and others. Interventions included those on enabling poor women and youth, especially in peri-urban areas, to participate and voice their needs to demand for services as well as resources, has been neglected in especially in Local government planning systems in Uganda. Some of the results of interventions indicated a change in systems of service provision by improving on the involvement of partnerships between the women’s group, Non Governmental organization (NGO) and private sector providers to join Local government actors. There was inclusive targeting of the poor women, men and youth, requires building capacity for their physical integration in planning and implementation of climate change focused actions. There was a system change in terms of inclusion of low income, women and youth who used to be receivers of services and resources but not full participants in making decisions on what they want to be provided for climate change adaptation and mitigation. Working through mobilized groups of women and youth provided an example of:

- how women and youth can be empowered to able to make decisions on resource and service provision; actors who can inclusively provide them with resources and services;
- how they can improve their organization as a collective effort of women and youth; and
- how they can improve on their incomes as well as household energy provision.

The service and resource providers for energy and climate change services and resources in Wakiso Local government, including Nansana town council had made structural modifications in planning to enable women and youth in low income communities, especially those in peri-urban areas, to participate in planning. However, it has been realized through the processes of this project, that structural modifications alone cannot promote inclusion. Change can be achieved by enabling physical integration of women and youth; their ability to participate and work together, their ability to gain social acceptance in ways that enable their participation to have positive interactions; and together be motivated to sustain the activities. Building capacity for physical integration of women and youth, positive interactions with actors in service and resource provision has enabled this project to achieve the following:

- their capacity built to demand for services and resources provision,
- their skills and knowledge strengthened through their physical integration as an organized group whose governance values and accountability to the group improved;
- enhanced ability to participate with skills gained in working on climate change adaptation and mitigation project as a business where they earn income
- Socially and economically included in the briquettes business for income earning as well as a form of energy efficient resource that saves time and is safe for use by both female and male members in the household;
- Enable women and youth, to be included as members of the community, to be fully involved in the climate change, energy, sanitation programs which utilize agricultural residue, vegetation related rubbish and other useful residues to make briquettes for income earning and household energy use.

\[\text{This was a change project for training by the International Training Programme (ITP) on Local Democracy and Local Development through Local Government with International Centre for Local Democracy (ICLD) in Sweden in collaboration with United Nations Capital Development Fund (UNCDF) and supported by SIDA.}\]
Many children in Uganda experience precocious puberty while in primary school but few receive adequate preparation for it. Many approach adolescence with conflicting and confusing sexuality messages. They are unable to seek information and protection as rights, and consequently vulnerable to sexual coercion, early sexual debut, teenage pregnancy, STIs and school dropout. 10 FGDs were conducted with girls and 10 with boys in 16 primary schools in Jinja District to explore 10 – 14 year olds’ pubertal knowledge, sources of information, challenges and support given by parents, teachers, and other duty bearers. Responses were thematically entered into Master Sheet Analysis Tool, cleaned, and manually analyzed with constant comparisons by age, sex, location (rural, urban) and school characteristics. Boys and girls know about the change in voice and enlargement of genitals in boys and about menstruation but not where the blood comes from. Boys learnt from peers the need to engage in early sex if the genitals are to enlarge. Children did not know emotional and social changes, children’s rights and self-protection against sexual abuse. Knowledge and understanding of puberty are generally low among boys and girls. Myths told by peers are a major source of pubertal information. Children perceive myths with respect, and fear of the consequences of neglecting them. Most myths concern manhood, menstrual hygiene, sexual intercourse, social-cultural values and stereotypes, preparation of boys and girls for marriage and child bearing, and prevention of anti-social behaviour. Myths being the main source of pubertal information for 10 – 14 year olds suggested lack of authentic pubertal information, thus the basis for developing an intervention. Rural children and those in low income urban schools held the most myths, and strongly believed in them compared to children from urban, educated and well-to-do class families. Although myths appear negative at first glance, they have positive hidden meanings of child protection and serve the interests and values of society and can therefore be drawn upon in designing health education programmes for young people.

Studies have shown that HIV/AIDS has greatly impacted on individual and national development particularly in the African region. The total burden of HIV in Uganda has continued to increase despite the measures put in place to check the spread. Two key issues are responsible to the total burden: continued spread of HIV among the general population and increased longevity of persons living with HIV. Noted is the fact that married and youth females are more at risk of infection than the male counterparts. This study aimed at assessing the interaction of uncontest masculinity and HIV prevention and mitigation the two districts. In particular the study assessed male use of condoms as a tool for HIV prevention, male’s self-efficacy in informing the partner of their HIV status as well as access to HIV and AIDS prevention and mitigation health services. A series of studies were conducted in Hoima and Kabarole districts over a period of ten year under Phase II and III funding. A sample of 480 female and male respondents, six focus group discussions and a total of 30 key informants were selected. Semi structured questionnaires; interview guides, focus group interview guide and key informant interviews guide were used to conduct the study among peri-urban communities, district leaders and health workers.

The key findings emphasize the importance of masculinities in condom use, high risk behaviours particularly multiple sexual relationships, limited self-efficacy to decide to use or not to use a condom based on perceptions of the HIV health risk, low self-efficacy in informing the partner of personal HIV status and high self-efficacy reported among condom adopters; limited knowledge and use of available health services. About 67% male condom adopters observed that they were a little at risk of getting infected while 81% non-adopters reported a great deal risk of infection implying that there is still lack of personalization with the HIV virus among the respondents. Strategies to address prevention and mitigation should continue to emphasize community, individual dialogues surrounding issues of masculinities and male involvement.
OP 404: State Repression And Walk-To-Work Oppositional Protests In Uganda: Silencing Citizens Demand For A Voice

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This paper analyzes the violent way in which the Walk-to-Work (W2W) protests aimed at voicing citizens concerns with the political and economic affairs of their livelihoods were suppressed in Uganda. The W2W oppositional protests have since 2011 engaged government engineered state repression mainly to suppress citizens voice. This protests have not only criticized the current state of affairs but have actively sought to engage the government of Uganda in a manner that is anticipatory of political change, involving mobilizing local people to participate in peaceful street protests to voice their concerns. The events of 2011 ushered in profound changes in political processes and ways of expressing grievances among the populace leading to the brutal repression of street protests. The key question to ask is: how does a newly elected and seemingly democratic government turn into an undemocratic and violent regime with a sole aim to silence dissenting citizens? Not only has the Kampala regime used violent means to crackdown on dissenting citizens voices and oppositional street protests but has also used state legal and extra legal mechanism to deny space for protests. In all, this paper focus on exploring many intricate maneuvers engaged by both the state and the dissenting citizens as each side tried to outshine the other with very devastating consequences to the general political outlook and the alteration of the democratic path in the country. Not only did the organizers outfox the government but also made new inroads with new forms of political mobilization regarding political organization, struggle and citizen engagement in public life. The paper uses data from a one-year fieldwork exploring different aspects of W2W protests modeled on the Arab Spring protests.

OP 405: Displacement Experience And Community Livelihood Strategies In Post-Conflict Northern Uganda.

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Northern Uganda has experienced tremendous conflict between the Lord's Resistance Army (LRA) rebel and the incumbent National Resistance Movement (NRM) government for over two decades (1986-2006). This conflict displaced approximately 1.8 million persons into internally displaced people's (IDP) camps from the original ancestral homes, which disenchantment the social set up, and livelihood assets that the IDPs had generated over a long period of time. During insurgence, the local people were abducted, massacred, forcefully conscripted into the rebel activity and had their livelihood assets destroyed. Consequently, suspicion and mistrust increased among family, neighbors and community members. Therefore upon this rationale, the paper investigates the effect of displacement on community relations of former IDPs in northern Uganda and the implications for livelihood strategies. The study is conducted in Oyam district, northern Uganda. It adopts qualitative design using interviews, Focus Group Discussion (FGDs), observation and documentary analysis focusing on the social capital and livelihoods transformations among former IDPs. Findings indicate that conflict and displacement caused mistrust and suspicion that broke down the social structure of kinship relations and community network of former IDPs. This was coupled with increased poverty levels, individualism and resource scarcity that undermined reciprocal culture. Nonetheless, nuclei family support prevailed amidst significant deterioration of mutual trust, cooperation and reciprocity that undermined the spirit of social resource protection and sharing hence increased vulnerability. Succinctly, I infer that displacement transformed livelihood strategies of former IDPs in northern Uganda from communalism to individualism and alcoholism hence increased vulnerability. I therefore propose that government of Uganda revitalize cooperative movement among small holder farmers in northern Uganda. Meanwhile, the former IDPs should be sensitized on the benefits of cooperative production to transform their livelihoods from subsistence to market oriented strategies. It is imperative to integrate community social relations component in the post-conflict reconstruction program for northern Uganda to attain sustainable development.
The protracted nature of conflicts in most fragile, conflict prone countries means that return-home for many refugees is increasingly delayed. This coupled with increased global terrorism and security concerns have significantly slowed down the process of resettlement in a third country which was the norm. This paper explores self-reliance - as opposed to care and maintenance - within the realms of local integration as a durable solution. The Self-Reliance Strategy implemented in refugee settlements in Uganda is premised largely on refugees meeting their own food needs as a precursor to meeting all other livelihood needs and thus becoming self-sufficient. However, a successful agricultural livelihood is determined by a multiplicity of factors including the size and quality of the land, land utilisation type and the socio-economic environment. Using a correlation cross-sectional survey in which both qualitative and quantitative techniques were used, a total of 348 refugee households were sampled. A paired-sample t-test was conducted to compare mean bean yields over two periods in 2000 and 2010-2013 with results showing significant differences in bean production in 2000 (M=372.03, SD=684.5) compared with 2010-2013 (M=144.28, SD=153.4); t(4)=5.66, p<0.005, while the maize mean showed a reduction in the same period but was not statistically significant:2000 (M=779.87, SD=1812.455), and 2010-2013 (M=674.23, SD=3260.997); t(162)=0.465, p=0.642<0.05. The study considered food ration values given to fresh case loads at 100% food dependence against what refugees produce from subsistence agriculture and what ultimately is consumed. For instance only 21.8% of the refugees had maize consumption at or above the threshold of WFP food ration per capita distribution an indicator that subsistence crop cultivation is unable to guarantee the realisation of self-reliance. Land sizes were rather small and the dependence on subsistence crop cultivation coupled with reduced soil fertility is already affecting self-reliance. The study therefore recommend exploring non-agricultural livelihood options alongside improving the current crop production levels as a trajectory measure to making refugees self-reliant as repatriation or third country resettlement are being awaited.

In Uganda, women’s sexuality in particular has been linked to the wearing of miniskirts that are deemed immodest since they show women’s thighs – a distinctly sexualised body part in Uganda. Both media sentiment and the law have been harnessed as tools to try and police and tame women who are seen to contravene patriarchal values and flout control of their bodies by choosing to wear miniskirts. I show how this was prompted by the drafting of the first version of the ‘anti-miniskirt law’ officially the Anti-Pornography Act proposed by Simon Lokodo, in the Ministry of Ethics and Integrity. It expands the scope of section 166 of the Penal Code Act, which prohibits the production and use of pornographic materials in Uganda. I demonstrate that this legislation did not emerge in isolation though. It draws on a history of similar legislation in Uganda, as well as misogynistic attitudes prevalent in the press. These attitudes are exemplified by the justifications for including the banning of miniskirts, claims that miniskirts should be banned because women wearing them distract male drivers, who stare at women’s thighs and then cause traffic accidents. It was also argued that sex workers wear such clothing, and that sex workers purportedly spread diseases such as HIV/AIDS, therefore miniskirts must be distinctive symbols of danger. In response to women’s dress, ‘moralists’ offered to teach these women a lesson, using both subtle and violent means, including beating, undressing, and raping them. This study argues that patriarchal interpretations of women’s dress as a sign of degeneration contributes to the culture of misogyny in Kampala, a culture of misogyny that discourages women’s contributions to politics and the economy. Furthermore, the assumptions about gender and sexuality that shape laws like these participate in making women’s empowerment difficult to obtain in Uganda generally, although these laws have specifically been used to target women in the urban spaces whose behaviour is considered non-traditional. This used a historical and contextual current debate, moving on to analyse relevant political cartoons and news stories that trivialise women’s intellectualism and public presence.
This paper examines post conflict policy making and reconstruction of health from a gender perspective. Conflict affects males and females differently, posing different health challenges for either gender. While post conflict planning and reconstruction has evolved from mere emphasis on rebuilding infrastructure to provision of health services, there is no evidence of gender mainstreaming in these processes. The tendency has been to provide health services according to national priorities, without any regard to the gendered nature of post conflict health challenges. The assumption that all will equally access health care once infrastructure has been established ignores the gendered challenges associated with access, making the realization of improved health indicators and sustainable peace and development a mirage. In response to war impact in northern Uganda, the Government embarked on reconstructing the region through various programmes, the most recent being the Peace, Recovery and Development Plan for northern Uganda (PRDP), presently in the second phase and seeking a third phase. While these efforts are commendable, it is not clear to what extent gender was a key factor in their development and implementation. Using documentary and policy review and interviews at national and district levels, this paper examines the extent to which females participated in post conflict reconstruction policy making processes; gender integration in relevant policies, the extent to which gender is mainstreamed in implementation; and the factors explaining the emerging trends. The findings reveal that no gender analysis was conducted to inform policy outcomes resulting in gender neutral policy documents and there were no efforts to ensure the participation of women during the consultative processes leading to policy formulation. Distances to health facilities and unequal gender power relations prevent women from accessing health care. As the government embarks on the process of preparing PRDP 3 it is important that a gender mainstreaming strategy is developed to ensure the resultant problems are addressed to achieve gender sensitive health reconstruction.


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On 15 October 2007 the Government of Uganda (GoU), launched the Peace, Recovery and Development Plan (PRDP) for Northern Uganda, including Acholi, Lango, Teso, West Nile, Karamoja, and Elgon. The PRDP is a comprehensive development framework aimed at improving socio-economic indicators in those areas affected by conflict and a serious breakdown in law and order and bringing them into line with national standards. It replaced the Emergency Humanitarian Action Plan (EHAP) and its Joint Monitoring Committee (JMC). The study sought to assess the contribution of PRDP in rebuilding and empowering the war affected communities in northern Uganda; the success and challenges of revitalizing the economy in northern Uganda; the extent to which PRDP has contributed to peace building and reconciliation in northern Uganda. The study was conducted in Gulu and Pader in Northern Uganda for comparative reasons. This is due to the fact that these areas were the epicentre of the conflict and witnessed the brunt of the violent conflict with massive displacements and atrocities. Some respondents were interviewed in Kampala. Both qualitative and quantitative methods of data collection were used. A total of 145 respondents participated in the study. PRDP has contributed in building infrastructure like schools, access roads, and health centre facilities. Livelihood support was also given to the returnees. It also helped the police in putting up police posts and purchasing vehicles. Some of the youth were not properly demobilized and re integrated into society and so they still have weapons. Land disputes are rampant thereby destabilizing the current wave of peace being experienced, which translates in part into food insecurity. Although PRDP supports setting up of infrastructure, it does not monitor the maintenance and functioning of these units. For example they do not recruit teachers or health workers for the schools and health facilities respectively.
Candidates for the role of policy makers are expected to use tools such as language to generate and rewrite political purposes for the ruling party to enshrine power. I critically analysed the ways in which sex and sexuality, ‘homosexuality’ and the myriad myths that such legislation seeks to protect the ‘traditional’ family are constructed as public issues and therefore worthy of legislative intervention. Linked to this, I examined how the mythical traditional heteronormative family are constituted as under threat from factors unrelated to homosexuality. I argue that the real purpose of the legislation was to reflect an image of patriotic duty that the NRM government wishes to communicate to the general public in Uganda, and ‘ennoble’ the government by portraying the ruling party as actively intervening in a perceived and constructed threat of homosexuality to the traditional family.

To make this argument, I critically analysed the ways in which sex and sexuality, ‘homosexuality’ and the ‘traditional’ heteronormative family are constituted as public issues and therefore worthy of legislative intervention. Linked to this, I examined how the mythical traditional family is constructed as under threat by ‘homosexuality’, and therefore the family is in need of government protection. By doing archival research, documentary analysis, legal analysis and cultural theory I showed that the constructed myths of traditional families, and ‘who homosexuals are’, are false, and explore the debates around the enactment of the legislation, and the potential for mis-use and legal challenge. I argue that these constructions are fantasies by government and the media that have been generated to serve political purposes for the ruling party, specifically to shore up a national sentiment that buttresses their power. I show by focusing on legislation and political discourse, that this effort to criminalise ‘homosexuality’ was as much “about defining proper and improper forms of national belonging” as it was “about defining proper and improper forms of intimacy”.

Contraceptive use has a potential of leading to 44% reduction in maternal deaths. Contraceptive prevalence in low and middle income countries is low. Sterilization contraception in Uganda is under-utilized. The objective of this study was to determine factors associated with willingness to utilize female sterilization contraception among married women in Tororo district, Uganda. A cross-sectional study of 603 married women aged 15-49 years was conducted. Data was collected using a semi-structured questionnaire. Univariable analysis was done to describe study variables. Logistic regression was performed at both bivariable and multivariable analyses to determine factors associated with willingness to utilize female sterilization contraception. The mean age of study respondents was 32 years. Overall, 70.3% of all (603) respondents were not willing to utilize female sterilization contraception. Up to 74% of married women who scored below 50% on likert-scale on non-couple communication were not willing to use sterilization. A moderate proportion (52%) were more concerned about the negative effects of female sterilization. On the other hand, 69% were not knowledgeable about the method. In multivariable analysis, factors associated with willingness to utilize female sterilization were age of women 40-49 years (AOR: 5.75, 95% CI: 1.73-19.01), education level) (AOR: 0.5, 95% CI 0.28-0.74), having formal employment (AOR: 0.23, 95% CI: 0.09-0.62) and using other contraceptives (AOR: 0.12, 95% CI:0.04-0.41). Willingness to utilize female sterilization was low. Age of women (40-49 years), tertiary education level and being in formal employment were factors associated with willingness to utilize sterilization while use of other contraceptives affected it. Health education is needed to address misconceptions that women hold about female sterilization contraception. A range of other interventions are also needed.
This paper highlights how the language of decadence in riddling acts entrenches corruption and violence in society. Since riddling is a learning strategy for communication and community transformation, the deliberate choices of the language used influences the people's social behavior. The study 1) analyses the contemporary language used in selected Lusoga riddle acts and 2) discusses its impact on the participants’ performance. This ethnographic field study uses participant-observation and unobtrusive discussions during and after the riddling acts during the Mak-Nufu Folklore Linkage Project activities in Busoga from 2007 - 2012. Three riddle events with over 200 riddle acts are analyzed using Critical Discourse Analysis (CDA). Ethnography is the most suitable method for the study of social behavior, as it requires the researcher to live among the study community. It yields accurate empirical data by recording all observed behavior and precisely describing the meanings of the signs and symbols encountered. The study finds that negative social behaviors commonly referred to or exhibited in the forms of arrogance, hypocrisy and indirection mostly originates from riddling. In particular, the stages of unraveling and declaration where, negotiations for bounty of power, terms like “Mpaomwami” (Give me a Chief) and “Nkise” (I have killed it) are used. Asking for payment in return for an answer no matter whether it is genuine or not is vice. Also, the object of reward is treated in the most undignified terms like ‘beat’, ‘squash’, and ‘kill’ that show total disrespect for life. This shows that riddling simulates violence and corruption by relying on violent language symbols and tokenism - “something small” (kitukidogo), while negotiating for goods and services. This radical power-play is systemically entrenched through constant riddling. Unlearning its corrupting influences would necessitate deliberate changes in the classic riddle declamations by replacing them with phrases of virtues such as respect, peace, honesty, harmony and justice.

OP 413: Life After Epidemic: Experiences of Ebola Survivors In Kibaale And Luwero Districts In Uganda

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Few social science studies have been conducted to document the experiences of Ebola survivors. In this paper we describe the experiences of Ebola survivors during and after their reintegration back into the communities in the two Uganda districts of Kibaale and Luwero that were hit by the 2012 Ebola outbreak. The study aimed at; describing the experiences of Ebola survivors and their families with regard to the community perceptions, challenges faced and the coping strategies employed. Data were collected from July to September 2014 using qualitative techniques. Guided by an exploratory descriptive study design, nine-in-depth interviews with Ebola survivors and 18 focus group discussions with community members were conducted. Ebola survivors were selected using purposive and snowball sampling. We also purposively selected and interviewed health workers at health facilities from where Ebola survivors were treated, village health teams, local leaders, Ebola task force committees, and NGO staff. Thematic analysis was used to analyse data. The process of reintegration at the community level was poorly managed, community engagement was pitiable. As a result, Ebola survivors were shunned, discriminated and stigmatized. The process of reintegration and the subsequent challenges faced by survivors were compounded by the initial local community interpretations of Ebola associating Ebola to witchcraft, denial of Ebola existence, low trust of the health care system, inadequately trained and poorly facilitated social mobilization teams to provide psychosocial support to the recovered persons and communities. The affected families are struggling with taking care of the orphans’ education and their general needs. Ebola seem forgotten by the health care system. However, feelings of vulnerability are “alive” in communities following Ebola outbreak in West Africa. Amidst all the challenges, Ebola survivors’ agency was critical in challenging the stigma, discrimination and facilitated their acceptance into the community. This conclusion points to the need to include survivors in the fight against Ebola as their involvement allows the community and survivors to heal psychosocially and provide the much needed manpower to address the care challenges that come with Ebola control and management.
A thesaurus is a dictionary of synonyms (words with similar meaning) and antonyms (words with opposite meaning). Other features can also be included in a thesaurus, namely, quotations, phrases, proverbs and encyclopaedic information related to a word. Synonyms are the major part of any thesaurus. There are different ways of identifying synonyms in the compilation of a thesaurus. In well-written languages, for example, English, the main method of identification of synonyms is by use of corpus. In less documented languages, the corpus method is not quite possible since there are no sufficient written materials to develop the corpus. The paper argues that the use of the guided-memory method as a theoretical approach to the identification of synonyms in the compilation of thesauruses in less documented languages is viable. A hypothesis to this effect was tested in three Ugandan languages (Lugungu, Runyoro-Rutooro and Runyankore-Rukiga), whereby the results of the hypothesis testing were largely positive across the test languages, and the hypothesis was confirmed. To come to this confirmation, both the unguided-memory method and guided-memory method were used for testing the hypothesis. They were compared on the results, and more positive results were registered by the latter than the former. Based on this test implication, the paper discusses the following emerging linguistic perspectives. There are more categories of synonyms than the ones seen in the current literature. Most synonyms have distinctive meaning, either according to their extended meanings or categorisation. Synonyms are translatable from one language to another following the principles of translation. According to the argumentation in the paper, conceptual types are an aspect that needs to be incorporated in the theory of sense relations (semantics). The paper also shows that the guided-memory method has the potential to be used for compilation of thesauruses in less documented languages. The conceptual types of words can be computed in software form, as a basis for creating computerised thesauruses in less documented languages.

The importance of employee commitment in so far as enhancing employee job performance is concerned is widely recognised in scholarly literature. Committed employees are more likely to engage in extra-role behaviours such as creativity, have less intentions of leaving the organisation, accept and enhance organisational change and involve in knowledge sharing. This study therefore was intended to isolate antecedents of employee commitment that can be manipulated to positively enhance employee commitment. This paper adopted the critical review methodology in analysing recent literature. The key results were 21 antecedents which were categorised into three groups of antecedents of employee commitment, namely; human resource management (HRM) practices, organisational and personal characteristics. Thus a key contribution of the study is a framework for the study of employee commitment basing on the three categories of antecedents. In terms of HRM practices, the framework hypothesises that recruitment, selection, performance appraisal, promotion, participation, remuneration, job design, job security and grievances handling are antecedents of employee commitment. In regard to organisational characteristics, the framework hypothesises that organisational structure, leadership styles, employee relationships and organisational support are antecedents of employee commitment. Lastly according to the framework, personal characteristics namely age, gender, educational level, marital status, job experience, job position and self efficacy are antecedents of employee commitment. Gaps in the studies reviewed are identified. The study will be a basis for knowledge generation for future research, writing of a PhD monograph and future articles on antecedents of commitment of academic staff in universities in Uganda.
OP 416: The Influence of University Governance on the Employability of Graduates from Public Universities in Uganda

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This study examined the influence of university governance on the employability of graduates from public universities in Uganda. This was in response to the complaints by employers that university graduates do not have adequate skills in tandem with the requirements of the workplace. The study employed a cross-sectional co-relational survey design where both quantitative and qualitative methods were used to collect data. A sample of 219 respondents selected from university councils, senates, and academic staff of four public universities and selected employers (or their representatives) participated in the study. Purposive, stratified and convenience sampling strategies were used to select the different study subjects. Data were analyzed using appropriate descriptive and inferential statistics as well as content analysis method. The study findings revealed that: first, the university-government relationship in Uganda was generally fair (not hostile) compared to what reportedly happens in some other countries. Second, public universities were still not appropriately accountable to their stakeholders, though both university-government relationship and accountability were significantly influencing the employability of graduates from public universities in Uganda. Lastly, the study revealed that public universities in Uganda, to a large extent, enjoyed institutional autonomy although this autonomy never significantly influences the employability of their graduates. From these findings, it was concluded that university governance has a role to play in enhancing the employability of graduates from public universities in Uganda. The study therefore proposed the following interventions: i) Government of Uganda needs to (a) develop guidelines for curriculum development for public universities, and (b), make internship compulsory and funded for all students; ii) University managers need to (a) strengthen the university-private sector forum; and also (b) improve on their accountability systems to all relevant stakeholders.

OP 417: Vulnerability among Mobile Workers in Timber harvesting livelihoods in Uganda

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Whereas work should give workers satisfaction and improve their esteem, vulnerability arising from work activities leads to exploitation and ultimately undermines these values. Mobile tree harvesting workers do impressive work for society but their livelihoods make them vulnerable. A number of studies which have been done on livelihoods at risk have given little attention to mobile tree harvesting workers whose activities, though not accessible to adequate formal training, provide and have potential to improve rural livelihoods. The study explored the nature of people involved in tree harvesting to understand livelihood processes and forms of vulnerability outcomes. The study used an exploratory research design. Due to the need to access the hidden and mobile population involved in timber harvesting, the sample was derived from places of origin, transition points and work sites. In total, 123 respondents were interviewed in phase one of quantitative survey. In phase two, 6 Focus Group Discussions were held with the workers across different age groups and 6 key informant interviews conducted with individuals who had knowledge and experience on the lumbering process and outcomes. Quantitative data analysis was done using SPSS and content analysis was used for the qualitative data. Findings show that in Uganda, workers whose livelihoods depend on tree harvesting have specific socio-demographic characteristics. Such workers are vulnerable in terms of their natural, physical, human, social and financial capital assets associated with livelihood activities. These workers cannot find alternative employment because due to limited and mono-industry specific skills. Their limited formal education results in constrained ability to negotiate favourable contracts. Debt bondage as a result of financial advance payments and the associated end-of-contract payment calculations, make vulnerabilities of most workers chronic. By training their relatives and friends in the same occupations, worker’s vulnerabilities continue through generations. Hence, there is need for line ministries to effect policy change by working with concessioners to ensure safe, decent and rewarding work for workers especially by assisting them to form an organisation to champion worker’s rights.

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OP 418: Exchange Rate Volatility and Economic Growth in the East African Countries

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Most African countries adopted economic reform programmes in the 1980s, with exchange rate liberalization as a major component. The move to a floating exchange rate system after the collapse of the Bretton Woods system has caused negative consequences for trade, investment and growth prospects of developing countries and has generated major concern by policy makers. The paper empirically analyses the effects of exchange rate volatility on the long-run economic growth for a set of 5 countries of East Africa namely; Burundi, Kenya, Rwanda, Tanzania and Uganda using a panel data set ranging from 1980 to 2012. The measure of exchange rate volatility adopted for the paper was the standard deviation. It employs the generalised method of moments (GMM) for dynamic panel data approach. The results for the GMM panel growth models show that a more (less) volatile exchange rate volatility has significant negative (positive) impact on economic growth and the results are robust for different model specifications. Besides exchange rate volatility the following also affect economic growth foreign exchange reserves, inflation, terms of trade. The empirical results indicate that the Ugandan shilling exhibited the highest volatility, while the Kenyan shilling fluctuated with the least. For the findings of this paper reveal that exchange rate volatility in these countries results from real shocks rather than nominal shocks. In addition to that, exchange rate stability seems to be more important to foster long-run economic growth than exchange rate misalignment.

OP 419: Modeling information access and flow for e-governance in selected local governments in Uganda

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Uganda has a legal, policy and institutional environment to promote e-governance, yet it is grappling with ways of raising public access to government information in its local governments. This research was motivated by the need for the local governments to establish information systems to facilitate access and flow of information for the successful implementation of e-governance. The research objectives were to review the current state of access to e-governance information in the local governments; to examine the current geometry of information flows and their imbalances; to review current e-governance information models in relation to Uganda; and to propose an appropriate model for Uganda’s local governments. The study adopted a mixed research strategy based on a concurrent triangulation design. It was conducted in two purposively selected local governments: Isingiro district and Mbarara municipality. Quantitative data was obtained from 320 randomly selected participants using a semi-structured questionnaire. Qualitative data was obtained from 64 participants in eight FGDs and 25 in-depth interviews with purposively selected KIs. The findings indicated that information access is constrained by lack of public access facilities and limited affordability of communication media. Governments rely heavily on broadcast media because of low diffusion of convergent media and poor citizen capacity to access them. Yet broadcast media are also underexploited. Citizens generally do not know where to seek official information; and government communication is not informed by citizen needs. Information flow is asymmetrical; flow to the citizens is uneven due to factors underlying social disadvantage. Current e-governance information models are ICT-intensive and designed for developed countries. Local governments can establish and maintain a homegrown e-governance information system. We conclude inter alia that G2C communication is based on ad hoc rather than formal programming, and is therefore more reactive than proactive contrary to the goals of the national communication strategy. Information flow is disrupted and represents an obstacle to citizen participation. Uganda’s local governments suffer from information asymmetry that makes citizens passive recipients of government information. Media programmes are not properly designed to promote public participation.
SUB THEME 5: ADVANCES IN EDUCATION, SCIENCE AND TECHNOLOGY

OP 501: The performance of gas burner for producer gas based on swirl flow and continuous air staging

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Biomass gasification has regained research and application resurgence in recent years as suitable technology for exploitation of abundant resources for sustainable energy provision. When biomass is gasified, the composition, calorific value and quantity of the gas generated can vary widely depending on the type and characteristics of feedstock materials, the feeding rate or method, the type and mode of operation of the gasifier. The above results in technical difficulties concerning combustion stability. The authors developed model of LVC gas burner to increase flame stability and reduce CO/NOx combustion emissions based on swirl flow and continuous air staging concept. This study therefore was conducted to validate of the model using a fixed bed gasifier running on maize cobs and coffee husks. The gas burner was integrated with a kiln. The burner swirl vanes were varied between 6, 8 and 10 while the swirl angle was varied from 30° to 45°. The results showed that the CO emissions as well as the maximum flame temperature and burner exit temperature reduced with increasing equivalence ratio, as was depicted in the model. Furthermore, the results with swirl angle 45° have shown a stable and cleaner combustion flame compared to the swirl angle 30°. Hence it can be said that the use of swirl flow and continuous air staging techniques in non-premix burners leads to a cleaner and stable combustion flame.

OP 502: Characterization Of Ten Uganda Bio-Waste Residues Under Proximate Analysis For Briquettes Production

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Ten Ugandan bio-waste agricultural residues were characterized under the ultimate analysis to determine their elemental constitution. The Eltra CHS-580 (Thermo-graphical Analyzer) was employed for determination of carbon, hydrogen and sulphur; while nitrogen the method of protein analysis was used. The atomic absorption spectroscopy technique (NEN6465 Dutch Standard) was employed for Calcium, sodium, potassium, and silicon and the colorimetric method was used for phosphorous. The moisture and ash content were determined using the Eltra Thermostep – Thermographic analyzer. The focus was to determine whether the eleven characteristics (content by percentage of carbon, hydrogen, oxygen, nitrogen, phosphorous, calcium, potassium, sodium, silicon, ash and moisture) in the ten selected Ugandan bio-wastes had a relationship among them to project a high Carbon value for the bio-waste briquette production. The contribution and difference between a fuel’s fixed carbon under proximate analysis and its constituent elemental carbon under ultimate analysis is presented and explained in the context of the ten bio-residues data. Using STATA software, the bio – waste ultimate analysis property values were regressed as independent variables against the carbon content. The statistical analysis showed hydrogen, oxygen, nitrogen, and sulphur and ash content constitution to be very significant at 95% confidence level in the bootstrapping-quantile regression model. A regression model equation was established from the analysis and in agreement with established scientific literature. The Kruskal-Wallis equality-of-populations rank test was employed to select bio-wastes residues with high carbon content for briquettes production. Sunflower seed cake, palm nut trash, saw-dust, ground-nut husks, cotton seed cake, cotton de-coated seed trash, maize cob trash, coffee husks were selected. Millet husks and rice husks were rejected owing to poor briquette fuel characteristics (low carbon value, high volatile matter and ash content) to harness for metallurgical application like reduction of iron ore.
OP 503: Design and Implementation of a GSM based Fuel Leakage Monitoring System on Trucks in Transit

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Many people in Uganda have been victims of fuel tank explosions from leaking fuel through getting injured, destroying their property and more so, losing their lives. This is a result of accidents and fuel leakages that go undetected causing fire explosions leaving big numbers of people dead. This design therefore consists of one or more sensors that can reliably monitor, detect, and send alerts upon occurrence of any fuel leakages. The message can either be sent to police, truck owner or the driver of the truck who can in turn react accordingly. The web portal in the control room can as well proactively monitor the truck’s real time movements. The main aim of this system is to present a working mechanism that will help to reduce on the number of people that would be involved in any fuel explosions and to proactively monitor the truck to avoid any explosions just in-case there is a fuel leakage. This project is going to work on the principle that if there is a fuel leakage, this fuel will get in contact with air and if this happens, it evaporated turning into gas. It is this gas we will detect using a gas sensor that will transduced into a voltage to be sent to the microcontroller which will automatically pick coordinates from the GPS module at that same time sending it to the GSM module. The GSM module will then send a message to the Police, driver and the company responsible for the fuel in transit. From the prototype results, the project was able to achieve its functionality where it recorded a good system and sensor response. The time to send and receive the 1st, 2nd and 3rd messages was very short. In conclusion, the system is an effective system which is a quick and safer replacement for the elementary method of smelling fuel to ascertain whether fuel has leaked or not and if this is given a further go ahead, it would help save the lives of the Ugandans as well save on the company’s revenues lost due to these occurrences.

OP 504: Operational Characteristics of Passing Zones on Two-Lane Rural Highways in Uganda

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This paper presents results of an empirical study on passing behavior on two-lane rural highways in Uganda using data collected at 19 passing zones. The data was collected using stationary camcorders placed along the length of passing zones. The objectives of the study were: (1) to characterize empirically the operation of passing zones with respect to where maneuvers begin and end in the zone; (2) to assess adequacy of the design PSD thresholds; and (3) to determine the time-to-collision and gap acceptance statistics of individual passing maneuvers. To achieve the three objectives, the study considered the frequency of passing maneuvers by where they begin and end with respect to the passing zone, and passing maneuver characteristics such as type of passing and passed vehicles, speeds of passing and passed vehicles at abreast position, passing duration, time-to-collision, and accepted gaps in the opposite traffic stream. Results show that there is a tendency for drivers to begin or end passing maneuvers outside the passing zone irrespective of the length, and the impact is substantially high at zones 355 meters or less. This behavior is inconsistent with design and legal requirement in Uganda for passing maneuvers to begin and end inside the passing zone. These maneuvers increase the risk of head-on collision between the passing and opposite vehicle due to sight distance limitation to avert the collision. There is no difference in the average duration a passing vehicle spends in the opposite traffic lane whether the passed vehicle is a passenger car or a short truck with 2-3 axles but significantly different for long trucks with 4-7 axles. Accepted gaps in the opposite direction at most 20 seconds resulted in time-to-collision less than 2.0 seconds exhibiting evasive actions by drivers to avert a potential collision. The results contributed to a revision of the design passing sight distance threshold, and recommendation of policy change on minimum length of passing zone for high-speed highways in Uganda.
During pre-independence period, Ugandan teachers seemed to like, enjoy and were proud of their profession. High teacher retention in schools was experienced and the best education system in Africa during 1960s. However, trends have changed with high teacher turnover intentions in primary schools reported at 60% due to the unknown individual and organizational characteristics and unclear education policy on teacher attrition and retention. The relationship between individual, organizational factors and teacher turnover intentions among primary schools in Mbarara district, should be established. Cross-sectional study design on 421(N=1951 teachers) 2012/2013 Mbarara district active teachers enrolled between 1st April and 30th June 2013 using SRS technique and self-administered semi-structured questionnaire. To measure associations, binary logistic regression method was used and reported in OR at 95% CI. To establish an association, variables having a P-value<0.2 were considered for further analysis. The strength of association at P-value<0.05 was considered following tests for confounding at 10%. Owning a car (OR=3.992, p=0.007), spouse's occupation as business (OR=0.287, p=0.002) and having <3 children (OR=5.928, p=0.005) were statistically significant. Organizational factors, low job vulnerability (OR=0.437, p=0.001), scholastic material absence; textbooks (OR=3.224, p=0.001) and lack of involvement of teachers in extra-curricular activities; being a classroom teacher (OR=2.522, p=0.001), denied timetable designing (OR=2.085, p=0.006) and extra lessons provided (OR=2.413, p=0.001) were statistically significant. Teachers with spouses involved in business and owned a car(s) were less likely to leave their profession though teachers having <3 children were more likely to quit teaching profession. Extra-curricular activities not allocated to teachers increased teacher attrition intentions by more than twice their counterparts allocated these responsibilities. Absence of teaching materials increased teacher attrition intentions 3-folds while low vulnerability on the job more than twice decreased teacher attrition. Recommend extra responsibilities on merit, encouraged to delay or have fewer children preferable not more than two, teachers with spouses having additional income/businesses to improve the family cashbase, strengthening the appointments mechanism through provision of appointment letter and regularisation into service and future studies to establish causality could be conducted countrywide.

OP 506: Copyright Infringement for Academic Authorship in Uganda: Implications on Exemptions of Fair Use for educational purposes in Universities

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Like any other property, Intellectual Property (IP) must be regarded, respected, and remunerated to address the historical, ethical, economical and informational needs of society. Article 26 of the Constitution of the Republic of Uganda 1995, the Copyright and Neighbouring Rights (CNR) Act 2006 and CNR Regulations 2010 guide copyright protection in Uganda. However, an unpredictable environment has negatively impact on certain author/intellectual freedoms; and the infringements on academic works that affect the economic rights of authors that limit authors from fully enjoying the benefits of authorship. Notwithstanding the different licensing systems and copyright protection avenues, educational institutions and custodians of copyright works (libraries, archives) have continued to advocate for open access to information resources, under the legal exceptions of fair use for educational purposes. Thus, a study was conducted in educational institutions, libraries and archives in Uganda to assess the state of copyright infringement in Uganda in an increased use of academic authored works. The study attempted to establish the nature and forms of Copyright Infringement, the circumstances for copyright infringement, assessed the opinions from the custodians on strategies for balancing copyright protection for economic and moral gains by authors and increased access to information for educational purposes and fair-use. Through a survey, using a
self-administered questionnaire, interviews and physical visits, the study was conducted in higher
education institutions, libraries and archives among the officers that manage and keep copyright
works. It established that the uncontrolled reproduction of copyright works in educational institutions
and information institutions, have contributed copyright infringement robbing authors of their potential
economic earnings and limiting their academic innovativeness and creativity. The study also
established that lack of consciousness and awareness on copyright issues by lecturers, universities
and libraries has made copyright works in Universities highly susceptible to copyright infringement.
Thus the increased access to materials without restrictions has resulted in copyright infringement
among the educational institutions, libraries and archives. A strategic alliance by the collecting Society
(Uganda Reproduction Rights Organisation (URRO), government, Universities and right holders
organisations (UTANA) to work together and institute a programme to address copyright protection
and access to information is pertinently required.

**OP 507: Space Weather Effects on Satellite Communication**

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The Sun emits highly conducting plasma at supersonic speeds into the interplanetary space as a
result of corona mass ejections (CME) and solar flares. This plasma is solar wind and consists of X-
rays, ultra violet radiation and charged particles. When directed towards Earth, the plasma may leak
into the Earth’s lower atmosphere and hence cause disturbances within the ionosphere, and if severe,
cause geomagnetic storms which are some of the manifestations of space weather. Satellite
communications play a vital role in the global telecommunications industry and over 2,000 satellites
orbiting Earth relay analog and digital signals carrying voice, video, and data to and from different
locations worldwide. Signals from communication and navigation satellites traverse the ionosphere
before reaching receivers on Earth. During severe explosive events that occur on the Sun the energy
of this radiation increases, and charged particles are ejected in large numbers, so that the
ionosphere is not uniformly ionized, causing small-scale irregularities. Ionospheric scintillation, which
is a rapid fluctuation in trans-ionospheric signal strength is caused by these small-scale irregularities
and can disrupt satellite-based communications and navigation. The purpose of this research was to
investigate space weather effects on GPS satellite signals within the East Africa region using GPS
receivers positioned at Makerere University and at the University of Nairobi. High data-rate NovAtel
GSV4004B GPS receivers collected GPS data from which GPS scintillations were obtained. The
results showed that scintillations mostly occurred during nighttime: from local sunset to just after
midnight. Scintillations were also observed to have a seasonal dependence and the effect was more
pronounced during geomagnetic storms. It is therefore imperative to say that even if it is not possible
to do away with space weather effects, it may be possible for communications/navigation operators to
make schedules such that the peak signal demand does not occur during high scintillation periods, or
else be able to use alternative means of communication and navigation during severe space weather
periods.
Electricity theft is the main source of non-technical losses in electricity distribution grids. It is a multifaceted problem that requires thorough research involving all stakeholders of the electricity system so that a comprehensive set of electricity theft prevention initiatives can be proposed. This paper presents findings of an exploratory study conducted among electricity consumers in Kampala and the electricity distribution employees to understand the causes of electricity theft, what is being done to deal with it. The main data collection tools were survey questionnaires administered to 250 electricity consumers in a number of areas with Kampala; including, Banda, Wandegeya, Bwaise, Bukoto and Kitintale; and in-depth semi-structured interviews to key employees within Umeme. Our study reveals that electricity theft in Kampala is largely due to economic reasons and corruption. The utility company is making progress shown by the success of prepaid metering and aerial buddy conductors but more effort is required to deal with corruption, address increasing electricity tariffs and relationship between the utility and the public. We also present a suite of information and communication technologies that can be used to facilitate reduction of electricity theft.

As environment related climatic changes have become national and international challenges, possible sources of vital human needs, paper inclusive must be looked for from alternative extraordinary sources which offer less adverse impact on the environment. Non-wood materials such as *Cymbopogon nardus* (citronella) don't have economic benefits contain cellulose in form of fibres and stand to be potential sources for pulp for paper industry with less environmental degradation threat. By isolating pulp from *Cymbopogon nardus* for paper may reduce on the rate of clearing mature trees as well as adding value to the wasted material. The research study evaluated the use of *Cymbopogon nardus* as raw material for pulp and paper industry. This was done by characterisation of the raw materials, identifying the appropriate pulping techniques and conditions as well as characterisation and evaluation of the pulp and paper made. The chemical characterisation of raw materials was done using the Norman and Jenkins’s methods as well as the standard TAPPI methods. Soda and Kraft pulping techniques were studied at varied Temperature and chemical charges in order to identify the appropriate method and conditions. The *Cymbopogon nardus* was identified with high holocellulose (68.51%), α-Cellulose (35.00%), low ethanol-benzene extractives (5.14%), ash content (3.66%), moderate lignin Content (27.38%), cold water extractives (15.00%), hot water extractives (20.00%) and 1% NaOH Extractives (25.99%). The pre-bleached pulp yield of 42.82% at a kappa number of 24.4 was achieved with soda pulping at chemical charge of 25% NaOH, 160 °C and a cooking time of one hour. And pre-bleached yield of 45.13% at a kappa number of 31.2 was achieved with Kraft pulping at 30 % sulphidity, 20% active alkalis, at 160°C and a cooking time of one hour. *Cymbopogon nardus* pulp was characterised with moderate weighted average fibre length (0.771 mm), moderate fibre width (14.4 μm), slenderness ratio (51.67), and brightness (69.65%); and the paper sheets with a tear index (6.44m Nm²/g). The composition, yield and physical properties of pulp and paper from *Cymbopogon nardus* are closer to those of other non-wood agricultural crop materials. *Cymbopogon nardus* stands potential source of pulp for paper industry.
OP 510: Effect of TMT Bar Lugging on Steel Reinforcement Failure Mode under Monotonic Loading.

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Thermo-mechanically treated (TMT) ribbed bars modify the overall progress of failure in reinforced concrete. The ribs maintain anchorage after friction on the rest of the bar is eliminated during deformation, taking up the ultimate compressive load. This however is inadvertently jeopardized by the stress concentration effect of the rib geometry. This paper analyses the extent to which some of the geometric forms of bar lugging affect the prevalence of ductile failure in the steel-concrete composite under monotonic loading otherwise imparted by their preconceived chemical and metallurgical constitution. Thirty pieces of two different types of rib pattern designs of Φ20mm thermo-mechanically treated ribbed steel bars were subjected to uniaxial tensile testing. Portions of these were stripped of their lugging and subjected to the same test. The tests were repeated after corresponding parts of the same bars were annealed. The fractured surfaces were then examined with a lens for macroscopic features and using an optical microscope at X50. Fracture traits varied from microvoid coalescence ductile features to external transgranular cleavage or intergranular separation. In 28% of the samples, the origin of the fracture is traceable to the rib joints. This reduced to 17% when the samples were annealed with a corresponding average increase in strain after yield evaluated by a.d.s of 14% and 8% for ribbed and machined bars respectively. In 82% of the samples stripped of their lugging, the fracture originated from the center of the bars. This shows that under monotonic loading the presence of ribs originates a stress concentration effect that directs the fracture source to the rib nodes and corners and also reduces of the deformation available after the yield point, curtailing the reinforcing effectiveness of the bar in the steel-concrete composite even in the absence of the surface hardening due to thermo-mechanical treatment.

OP 511: The Practice Of Using Emerging Technologies For Teaching Large Classes: A Case At Makerere University

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A survey of universities in Sub-Saharan Africa indicates exploding demand for higher education which has resulted in over-flowing lecture rooms and the situation becomes more complicated as infrastructure remains highly limited. Makerere University with about 280 programs both at under and postgraduate levels has 40,000 enrolled students, and 1400 educators. Many of the educators therefore have to contend with the large numbers. Some educators have successfully using lectures. Another option is using emerging technologies however, many educators are not keen, leading to the over reliance and dominance of lecture methodologies. Lectures are not a problem in themselves, but an educator’s ability to use emerging technologies as an alternative is equally important. Educators are lamenting about the nightmare of lecture methodologies with little or no trial of the alternative. The study draws from educational design research methodologies where the research worked in collaboration with educator practitioners to identify the research problem. Based on the question: how are educators encouraged to engage in the practice of using emerging technologies in teaching large classes, activities were designed. The activities involved educators in sharing mutual engagement in using technologies so as to collaborate and achieve shared repertoire. The study uses the situated learning theory- knowledge is culturally mediated and socially shared and distributed across people, tools and practicing communities. Emphasizing learning by a group of people sharing a career and collectively interacting regularly to share information and experiences in order to learn from each other through legitimate peripheral participation in community activities. Findings indicate that in a community of practice, educators are able to actively reflect on the practice, dialogue and negotiate meanings, collaborate and contribute to mentorship. The multiple perspectives, values and beliefs also present opportunities for contextual knowledge validation. It is recommended that communities be intentionally established and promoted as they provide both immediate and long-time benefits to using emerging technologies to teach large classes, a challenge faced by many educators.
OP 512: Seamless Collaborative And Cooperative Mlearning System

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Globalisation is orchestrating increasing mobility of people across the globe. Similarly, it is orchestrating the need for continuous schooling and retooling in what is now termed, ‘lifelong learning’. As such, lifelong learning needs of this mobile generation have to be catered for. This calls for mobile learning (mLearning) systems that are capable of spurring seamless learning. In this paper, we present a research that culminated into the development of a seamless collaborative and cooperative mLearning system. This system is important as an avenue for redefining the way academic and administrative student support services are extended to learners who might find themselves situated in different learning spaces and with multiple societal roles.

The seamless system was designed and implemented after profiling: 1) open and distance learning support activities in Uganda; 2) mobile phones owned; and 3) accessible mobile networking technologies and architectures and implementations of existing mobile applications systems in Uganda and beyond. A profile of these key system aspects provided the requirements from which the mLearning application system was designed and implemented. The system was tested, piloted and installed for use at the Department of Open and Distance Learning, Makerere University. Quantitative and qualitative research methods underpinned by the Mobile Learning Object Deployment and Utilisation Framework (MoLODUF) were employed to collect and analyse profiling data that eventually contributed to the seamless mLearning system requirements. These methods included: a field survey of learners, interviews/focus group discussion with key stakeholders and review of mLearning literature.

The ensuing seamless mLearning systems consists of four components, namely: 1) collaborative virtual mLearning system (CollaVmLearn) – for collaborative learning; 2) cooperative virtual mLearning system (CoopVmLearn) – for cooperative learning; 3) mobile broadcast system (MoBros) – for asynchronous one way communication; and 4) mobile dictionary (MobDic). By enabling ubiquitous collaborative and cooperative learning, the system demonstrated that learning activities that integrate learning across formal and informal contexts could be achieved. Also, through group solutions derived from collaborative working, a reflection of the cultural diversity of learners is made apparent. Further research is recommended in determining the learning achievements gained out of learning collaborative and cooperative seamless mLearning systems.

OP 513: Digitizing Ateso Oral Narratives is Compulsory

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The study on ‘Performance of Ateso Oral Narratives’ investigates how the dynamics of narrator, audience and story interface in portraying the communicative processes in Oral Literature. A survey of the performances in some Ateso speaking districts in Uganda and Kenya from 2009 to 2013 showed that professional storytelling employed more than one channel for eliciting calculated responses from the audiences at varying encounters. Oral narratives embrace the teaching and dissemination of developmental information used by both public and private entities in the Teso region. The results of the investigations revealed that the verbal, aesthetic, visual and expressive discourses produce interpretations and meanings to events that throw more light to the people’s new efforts at seeking solutions to various crises. However, technological advancements should be utilized in digitizing oral narratives so that the power of Ateso Oral Literature could be harnessed effectively for community conscientisation. The study is aware that digitizing analog material is an expensive venture but it must be executed for technological and socio-economic advancement of the communities.
OP 514: Using Wikis to preserve History Education: A Case of Pre-service teachers at Makerere University.

Sebbowa Dorothy

The research emanates from the realization that history education is becoming dangerously obsolete, as it does not always relate to the contemporary needs of 21st century learners, who often find history useless and irrelevant to their present situation. This challenge is attributed to, among other reasons, the way history is taught employing largely lecture-driven pedagogies which significantly reduced active learner engagement and without much alignment to their daily lives. This research draws on Gadamer’s Hermeneutic theory (Gadamer, 1989) to advocate for dialogue in understanding and interpreting history artifacts using 21st century technologies. Gadamerian Hermeneutics focuses on horizons of understanding through open–ended questioning and answering between past and present rather than transmission to passive audiences. The main objective of the study is to investigate how historicity is constructed on a Wiki platform among pre-service teachers at Makerere University. Historicity/History Education is conceptualized as an interpretation of and learning about the human past that is useful to explain the present and project that understanding onto what the Future might or could be like. Empirical evidence suggests that most history teachers lack the resourcefulness of transforming history into a dynamic subject opting for the singular interpretation (Savich, 2009; Takako, 2011; Nabushawo, 2013, Kakeeto, Tamale & Nakata, 2014). This research argues for the collaborative interpretation of history meanings between teachers and students mediated by a Wiki/Wikipedia. Wikis are agitated for because they provide a way collaborative participative writing of history as it happens. The study engaged with the Educational Design Research Methodology (Plomp, 2009) with a case study of pre-service teachers enrolled at Makerere University in Uganda. The purely qualitative study involved data collection methods; observations on the Wiki page, making personal diaries entries, semi-structured interviews and semi structured questionnaires. Iterative cycles of testing and refining solutions to the study problem (Reeves, 2009) involved pilot study conducted in 2013 with continuous workshops to improve pedagogical practice. A hermeneutic theory driven analysis informed the process with key findings indicating that collaborative dialogue between the past and the present in projection of the future can be afforded on Wiki platform. Also, meanings to the past can be interpreted in the present through sharing pictures, videos, audios that makes learning history fun and interesting.

OP 515: The Need for an Integrated Weather Information Dissemination System for Uganda

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Weather is one of the key factors that affect the livelihood of people in Uganda, especially in the sectors of agriculture, aviation, construction, health, defense, disaster management and resource management. Accessibility to reliable weather information is therefore vital for decision making. In this paper, we present the findings from a survey carried out to establish the status of the weather information dissemination system in Uganda. The survey sought to generate and report on the current usage of weather information; inform on the current and future weather information needs for the different sectors and users, and guide appropriate modes for packaging weather information for different purposes so as to forge a strategy that can improve the quality, access and impact of weather information. Results from the analysis indicated a great interest in weather information and an expression by respondents for varying detail of weather information and creation of more products that can serve their interests. This provides the need for an effective weather dissemination system in order to provide more timely, accurate and accessible weather information.
OP 516: Real-Time Identification Of Incompetent Laboratories Using Geographical Information Systems Application In Jinja Health Region In Uganda

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There were delays to make decisions for initiating corrective actions to incompetent laboratories because existing mechanisms did not provide for real-time identification of incompetent laboratories. Incompetent labs consequently continued to provide wrong test results to patients who eventually received wrong treatment. A customised geographical information system (GIS) of open data kit (ODK) and Google earth was to be used to track laboratory performance in real-time to enable quick corrective action, in Jinja health region in Uganda. Between June and August 2014, the GIS were customized to link and visualize; laboratory profile data, and performance data for malaria and TB external quality assessment (EQA) schemes in 12 laboratories of HC IVs and HC IIIs in Jinja, Iganga, Kaliko and Luuka districts that participated in malaria and TB EQA schemes conducted by CPHL and NTRL respectively. 5 laboratories did not maintain facility EQA records and analysis was based on 7 laboratories. Laboratories with less than 80% performance and submitted results beyond the required time of three weeks were identified as incompetent and colored red. Performance data were abstracted from lab records and transferred in real-time using ODK collect application on mobile phones to a virtual server with predetermined grading that instantly attached a colour coding to the grade. Server information was converted into a KMZ file opened by Google earth application to provide visual presentations at a glance. 8 EQA officers were trained in opening the KMZ file and there after responded to a self administered answer sheet for questions on a score card with the ability to assess the capacity of using the GIS application to identify incompetent laboratories. Without seeking additional assistance, all EQA officers were able to identify 5 out of 7 (71%) laboratories as incompetent when conducting malaria tests and 4 out of 7 (57%) laboratories as incompetent when conducting TB tests. GIS applications can identify incompetent labs immediately. MoH should adopt proven phone technologies that provide real-time transfer of data from remote districts, link EQA datasets, store and visualize EQA records at a glance so as to provide better record keeping, improved communication, while saving resources, time and energy.

OP 517: Crop disease surveillance using smart-phones

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Viral diseases among staple food crops are a leading cause of food insecurity in Africa. In Uganda particularly, the cassava crop is the second most important staple crop and a source of livelihood to 75% of all farming households. It is estimated that losses in the millions (USD) accrue annually due to loss of cassava yield as a result of viral disease in cassava. Every year, a national cassava health survey is conducted by the National Crops Resources Research Institute (NaCRRI), the body responsible for national agricultural research. The surveys use more traditional methods of data collection like paper forms which require extra resource to be digitized and suffer great wear and tear over time. Furthermore, the existing standard crop survey methods are expensive, untimely and within limited budgets, cover small proportions of the area of interest being surveyed. Our work investigates the use of smart-phones for doing the crop surveillance. We developed an smart-phone application that can be used to digitally capture surveillance data in the field as well as capture image data and geo-coordinates of crops inspected. The data is automatically mapped in real-time as the survey proceeds. We tested our method by participating in the field survey at the end of 2014 with the teams from NaCRRI. In this work we provide a description of our methodology, our software and a comparative analysis of using both methods of surveillance. We show that our method achieves early benefits from the surveillance exercise that can inform quick intervention decisions and as such alleviate the incidence of food insecurity in many households in Uganda. We foresee the work proposed here contributing many important results toward the goal of creating sustainable livelihoods in agriculture for small-holder farmers and facilitating timely interventions to curb viral crop disease spread.
The paper castigates the deep-seated stance “contrapreneurship”, that is, the active resistance to change, that – more often than not – possess a challenge on the management of educational institutions. It propagates for Total Quality Management (TQM), which is perceived as a metaphor for the process, and management of change designed to realign the culture and working practices in any given organisation for the pursuit of continued quality improvement. The cross-sectional survey solicited responses from group categories of Administrators, Academic staff, Students, and Support staff at three universities in Uganda. Of these, Mbarara University of science and Technology (MUST) and Uganda Martyrs University (UMU) where selected wholesale, owing to their size, while respondents from Makerere University were selected from the College of Education and External Studies (CEES), College of Humanities and Social Sciences (CHESS), and College of Business and Management Studies (COBAMS). The results revealed that the members of the academic community at the universities are – although varying in both degree and essence – occasionally ready for change initiatives. Pinpointed was that the superordinates were opposed to change because the system favoured them; and, therefore, any propagation of change necessarily threatened their authority. The paper ultimately advocates for “Total Management Commitment” and flexibility of all members of a given academic community, arguing that organisations can hardly survive in today’s competitive and changing world unless they commit to Total Quality as a central driving force.
In Uganda, maternal and neonatal mortality and morbidity remains high due to a number of factors including poor quality of care at health facilities. This research presents the experience of building capacity for maternal and newborn care at a district hospital and lower level health facilities in eastern Uganda within the existing system parameters. This study, part of the Uganda Newborn Study (UNEST), aimed to increase frontline health worker capacity through district-led training, support supervision and mentoring at one district hospital and 19 lower level facilities. The training addressed the major causes of maternal and newborn deaths and morbidity including: infection prevention, management of labour using a partograph, active management of third stage of labour, resuscitation, and care for preterm and low birth weight babies. A once-off supply of essential medicines and equipment was provided to address immediate critical gaps. Health workers were empowered to requisition subsequent supplies through use of district resources. Minimal infrastructure adjustments were provided. Data collection was done within routine process monitoring. We use the World Health Organization health system building blocks to describe the process of district-led health facility strengthening. A total of 72% of health workers were trained. The mean post-training knowledge score was 68% compared to 32% in the pre-training test, and 80% one year later. As a result of support supervision and mentoring, health workers’ skills and competencies in care of high risk babies improved. Health facility deliveries increased from 3151 to 4115 (a 30% increase) in 2 years. Of 547 preterm babies admitted to the newly introduced KMC unit, 85% were discharged alive. There was a non-significant declining trend for in-hospital neonatal deaths across the two-year study period. In-hospital maternal mortality ration reduced from 700/100,000 to 300/100,000 live births. While equipment levels remained high after initial improvement efforts, maintaining supply of even the most basic medications was a challenge with less than 40% of health facilities reporting no stock-outs. Health system strengthening for care at birth and the newborn period is possible even in low resource settings and can be associated with improved utilisation and outcomes. Through a participatory process with wide engagement, training, improvements to support supervision and logistics, health workers were able to change behaviours and practices for maternal and newborn care. However, local solutions are needed to ensure sustainability of medical commodities. This study was supported by the Sida/SAREC – Makerere University – Karolinska Institutet Research collaboration as well as by funds provided by Save the Children through a grant from the Bill & Melinda Gates Foundation. This supplement was funded by Save the Children’s Saving Newborn Lives programme through a grant from The Bill & Melinda Gates Foundation.
PP 102: Mortality and Cause of death in children aged below five years: The utility of Health & Demographic Surveillance sites in monitoring key health indicators in rural Uganda

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Under five mortality is still a global public health problem with about 9 to 10 million children dying every year (WHO 2012; Koyate et al. 2012; Gareth et al. 2003) with majority from low income countries (Gareth et al. 2003). Under-five mortality estimates as well as reliable causes of deaths information are so essential for development and implementation of public health interventions but are often rare to come-by especially in Sub-Saharan Africa where substantial deaths occur outside formal health facilities (Kanungo et al. 2010; Adjuk et al. 2006). Health and demographic surveillance sites (HDSS) provide mortality estimates in a fairly large and well defined populations including causes of deaths using the International Classification of Diseases version 10 (ICD 10) guided physician coding system. This paper examines trend in under-five mortality, causes of death and associated individual and contextual factors using IHDSS data to inform local district health planning. Data about deaths of children aged below five years that was collected through home visits between January 1, 2008 and 31st December 2012 in Iganga-Mayuge HDSS was analysed. 783 deaths were registered, however further analysis used 491(62.7%) that had cause of death information. Stata version 10 was used in analysis. The average under-five and infant mortality rate was 81 and 42 deaths per 1000 live birth respectively. A mortality decline (17.2%) was observed between 2009 (93/1000 live births) and 2011 (77/1000 live births). Majority of deaths (43%) occurred in rural and poor households and mothers with no or primary education were 23% more likely to experience death than those in peri-urban and rich households. Neonatal pneumonia (29%), sepsis (15%) and birth asphyxia (12%) were the major causes of neonatal deaths, while malaria (27.7%), ARIs pneumonia (18%), HIV related diseases including diarrhea (15%) were cause of infant deaths. Children aged between 1 and 4 years also died mostly from malaria (24.5%), pneumonia (20.5%) and HIV related diseases and diarrhea (23.5%). Despite some notable decline in under five mortality between the reporting period, preventable causes of deaths such as malaria, pneumonia, HIV related deaths and diarrheal diseases continued to kill these children. More examination of community and household health practices and promotion of community led preventive programs may be implemented for positive results.

PP 103: Cholesterol and urea lowering potential of malakwang (Hibiscus) species aqueous leaf extract: an experimental trial in hyperlipidemia-induced rats

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Plant-based remedies have been established as safe, easily available and affordable therapies; in some cases comparable to conventional medicine, resulting in their growing interest and nutritional relevance globally. In Uganda, malakwang (Hibiscus) species are grown widely in many rural households. This study evaluated the lowering effects of aqueous leaf extract of malakwang (Hibiscus) species on the cholesterol, lipid profiles and urea levels. In the study forty two adult Albino Wistar rats of 7-8 weeks mean age and 86.6g mean weight were subjected to different treatments. Groups 2 – 7 were made hyperlipidemia by feeding on high fat diet for two weeks, groups 2-6 were continued on the high fat diet for five weeks. Leaf extract of the white and red varieties of malakwang (Hibiscus) species at 200g and 400g/kg doses were administered to groups 3-4 and 5-6 respectively for three consecutive weeks. Meanwhile, group 1, as a control, was fed on normal, non-modified diet for five weeks. Artova-statin (lipid lowering drug) was administered to group 7 at 5mg/kg. Venous blood results were analysed and historical slides of the organs were microscopically examined. Results indicated that group 2 treated with high fat diet showed a significant increase (p = 0.001) in triglyceride (TG), total cholesterol (TC) and very low density lipoprotein (VLDL). Both extracts of malakwang (Hibiscus) leaf species extract at dose rate of 200 and 400g/kg showed significant reduction (p = 0.001) in the level of serum urea. A significant reduction (p < 0.05) in body weight of animals subjected to the highest dose (400g/kg) of both aqueous leaf extracts was also observed. The historical slides of the rats’ organs on the high fat diet showed fat deposition and fat globules inside the blood vessels and around the base of the heart. The findings demonstrate / reveal/illustrate the value and potential of malakwang (Hibiscus) species in regulating cholesterol and urea in animals.
These findings stimulate further biochemical and molecular investigations with pharmacological and public health nutrition implications.

**PP 104: Intensively housed pigs by smallholder farmers are less likely to carry non-typhoidal salmonellae**

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Non-typhoidal salmonellosis (NTS) caused by non-typhi salmonellae is an economic and a public health disease. In piglets and growing pigs, Salmonella infections cause enterocolitis, septicemia and death. NTS is one of the most common food-borne zoonoses and common among the children, the elderly and the immunocompromised persons. One of the ways to control NTS is to prevent salmonellae infections in pigs and therefore, prevent contamination of pork and pork products by identifying possible risk factors. A study was carried out during 2011 and 2012 in Gulu, northern and Soroti, eastern Uganda to determine the prevalence of salmonellae in piglets and weaners and the risk factors of infection. Fecal swab samples from piglets and weaners in 93 households were collected for bacteriological isolation and confirmation and questionnaires were administered to gather data on the potential risk factors. Logistic regression using SAS GLIMMIX was performed to identify the possible risk factors. Post-mortem investigations were also carried out on some of the diarrheic piglets. From the results, 12% of the piglets and weaners were Salmonella culture positive and 39% of the households had at least one Salmonella-positive pig. Diarrhea due to clinical salmonellosis was observed and confirmed in one piglet. However, intensive management (housing throughout) was protective against Salmonella when compared with tethering and roaming ($p= 0.016$, OR = 0.112) or semi-intensive management ($p= 0.048$, OR = 0.115). In conclusion, there are clinical and sub-clinical salmonellae infections in piglets and weaners from Gulu and Soroti but intensive management could be promoted to reduce these infections.

**PP 105: Antigenic types of toxin-producing Escherichia coli from diarrheic piglets in rural households from Gulu, northern Uganda**

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Enterotoxigenic E. coli (ETEC) are a major cause of piglet diarrhea in intensive pig production. In Uganda, this diarrhea has been suspected based on the post-mortem examinations. Control of ETEC infections (colibacillosis) largely depends on the use of vaccines against the predominant antigens. This study was aimed at identifying the antigenic types of these bacteria from diarrheic piglets in rural households from Gulu district. Fecal samples were collected from diarrheic piglets and E. coli were isolated from fecal material. The DNA from the E. coli was extracted and gene amplifications for the toxins and surface antigens carried out by PCR. Post-mortem examinations on piglets with very severe diarrhea were also carried out. From the results, gross and histopathological pictures of enterotoxigenic E. coli infections were observed. Fragments of the genes for surface antigens, F4 and AIDA were amplified from E. coli. The predominant antigen in E. coli from diarrheic piglets was F4 followed by AIDA. Toxin genes for STA, STb and EAST1 were also detected. In conclusion, piglets from rural households in Gulu suffer from colibacillosis. Vaccinations using F4-based vaccines could be one of the approaches to control colibacillosis in piglets, more so with promotion of intensive piggery.
The Pediatric Evaluation of Disability Inventory (PEDI) clinical assessment tool was developed and standardized to measure functional performance for typically developing American children. Hitherto there has been no published study of the use of the PEDI in sub Saharan Africa. Our aim was to create a more culturally relevant PEDI and describe experiences with its adaptation and translation in Uganda. Translation and transcultural adaptation of the PEDI was performed in accordance with the international recommendations. Using a series of technical advisory group (TAG) meetings, we adapted the PEDI by noting ambiguous terms, modifying culturally inappropriate items, and generating modifications. The adapted PEDI was pilot tested on 35 caregivers of children aged 6 months to 7.5 years. A series of informal interviews were held with 10 caregivers to provide feedback on the questions. Further revisions were made and field-tested on 40 mothers of children in the same age range until the TAG was satisfied that the new versions of the questions were appropriate. An adapted PEDI with 185 items was created. Face and content validity was established. The revisions made included: deletion of irrelevant items ‘taking off coat when entering the house’ (no winter in Uganda); insertion of new items (child cares for nose with what is available’ - fingers/shirt/dress/hanky), modification in the wording of some items ‘removes pants with elastic waist’ (takes off trousers/skirts with an elastic waist); provision of alternative questions ‘use of the flush toilet’ (to use of pit latrine often used in rural areas) and use of local examples ‘eats ground lumpy food’ (to eats foods such as ekitoobero). Gender had an effect on some items. Overall, 7 new questions were inserted, 10 alternative questions created and 19 questions deleted implying that 178 of the original 197 items (90%) were retained in the final 185 items PEDI-UG. On the whole the PEDI is appropriate in the African context with a number of adaptable items, however some are culturally inappropriate. We have proposed a few adjustments to improve its clarity. Although the results are encouraging, there is need to re-evaluate them through a forthcoming psychometric analysis.

The dramatic decline in preventable child deaths over the past quarter of a century is one of the most significant achievements in human history. The global mortality rate has declined by nearly half (49 per cent) since 1990, dropping from 90 to 46 deaths per 1,000 live births in 2013. Despite this admirable accomplishment worldwide, African counties are still struggling with child mortality rates that are high at 95 per 1000 live births. The aim is to determine socio-economic factors associated with under five mortality. A census of all children below the age of one year was done in December 2008. These children were then followed up to December 2012 through a longitudinal bi-annual survey that monitors births, deaths and migrations in Iganga/Mayuge health and demographic surveillance site. By the end of the study, of the 2286 enumerated children 479 had died, 519 had out migrated with families and 1288 were alive. Considering children who had died and those that were still living a logistic regression model was built to identify the factors that affect under five child mortality.

The variables that were found to be associated with under five mortality were death of the father, the child not living with parents, mother cohabiting with partner, low socioeconomic status of household compared to high and the household head being a farmer as compared to being involved in business or trade. It is important for health system planners to put extra focus on households with orphans or un-married mothers and also encourage parents to live with their children for health promotion and interventions for children under 5. Strategies to increase income generating activities and accessibility to health care for poor households have the potential to contribute to higher child survival in Uganda.
PP 108: Use Of Herbal Medicines Among Pregnant Women Attending Antenatal Clinic At Kiryandongo Hospital Uganda.

Kyegombe Willy', Mutesi Ramulah', BakulumpagiDeogratitus', Walufu Ivan Egesa', Maweje saul and Openy Abraham'

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In Uganda the prevalence of herbal medicine use during pregnancy was established to be at 80% (Kamatenesi, 2004) in western Uganda and 74% (Kamara, 2007) at Mulago National Referral Hospital. Despite of the very many claimed benefits, their use during pregnancy has been associated by many studies, with undesirable out comes. In Uganda complications resulting from reproductive health related conditions such as maternal mortality and morbidity account for number one problem among the disease burden. This makes herbal medicine during pregnancy a major public health concern. However the knowledge base and motivating factors behind their use during pregnancy has not been widely studied in Uganda. The objective is to determine the prevalence of herbal medicine use, knowledge base and attitudes towards the use of herbal medicines during pregnancy among pregnant women attending the antenatal clinic. This was a cross-sectional descriptive study in which the opinion of 400 pregnant women about the use of herbal medicines were collected using self-administered questionnaires that contained both open and close ended question. SPSS version 16 was used to analyze the data. Descriptive statistics were used at 95% confidence level to evaluate the data obtained. Level of significance was set at p < 0.05. The use of herbal medicine among our subjects was not so high at 37.7%. It was more prevalent among the Baganda (65.2%) and Banyoro (42.5%). Previous herbal medicine was positively correlated to use in current pregnancy. The commonest source of information were friends and family relatives. Majority of the women considered herbal medicines to be safe during pregnancy and preferred them to conventional medicines because they have low side effect profile are cheap and easy to access and because it is part of their tradition to use them during pregnancy. Pregnant mothers should be advised not to expose their unborn child to the risk of herbal medicines and educated about the dangers of self-medication during pregnancy. Pharmacological and case control studies will be vital in assessing the efficacy and risks associated with herbal medicine use during pregnancy.

Midwives, obstetricians and GPs should facilitate women’s wishes without condemnation, but this must be tempered with accurate information.

PP 109: Modeling hepatotoxicity of antiretroviral therapy in the liver during HIV mono-infection

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Liver related complications are currently the leading cause of morbidity and mortality among human immunodeficiency virus (HIV) infected individuals. In HIV monoinfected individuals on therapy, liver injury has been associated with the use of antiretroviral agents as most of them exhibit some degree of toxicity. In this study we proposed a mathematical model with the aim of investigating hepatotoxicity of combinational therapy of antiretroviral drugs. Therapy efficacy and toxicity were incorporated in the model as dose-response functions. With the parameter values used in the study, protease inhibitors-based regimens were found to be more toxic than nonnucleoside reverse transcriptase inhibitors-based regimens. In both regimens, the combination of stavudine and zidovudine was the most toxic baseline nucleoside reverse transcriptase inhibitors followed by didanosine with stavudine. However, the least toxic combinations were zidovudine and lamivudine followed by didanosine and lamivudine. The study proposed that, under the same second line regimens, the most toxic first line combination gives the highest viral load and vice versa.
PP 110: Causes and trend of adult mortality (age group 15 years and above) in Iganga/ Mayuge Health and Demographic Surveillance Site for the period 2007 to 2011

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Adult mortality is higher in Sub-Saharan Africa than in the rest of the world. Cause of death information appears more uneven because of limited access to health care services. Non-communicable diseases have emerged as the major sources of mortality and they are even projected to overtake communicable diseases in sub-Saharan Africa by 2030. Analysis of adult mortality in Iganga-Mayuge Health and Demographic Surveillance Site generated adequate information on trend and cause of death to guide policy-making and to promote behavioral change at community and national levels. Our aim was to establish the causes and trend of adult mortality (age group 15 years and above) over a five-year period. The data was collected from 2007 to 2011 through a longitudinal bi-annual survey that monitors births, deaths and migrations in Iganga-Mayuge Health and Demographic Surveillance Site. Out of an average population of 34,393 adults, 926 deaths were registered. Verbal autopsy interviews were carried out for 782 cases using a structured open and closed ended questionnaire. Close relatives of the deceased provided information on the circumstances that led to the death. Physician coders interpreted the data. Communicable diseases accounted for 41% of total adult deaths, non-communicable 39%, Injuries 11%, Maternal causes 2% while 7% was undetermined. Cardiovascular diseases including Hypertension (19%), Injuries (11%), Malaria (10%), Diarrheal diseases (10%) and Aids alone or in combination with Tuberculosis (6%) were the leading causes of Adult death. Trends showed a steady increase in cardiovascular diseases and hypertension as causes of death over a five-year period. There is a double burden of Communicable and Non-Communicable diseases in the study population. There is need to prioritize prevention and treatment for both communicable and non-communicable diseases in Uganda. Special focus should be put on treatment and prevention of cardiovascular diseases including Hypertension, Injuries, Malaria, Diarrheal diseases and HIV/Aids Further research that investigates health behaviour of the adult population is needed to inform appropriate Health interventions.

PP 111: Factors Associated with Health Facility Deliveries in Kabale Municipally, Uganda

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In Uganda, maternal mortality is estimated at 438/100,000 live births. A key strategy to reducing maternal and neonatal deaths is the ‘health-centre intrapartum care strategy where qualified skilled workers manage labour effectively and referral systems. In Uganda 57% of all births occur in health facilities and the condition is more serious in Southwest region where Kabale municipally is located which only 40.4% of pregnant women deliver in health facilities and is the second leading region of home deliveries after Karamoja. To effectively intervene to minimize these unnecessary deaths, there is a need to assess the factors associated with health facility deliveries. This was a cross-sectional study conducted among 410 randomly selected women who had given birth in a period of one year or less preceding the study. The outcome variable was health-facility delivery. Multivariable logistic regression was performed to identify factors associated with the outcome variable. Associations were measured using odds ratios and corresponding 95% confidence intervals. Overall, 223 (54.39%) of 410 women interviewed delivered in health facilities. Of 187 (45.61%) mothers delivered at home, 80.0% of them were assisted by family members and relatives. The common reasons for not delivering in health facility were: long distance to health facility138 (33.4%), unexpected labour 154(37.5%), negative attitudes of health workers 68(16.6%) and presence of TBAs 48(11.5%). Being educated (AOR: 1.66; 95% CI: 1.042-2.654), having a formal employment (AOR: 3.30; 95% CI: 1.297-8.402), husband education level (AOR: 2.18; 95% CI: 1.164-4.069) and time to reach health facility (AOR: 1.10; 95% CI: 0.719-1.568) had significantly associated with delivering in health facility. Low health facility deliveries were observed in the study area. Factors associated with delivering in health facility were education level for both mothers and the husbands, being in formal employment, living closer to the facility. Programs to promote health-facility deliveries should address both community and health system factors.
PP 112: Human brucellosis: Sero-prevalence and associated risk factors in agro-pastoral communities of Kiboga District, Central Uganda

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Brucellosis remains a neglected zoonotic disease in Uganda. Humans especially those living in agro-pastoral communities and depend on livestock are at higher risk of being infected with human brucellosis. A cross sectional study was carried out to determine the seroprevalence and risk factors associated with human brucellosis among people living in agro-pastoral community in Kiboga district where livestock rearing in a common practice. A total of 235 participants who had been in the study area for the last three months were involved in the study. Blood sample was collected and tested for the Brucella using Serum Agglutination Test and Rose Bengal Plate Test. A questionnaire was used to collected data on sociodemographic characteristics and human related risk factors for brucellosis. Human Brucella seroprevalence was at 17.0% being higher among males (20.5%) and among the elderly above 60 years (22.2%). Residing in rural areas (OR 3.16, 95% CI 1.16 - 8.56; p=0.02), consuming locally processed milk products (OR 2.54, 95% CI 1.12 - 5.78; p=0.03) and being single (OR 2.44 95% CI 1.05 – 5.68 p=0.04) were associated with increased risk of brucellosis. Sex, age, occupation, religion, education levels, knowledge of the disease, keeping animals at home, consumption of raw milk, processing local milk products, slaughter of animals, handling of abortus, assisting animals giving birth, drinking of animal’s urine and sharing water points with animals were not significantly associated with brucellosis. Brucellosis is a significant and neglected public health problem among human population living in livestock keeping and the risk is being aggravated by consumption of unpasteurized milk products. There is a need to initiate screening and early treatment of infected humans. Also, awareness of the public about brucellosis needs to be established especially on risk factors.

PP 113: A comparison of the institutionalization of ART programs in four categories of health facilities in Uganda

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In 2004, Uganda commissioned a national antiretroviral therapy (ART) scale-up program with external donor support. There has been limited post-implementation research evaluating program sustainability outcomes. Without donor support, the sustainment of interventions is most likely to occur when they become an integral part of an organization. We sought to measure the extent of institutionalization of ART programs in health facilities in Uganda and compare institutionalization scores by health facility category. Level of Institutionalization (LoIn) scales developed by Goodman, et al.(1993) were used to measure the extent of institutionalization of ART programs at 195 health facilities in 42 districts of Uganda which received donor support between 2004 and 2009 to initiate ART services. Health facilities were categorized as Public, Private for Profit (PFP), and Private Not for Profit (PNFP) and HIV Research Clinics. The 45-item questionnaire measured institutionalization based on four ‘sub- systems’ theorized to make up an organization (Production, Maintenance, Supportive, Managerial) assessed against two levels of institutionalization; routines (lower) and niche saturation (higher). Data were collected between December 2013 and April 2014. Descriptive statistics were generated and used to describe organizational characteristics and calculate and then rank health facilities into quartiles based on their mean institutionalization scores. The overall mean institutionalization score for participating health facilities was 3.5(Range, 1-4) and the mean score for niche saturation, the highest level of institutionalization, was 3.2(Range, 1-4). Of the four systems, the production sub system, concerned with ART product delivery activities, scored the highest mean component score. The Managerial sub system, concerned with coordinating the operations of other sub-systems, had the lowest mean component score. PFP health facilities had the lowest mean institutionalization score. PNFP health facilities had a higher overall mean institutionalization score than Public facilities. There was a statistical significance in the correlation between institutionalization scores and health facility type (p<0.05). Programs for deepening the institutionalization of ART interventions in private health facilities are recommended. ART program evaluation and supervision need strengthening across health facilities. Mainstreaming best practices from health facilities with the highest institutionalization scores could enhance sustainability of ART programs in Uganda and other resource-limited settings.
SUB – THEME 2: NATURAL RESOURCE UTILISATION, CONSERVATION AND ENVIRONMENTAL SUSTAINABILITY

PP 201: Polychlorinated Biphenyls In Air And Precipitation Samples From The Northern Region Of Lake Victoria, East Africa.
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Lake Victoria has elevated potential for atmospheric loading of persistent organic pollutants (POPs) yet there remain limited monitoring studies within its watershed. We present results of the largest study to-date of polychlorinated biphenyls (PCBs) in air and precipitation samples from the lake's atmospheric environment. High volume (24 hr) air samples were collected, from two sampling stations, at Kakira (KAK) and Entebbe (EBB) within the northern Lake Victoria watershed in Uganda. Sampling was conducted over two periods; 1999-2004 (at KAK and EBB) and 2008-2010 (at EBB only). Precipitation samples were also collected during the 2008-2010 period at EBB. The samples were analyzed using GC-ECD in a dual column approach. The ranges of ΣPCB concentrations in the KAK air samples were 154 - 462 pg m\textsuperscript{-3} for KAK 1999 – 2000 and 26.7 – 226 pg m\textsuperscript{-3} for KAK 2003 - 2004. The EBB samples had ΣPCB concentration ranges of 27.0 - 186 pg m\textsuperscript{-3} for EBB 2003, 46.8 - 174 pg m\textsuperscript{-3} for EBB 2004, 19.2 - 128 pg m\textsuperscript{-3} for EBB 2008, 45.8 - 237 pg m\textsuperscript{-3} for EBB 2009 and 65.6 - 244 pg m\textsuperscript{-3} for EBB 2010. The di-, tri-, tetra- and penta-PCBs predominated the air sample sets. Principal component analysis and correlation analyses suggested influence of combustion sources in the 2009 and 2010 EBB samples. Concentrations at EBB were higher than in other studies for urban sites in the east and central African region. The mean flux of ΣPCBs in the precipitation samples was 26.9 ng m\textsuperscript{-2} (range of 14.8 – 41.5 and median of 27.5). The most washed-out homologues were the tetra- and the penta-PCBs with mean fluxes of 10.1 ng m\textsuperscript{-2} and 6.09 ng m\textsuperscript{-2}, respectively. Generally, the same congeners were abundant in the air and precipitation samples for each homologue. Backward air trajectories indicated possible PCB sources from the major East African urbanized regions. This is the first study to report PCBs in precipitation in the Lake Victoria basin.

PP 202: Community Participation in decision making on access to Forest resources under Collaborative forest Management framework in BWINDI (BINP): A Gender perspective
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It was conducted in the Bwindi forest edge community, Kanungu district. Data were collected from four parishes namely Mukono, Bujengwe, Karangara and Mpungu using a survey, in-depth interviews; key informant interviews and focus group discussions. A sample of 120 respondents was selected of which half were women. Theoretical concepts such as gender, participation and access were used to guide data analysis. The study findings demonstrate that community men and women differ in socio-economic status therefore, affected by CFM framework differently. The study findings highlight that CFM framework treat men and women homogeneously much as the two are affected by CFM framework differently due to their socio-cultural differences. The study findings have further revealed that due to socio-cultural obligations at household level men and women in Mukono and Bujengwe parishes are more affected than their counterparts in Karangara and Mpungu who have the right to access to forest resources. The study findings have revealed that though males and females participate in forest resource management decision-making power on the right to access and use forest resources was still concentrated with UWA as an organization. Though the community involved in the election of community leaders to participate in decision making, the unequal number of males and females in leadership positions led to the relegation of women’s interests especially when democratic principles of majority consensus had to apply. These findings allow deriving theoretical, methodological and policy recommendations to support women’s right to access forest resources.
under the CFM framework. At the theoretical level, the study indicates that a mix of theories can provide complementary perspectives allowing for a nuanced analysis of women’s participation and right to access forest resources under the CFM. At the methodological level, it shows the need to employ a carefully designed mix of quantitative and qualitative methods to capture the various dimensions of women’s participation and thus enrich our understanding of women’s participation and right to access forest resources. At the policy and management level, these findings advocate the need to understand community as a variable context and analyze the impact of policy measures within a reflexive and adaptive framework. Thus, a nuanced look at social processes is essential to ensure that increasing women’s active participation and right to access forest resources under CFM framework is achieved through a socially just process that is both adaptive to the changing social context and transformative against discriminating power relations.

**PP 203: Evaluation Of Napier Grass Clones For Performance And Tolerance To Napier Stunt Disease In Eastern And Central Africa**

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Napier grass (*Pennisetum purpureum*) constitutes 40 to 80% of the forages fed to cattle in smallholder dairy farming systems in Eastern and Central Africa region. Napier stunt disease (NSD) significantly reduces herbage yield and therefore threatens the sustainability of smallholder dairying. A study was therefore conducted at the National Crops Resources Research Institute in Uganda to assess the herbage biomass yield and tolerance to NSD of 22 Napier grass varieties acquired from Kenya Agricultural and Livestock Research Organization (KALO). Each variety was replicated three times in a Completely Randomized Design and each of the plots was surrounded by infected Napier grass. For every two months, the plots were harvested for determination of leaf biomass, stem biomass, total biomass yield and disease severity and tolerance and a total of seven harvests were made. Results showed that the varieties differed significantly (p < 0.05) for dry matter yield (DMY), disease severity (P<0.05) with no significant (p >0.05) difference between the varieties for leaf:stem. Kakamega 1 had the highest average DMY (42.0±7.708t/ha) whereas River Bank had the lowest (17.1±7.708t/ha). Majority (68.18%) of the varieties succumbed to NSD with increasing number of harvests. Kakamega 2, 16805, 112 and Kakamega 1 which never showed any symptoms of the disease up to the fourth harvest and among the varieties with highest DMY are recommended for multiplication and disseminaton, these varieties can as well be used in breeding programs for tolerance to Napier Stunt disease. All clones had a mean severity score of less than 3 which shows that the clones are tolerant to NSD under Ugandan conditions.
The close link between poverty and land degradation is of great significance, especially in most developing countries where the agricultural sector supports a majority of the population, and is responsible for growth and development for many years to come. Soil and water conservation technologies are some of the means that have been widely recommended to reduce degradation rates. However, ex-ante and ex-post analyses of the performance and impact of these technologies are still few, yet they are an essential ingredient of sustainable conservation programs. This study estimates the adoption rate of soil and water conservation technologies in South Western Uganda, and the impact of adoption on household agricultural income and poverty levels. The Tradeoff Analysis for Multi-Dimensional Impact Assessment (TOA-MD) model was used to analyze household level survey data collected from 338 households in Kabale district. The study focused on the population where soil and water conservation technologies have been disseminated, and analysis is based on a comparison of households that adopted soil and water conservation versus those that did not adopt. Results indicate that adoption rates of soil and water conservation technologies in the study area range between 55 and 85 percent and can go up to about 90 percent with time, especially among the relatively higher income farms. Results further indicate that farmers can benefit from adoption of soil and water conservation technologies in terms of higher income from farming, and poverty reduction. In addition, results indicate that adoption is positively correlated with household non-farm income. The study recommends that measures that increase access to inputs, especially for low income households, such as access to credit, and improvement in infrastructure need to be put in place. In addition, it is noted that soil and water conservation technology dissemination needs to be combined with other income generating measures in order to have a bigger impact on household welfare.

PP 205: Nakulabye Briquettes Making Technology
Zalwango Alice and Makawa Joshua

Nakulabye Briquettes Making Technology (NBMT) was founded in 2010 as an organization to provide alternatives to the firewood and charcoal problem in the country. In an attempt to conserve the environment, NBMT collects waste from different parts of Kampala town; sorts, dries it and recycles it into charcoal briquettes. After drying, which takes 2 – 3 days depending on the weather, the waste is carbonized and turned into char. A binder is then added to the char and then molded into briquettes. The binder used is cassava flour which is boiled with water and mixed with clay. The output in using the briquettes is; environmental friendly, smoke free, cost effective and has more energy than ordinary charcoal.
The briquettes are then sold to the general public. This process of producing briquettes in an environmental friendly way, lowers the cost of energy in people’s homes but also prevents cutting of trees and usage of charcoal which is not only with smoke but also brings dirt with it. The savings in cost is three times compared to a similar amount of charcoal and has the benefits of conservation of resources, improved livelihoods and sustaining the environment. The objectives were reduce cutting down of trees, Environmental sustainability and Providing cheaper energy solutions The method used is descriptive methodology

**PP 206: Rampant indigenous biodiversity destruction: a precursor for disaster in livelihood opportunities in Offaka Sub County Arua district Uganda**

**Andama Edward**

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Indigenous plants provide important resource to support livelihoods of the rural community. Offaka Sub County is facing rapid degradation and loss of indigenous plant biodiversity due to increased charcoal production, fuel wood extraction for tobacco curing, increased clearing of land for agriculture, livestock grazing, and coupled with wild fires. This study focused on plants with economic, medicinal and environmental importance to the community. Specific objectives were to: (i) document vegetation types, mosaics and plant species. (ii) Document flora which have economic, nutritional, medicinal and social potential to the community. (iii) Determine vegetation cover change over the past ten year period and (iii) document key challenges facing conservation and sustainable use of the plant resources. Household questionnaires, Focus Group Discussion (FGD) and targeted informant interviews were used to collect information. Vegetation survey was conducted using the standard nested quadrants. Landsat and Google Spot images were used to undertake vegetation change analysis between the 2000 FAO land cover map and the 2014 land cover map complimented by ground truething done using village transect walks. The tree vegetation cover was dominated by *Combretum, Acacia* and shrub layer was dominated by *Grewia* and *Annonasenegalense* species. The grass cover was dominated by *Hyperthermiadissolute, Branchiaria* and *Enteropogan* species. In the study four plant species *Afzelia africana*, *Dalbergia melanoxylon*, *Vitellaria paradoxa* and *Khaya anthotheca* were categorized as endangered plant species in the IUCN category. The key uses of the plant species ranged from construction, medicinal, food, cultural and biomass fuel. 88% of respondents reported used herbal plants collected from the wild to tackle primary health needs. Vegetation change analysis indicated drastic reduction in vegetation cover over the last 14 years, with 87% reduction in closed woodland, a 77% increase in land use for agriculture, these are leading to loss of natural vegetation, coupled with rampant bush burning. This study demonstrated that the rich biodiversity is under threat. Unless urgent action is taken to reverse the trend, there is a looming disaster to livelihood of the community. The relevant stakeholders are hereby urged to remedy the situation before it is too late!
SUB THEME 3: FOOD SECURITY, SAFETY AND VALUE ADDITION

PP 301: Perceptions of Consumers on Safety of Ready-to-Eat Pork in Metropolitan Kampala

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The study was conducted in metropolitan Kampala in 2013 to establish the perceptions of consumers on the safety of ready-to-eat pork in metropolitan Kampala. A total of six pork eateries (popularly called “pork joints”) were purposively selected in the localities of Nakulabye, Wandegeya, Kikoni and Ntinda. Twenty four (24) pork consumers were interviewed either individually or in groups of 2 to 4 persons. Semi-structured interviews were conducted using a standardized interview guide. In addition, direct observations were made on operations in the eateries. The major safety factors consumers considered at pork eateries were: 1) the hygiene of the premises, utensils and waiters, 2) freshness of pork, 3) amount of fat on the pork, and 4) availability of toilet facilities. Fifty percent (50%) of the consumers ranked pork as the most risky animal source food in relation to transmission of infectious diseases to humans. The frequency of consumption of pork varied from daily to once in 3 months. Consumption of pork was preferred over weekends. Direct observations of the pork eateries showed that both well roasted and well fried pork was consumed. The pork was usually eaten with other foods, commonly, boiled cassava, raw tomatoes, raw cabbages, raw onions, raw green pepper, raw red pepper and avocado. Often, table salt was added to the pork. In addition, the pork consumers consumed alcoholic beverages, commonly beer, as they ate pork. The study concluded that though the pork consumed in moderation was well roasted or well fried, the accompanying raw foods, salt and alcohol may pose a health risk to pork consumers.

PP 302: Effect of concentrate supplementation on foraging behaviour of finishing Mubende-Boer crossbred goats in Uganda

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The effect of graded levels of concentrate supplement and length of feeding was assessed on grazing behavior of meat goats, so as to allow development of management strategies aimed at optimizing the use of Ugandan rangelands for increased productivity. 144 castrated Mubende-Boer crossbreds with an average initial weight of 25±3kg were randomly allocated to 4 dietary treatments viz: sole grazing with no supplement as control, grazing plus either 200, 400 or 600g DM/day of concentrate supplement and kept for either 60, 90 or 120 days on allotted dietary treatment in a 4x3 factorial treatment structure. Unlike duration of grazing, level of supplementation significantly affected (P<0.05) all the behavioral activities of the meat goats. The highest (quadratic, P<0.05) proportion of activity time (30.3-76.8%) by meat goats when fed graded levels of concentrate was spent on grazing & browsing as opposed to standing & ruminating (9.6-25.5%), Playing (2.4-39.5%), lying & ruminating (0.4-9%) and bullying (1.3-5.9%). The time spent on grazing & browsing increased at an increasing rate (P<0.05) when the concentrate level was increased from 0 to 200g DM/Day. It then decreased at an increasing rate (P<0.05) when the level of supplement was further increased to 400g DM/day and subsequently to 600g DM/Day. The extent to which goats stood & ruminated, irrespective of supplementation level and duration of feeding, followed similar trends as observed for grazing & browsing, but time spent on this activity was 2-7 times shorter. Reduction in forage intake with increasing levels of concentrate is attributed to higher palatability and extra nutrients supplied by the supplemental concentrates, providing evidence that energy intake, rather than physical fill, is the dominant factor influencing dry matter intake from diets. Reduction in ruminating time with increase in
concentrate level offered to the goats, results from the lower intake from grazing which is a source of fibrous material associated with longer ruminating time. The Substitution effect observed is considered uneconomical because pastures represent the cheapest means of raising goats. These results are interpreted to mean that increased intake and utilization of pastures by meat goats can be enhanced by feeding concentrates at optimal levels below ad libitum to supply deficient nutrients and influence feeding behavior so as to improve production at minimal cost.

PP 303: Cassava viral disease diagnosis and modeling
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We present a poster of a suite of diagnostic tools for diagnosing viral crop diseases in cassava crops. This is a description of a research project being undertaken by the AI-DEV research group at the School of Computing and IT. We present several methodologies based on cutting edge crop surveillance techniques. These include smart-phone enabled field based diagnosis of plant diseases, the use of spectrometry techniques in performing non-invasive diagnosis of disease in asymptomatic crops as well as spatial temporal models for disease spread and incidence. The overall goal of the project is to improve the livelihoods of small-holder cassava farmers by enhancing crop yield through the application of these techniques. We will develop applications for the mobile phone that an extension worker or farmer can use to diagnose cassava viral disease in the field. The application will use techniques from machine learning to analyze crop images and diagnose the disease as well as its severity. We will investigate the development of a low-cost portable spectral imaging device that can be appended to a phone and used for two purposes: first, early detection of diseases in plants where symptoms are not visible to the naked eye and second, inspection of planting materials to determine if they are disease-free. Our team has had previous experience with 3D printing and mobile imaging for disease diagnosis in a clinical context. We essentially developed a 3D-printed smartphone mount for a microscope. With computer vision techniques implemented on the phone, it makes it possible to divorce the expert from the task of microscopic examination of blood films for the presence of malaria parasites. 3D printing is useful in this regard, because customized mounts can be produced on spec for any combination of phone and microscope model.

PP 304: Nutritional and Phytochemical Composition of Canarium schweinfurthii Fruits from Buikwe district in Uganda
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Canarium schweinfurthii engl. (Burceracea) referred to us an African olive is an indigenous fruit tree distributed throughout tropical Africa. Despite its wide use as edible fruit and medicine with a high commercial potential, little has been reported on the nutritional and phytochemical composition of its fruits in the Lake Victoria Basin (LVB) in East Africa. This study evaluated the nutritional and phytochemical composition of C. schweinfurthii fruits in Uganda. Ripe fruits from Buikwe district were analyzed for nutritional and phytochemical compositions. The proximate composition of moisture content, total ash, crude protein, dietary fibre, total fat, total carbohydrates and energy (K, Na, Ca, Fe, Zn, Cu, Se and Mg) of the fruit pulp were 44.39±2.44, 2.21±0.01, 5.06±0.42, 28.57±0.04, 36.50±0.71, 11.85±2.59g/100g and 402.08±6.34Kcal, respectively. The phytochemical components of the fruit pulp showed presence of alkaloids, tannins, coumarins, sterols and triterpenes, volatile oils, higher fatty acids, reducing compounds, flavanoids and anthocyanins. The study has established that Canarium schweinfurthii fruits contain essential food nutrients and bioactive components with therapeutic applications. Therefore, Canarium schweinfurthii can be promoted through on-farm cultivation for nutritional food security, value addition into nutritious food products (e.g. jam and wine) and as source of medicine for the local communities living in LVB.
Urban/peri-urban dairy farming is an important practice for economic livelihood and food security for dwellers in urban settings of low-income countries. Cow reproduction facts are scanty yet critical for good production and food security insurance in this livelihood. In a longitudinal study of uni-and multiparous of cows (N=58) in 24 farms around Kampala, Uganda; interval to post-partum resumption of ovarian activity and factors influencing it were determined. Cow milk progesterone (P4) concentration in samples taken at 10-12 day-intervals was analyzed using ELISA (Ridgeway Science) until 85 days post-partum and P4 profiles classified (Petersson et al., 2006). Normal ovarian activity (<56 days) in 81% of cows and delayed or prolonged in19% (>56 days) was associated feed supplements and water irrespective of cow history or management. Cows (n=11) delayed or ceased ovarian activity expression beyond 56 days. P4 profiles of 36.2% open-grazed cows, freely accessing bulls however were prolonged. Ovarian activity expression occurred in 24 cows (41.4%) despite abnormal calving history. Banana peel and limited water in zero-grazed husbandry delayed the resumption of ovarian activity in cows of urban/peri-urban Kampala. In conclusion, normal resumption of ovarian activity in the majority of dairy cows in the urban and peri-urban farming systems around Kampala occurs early enough for accepted efficient annual reproduction. Sustainability however, of the activity in many cows is hindered by factors such as cow feeding on mainly banana peel diet, limited water supplies, or is uncertain because of unrestricted bull exposure practices on open grazing farms.
Injuries among commercial motorcyclists (CM) account for a greater proportion of all road traffic injuries recorded in Uganda. The aim of this study was to assess the knowledge and attitudes of CMs towards road safety measures in Mbale, Uganda. A cross-sectional study was conducted among 376 randomly selected CMs. Data was collected using questionnaires. The outcome variables were the riders’ knowledge, (good or poor), and attitude to road safety measures (positive or negative). Logistic regression was used to determine factors associated with each outcome variable (above) at bivariate and multivariate analyses. Among the cyclists, 44.4% were aged 26-35 years. The majority 69.4% knew that only one passenger was permitted by law per route. 62.5% had a positive attitude towards road safety measures. 62% had knowledge on the law against drink-riding and 85.4% had a positive attitude towards it. Only 43.6% had good knowledge about common road signs but 97.9% had a positive attitude towards observing them. The majority (80.6%) had a positive attitude towards proper helmet use. When computed as composite variables, 69.1% had good knowledge while 96.8% had a positive attitude towards road safety measures. At multivariate analysis, being married was associated with having good knowledge (OR=1.68, 95% CI: 1.03-2.74) while being trained prior to riding was associated with having a positive attitude toward road safety measures (OR=4.89, 95% CI: 1.51-15.82). A moderate proportion had good knowledge on road safety measures while a high proportion had a positive attitude towards it. The married groups had good knowledge while those trained had a positive attitude towards road safety measures. A mixture of measures like sensitization and training are needed to promote road safety measures among CMs.

Managing the informal settlements in the urban centers of the developing countries and providing low-income households with appropriate housing is a challenge. With their strained budgets governments are no longer providers but supporters of housing provision. Governments carry out the supporter role through many approaches such as self-help, upgrading and enabling approaches. The enabling approach advocates for the creation of environments supportive to low-income housing provision, to enable them house themselves. The enabling approach is advocated for as the best to guide the development of sustainable cities. It is also assumed to promote other parallel benefits such as capacity building for the poor through their participation in housing provision, which increases their self-reliance and sufficiency by maximising the utilisation of their time and limited financial resources, to upgrade their socio-economic status. In Uganda and internationally women have been identified as being the most marginalised with respect to housing, this underscores the need to focus on them in all forms of housing discourse. As a confirmation to this the Ugandan government launched the Masese Women's Housing Scheme (MWHS) in Masese, Jinja, which targeted low-income women as the main beneficiaries of housing and other socio-economic benefits. The Masese project provided several housing prototypes for the women to select from. However to what extent did this project satisfy their housing needs? Why do the women transform their houses? This paper attempts to answer these
questions. The study attempts to explore whether house designs provided by the Masese housing scheme satisfied the women’s housing needs, and whether the women adjust their houses to enhance their appropriateness and responsiveness to their needs. The findings of this paper contribute to the existing knowledge related to housing schemes that target the low-income households. The study will facilitate the development of gender sensitive housing thus promoting equitable and sustainable human settlements. The research uses the case study approach to conduct investigations of MWHS. The methods used include personal observations, photography, document reviews, in-depth interviews, focus group discussions, systematic sketching and drawing. The study reveals that for women, the house receives its appropriateness from its ability to facilitate their reproductive role, which means taking care of the household and productive role, meaning accommodating income-generating activities, as well as facilitating socialisation and interaction within communities. The housing designs should be flexible enough and adjustable to respond to households’ changing needs to suit life circumstances overtime. It was discovered that the responsiveness of housing designs to socio-cultural contexts poses an important factor to housing adequacy and appropriateness than the elaborateness of building materials or technology.

**PP 405: Ethics And Integrity For Sustainable Livelihoods**

*Lajul Wilfred*

Amartya Sen and Martha Nussbaum maintain that “Global hunger and other severe deprivations indicate conceptual and ethical failures as well as scientific, technical and political ones.” The research on ethics and integrity for sustainable livelihoods, delved into this discussion. Conceptually, the research established that a very close correlation exists between corruption and quality of livelihoods; where corruption was high, livelihood standard was lower and vice versa. People were poor, not because of lack of resources, but to a great extent because of mismanagement of resources. The Directorate of Ethics and Integrity observed in the preamble statement to their report on the development of National Values that “corruption threatens the moral, political, economic and social well being of the country. It impairs service delivery, diverts and wastes resources and undermines the legitimacy of government.” This simply means where corruption flourishes the livelihoods of the majority will be undermined. The research established that severe deprivations can be caused by different factors like; limitation in scientific innovations, use of poor technological knowhow and bad governance. However, behind all these, stands one main factor; lack of integrity, which is the inconsistency between values, objectives, missions, visions, right moral order and human behaviour. Unethical behaviour would not have had such deleterious effects to the body politic or sustainability of human livelihoods if it was not for the immunity of the public to the evil of corruption and all manner of abuse of public offices by tolerating them. But to say the public tolerates corruption is an understatement: the public fuels unethical behaviour when they hail, glorify, adore the unscrupulous who display luxurious and sleazy life styles. Livelihood will not be sustainable, if the culture of ethics and integrity remains elusive as is the case now. With the concerted efforts of the district leaders, the ethics and integrity committee members established in the pilot districts, and other stake holders, ethics and integrity will eventually be deeply rooted in our communities. This project has created some awareness through training in ethics and integrity that should eventually be rolled out to other districts of Uganda.
The objective of this paper is to review the state-of-the-art processes of biomass briquettes manufacture and their characterization. The assessment examines the viability in exploiting the properties of Uganda biomass as locally available agro-waste raw materials and their briquettability to suit high temperature applications like smelting iron ore in a furnace. Biomass briquettes are woody or non-woody organic matter densified under high pressure in a specified framework fixture or press. Briquettes energy applications are mainly heating and cooking and still yet to be used in metallurgical industries. The briquettes have been used in the gasification and pyrolytic processes for domestic fuel production. They are a renewable energy source and avoid adding net carbon to the atmosphere. Briquette production may require binders in low pressure densification but in high pressure applications binders are not necessary. This is possible because during the compaction of the material, temperatures rise sufficiently (about 200°C) to make the raw material liberate various adhesives. The high temperature also causes the moisture in the raw material to evaporate. The briquettes have been used as a replacement for fossil fuels such as oil or coal in many engineering applications and could be considered as reductant in iron ore smelting. This paper discusses the traditional and current methods of biomass and biomass briquetting, their suitability and derived benefits as an alternative energy resource to fossil fuels, and highlights recent studies on development and manufacture of biomass briquettes from agro-wastes and their properties.

A shift from traditional pedagogy, premised on teacher transfer of information, to a learner centered one with teacher as facilitator has been prompted by the demand to use educational technologies (ETs). Ones perceptions are presumed as determinants of uptake but universities in Africa, Makerere University inclusive have a low uptake of ETs (Bakkabulindi, 2012). Hence the need to understand realities that shape perceptions related to access and use of ET. With this, the low uptake would be explained and thus contribute to improving the quality of teaching and learning in Makerere University. Thus, a one year research was undertaken in 2009, to investigate whether perception of staff and students in Makerere University on access and use of ETs were gendered and influenced uptake. Data was collected at three levels from 218 Academic staff, 7 none Academic staff and 236 students. Units of study were grouped into 3 i.e. Education with School of Education, Institute of Adult and Continuing Education; Science with Faculty of Agriculture, Faculty of Technology, Faculty of Science, Faculty of Computing and Information Technology and Faculty of forestry as well as Humanities and Social Sciences which had Faculty of Social Sciences and Faculty of Arts. Findings showed that: both academic staff and students perceived ETs as referring to learning technologies; a number of ET are available; and are either individually or university owned. It was further found that
female students were more dependent on university ETs than their male counterparts. Both staff and students, male and female perceived use of ETs to have the potential of improve learning experiences especially through better and easier access to information. However, challenges posed by increasing students’ numbers, inadequate ICT infrastructure, and lack of staff motivation undermined creation of perceptions to support use of ETs for teaching. Further, although gender did not directly influence staff and students perceptions, it influenced the different strategies and options available to address the challenges in access and use ETs. In conclusion, for teaching to equally benefit from use of ETs, more has got to be done at management and individual level.

PP 503: Getting Computer Uptake High: Influence Of University Students’ Gender Symbolism
Consolata Kabonesa And Ruth Nsibirano

The use of computers in universities has spread globally providing alternative modes of teaching and learning, and ease access to information. Theoretically individuals make use of computers if provided, however they act on the basis of meanings which are subjectively constructed from contextually situated experiences. The validity of this statement is investigated among students at Makerere University and Uganda Christian University. The objective of this study was to assess the relationship between meanings students’ attach to computer and computer utilization. Specifically the study aimed at establishing male and female student perceptions of the computer, gendered differences in computer meanings and the influence of meaning on student’s computer uptake. The study utilized both retrospective and cross-sectional design. The quantitative assessment was made from a sample of 246 students from Makerere University and Uganda Christian University. The data were analysed using frequency distributions and Analysis of Variance Test. On the other hand, qualitative approach to the study was made based on focus group discussions, in-depth and key informant interviews and were analysed thematically. In the results, the majority (96.7%) of the students perceived computers to be useful. Variations in perception regarding ease of use were noted by gender and students’ prior experiences at p < 0.05. Further, the study revealed that the meanings such as a computer as an academic tool, a resource or personal tool are created, shared and attached to computers formally and informally. The results further indicated that female students were more likely to form meanings informally. Whereas formally created meanings of computers drive academic use, informally created meanings drive other usage including “skills cross pollination” of skills. In light of the findings, enhancing utilization of computers requires stepping-up measures to: (i) widen computer spaces such hotspots to allow ease access to create positive perceptions, ii) allow students convenient and free interaction with computers to enable them to create experiences that enhance creation of academic meaning (iii) promote gender inclusive uptake and (iv) enhance creation of formal meanings to promote academic uptake.
Scholars attest that life has become increasingly busy, to the extent that learners must balance work, family and study. As such, they expect a paradigm shift where educators integrate use of ETs in ways that provide alternatives to the inflexible face-to-face teaching and learning methods. Unfortunately in Makerere University, despite increasing awareness of benefits of ETs and numerous support to popularise the digital supported options, teaching approaches have remained traditional. Not much is documented to explain the realities from the teachers’ perspectives. Thus, in 2011, with support from the Partnership for Higher Education in Africa (PHEA), a multi-site study was implemented to establish the factors that influence the uptake of technology for teaching, learning and assessment in seven African universities. Each of the seven universities set out independently assess the technologies used for teaching and learning, identify the users of these technologies and they are used, and finally critically analyse the reasons for preferred ET. The study utilised a cross sectional design with qualitative and quantitative research methods. A sample of 279 respondents (240 students and 39 academic staff) was selected from seven colleges at Makerere University. A semi-structured survey both on line and hard copy were conducted with the respondents first followed by in-depth interviews for key informants. In addition focus group discussions were conducted with students to ascertain the general views about ETs in teaching and learning. Findings showed that varied technologies were available but the computer was the preferred ET because it was readily available. The ET users for teaching were mostly at the ranks of assistant lecturer and lecturer. Finally enabling and constraining factors for uptake of ETs were at institutional, technical and personal levels. Of these three, institutional level factors greatly influenced uptake for teaching. In conclusion, low uptake of ETs for teaching, learning and assessment can be mitigated with clear policies on the context by enabling routine repair, servicing and maintenance of ETs, providing in time technical support as well as staff recognition.
POLICY BRIEFS

SUB – THEME 1: HEALTH AND HEALTH SYSTEM

OPB 105 Misdiagnosis of asthma in children less than 5 years of age in Uganda

This policy brief was prepared by Rebecca Nantanda, Grace Ndezi, Marianne S Østergaard and James K. Tumwine with technical support from the Innovations and Knowledge Translation Office-Makerere University College of Health Sciences

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1. Childmed project, Child Health and Development Centre, Makerere College of Health Sciences (MakCHS)
2. Ministry of Foreign Affairs, Denmark
3. University of Copenhagen
4. The Innovations and Knowledge Translation office, MakCHS

Introduction
Asthma is a common childhood illness but its diagnosis is often missed by health workers. This policy brief explores the issues related to asthma misdiagnosis and provides key recommendations for addressing this problem.

A. The problem
Almost a half of the children less than 5 years of age with asthma in Uganda are misdiagnosed as pneumonia [1]. This implies that a great number of children with asthma are not diagnosed and so do not get the correct treatment. This may result in long-standing suffering or even death. Misdiagnosis also wastes the scarce resources for child health and exposes the affected children to unnecessary medicines; and denies them correct treatment.
A1. Size of the problem
Four of every 10 children with cough and or difficult breathing have asthma but are misdiagnosed as pneumonia [1-4]. According to the Uganda Demographic and Health Survey (UDHS 2011), one in five children below 5 years of age in Uganda has cough at any one time [5]. Presence of cough may indicate pneumonia; however it may also indicate asthma [6,7]. The majority of the children under five years of age with asthma are likely to be diagnosed as pneumonia and will be treated with antibiotics [1,2,8]. These children will eventually experience repeated hospital visits and this leads to high healthcare costs to the caretakers and the health system. In addition, untreated asthma causes poor growth and development. It also leads to low quality of life of the affected children and their caretakers [9-12].

A2. Causes of the problem or factors underlying the problem
In Uganda, we use the WHO IMCI (Integrated Management of Childhood Illnesses) guidelines which are not clear on how to diagnose asthma [13]. They just state that a child who is wheezing should receive a rapid acting bronchodilator (medicine for relief of asthma symptoms) and should be referred for further management. Other guidelines such as Global Initiative for Asthma (GINA) which are useful in assessing children with cough are not routinely used.

In both pre-service and in-service training programmes, there has been an over-emphasis of pneumonia as a major reason for cough and difficult breathing. Children with asthma have similar symptoms and are often assigned the diagnosis of pneumonia.

In most of the primary care settings in Uganda, we use the WHO IMCI guidelines for treating children with cough.

B. What we did about the problem; how we did it.
We studied 614 children aged less than 5 years presenting with cough and/or difficult breathing at the Children’s emergency ward of Mulago hospital. We assessed the children for asthma and pneumonia using the GINA and WHO guidelines. Three child health experts reviewed each child’s symptoms and clinical information and made a diagnosis of either pneumonia or asthma.

C. What we found and lessons learned
Four out of 10 children initially presumed to have pneumonia had asthma and had wrongly been treated with antibiotics. This means that they did not receive treatment for asthma. This exposed them to unnecessary antibiotics and could have led to long hospital stay [14].

D. Our recommendations: Policy/Practice options
The options proposed in this brief are based on findings from our study and similar studies on asthma and pneumonia in children.

D1. Policy option 1:
Revise the WHO IMCI guidelines to include assessment of children for asthma. This revision should include the following: recurrent cough (worse at night), difficult breathing and recurrent wheeze; family history of asthma or allergy; and environmental exposure to smoke, animal fur, pollen, sprays (including perfumes and insecticides) and cold weather.

Pros: WHO IMCI guidelines are widely used even in primary care settings.
**Cons:** Revision of guidelines is a lengthy process which involves back and forth consultations and lobbying with many stakeholders worldwide. In addition, it involves a lot of financial costs.

**Plausibility and acceptability:** Revision of the IMCI guidelines is a plausible option because they are widely accepted and used in many healthcare settings. They are also presented as a flow chart which is easily understood by majority of healthcare providers.

**Policy option 2:**

The Uganda Ministry of Health should adopt the GINA guidelines for diagnosis and management of asthma in children.

For the diagnosis of asthma, the GINA guidelines recommend the following: recurrent cough (worse at night), difficult breathing and recurrent wheeze. These symptoms occur or worsen with a common cold, smoke, animal fur, pollen, sprays (including perfumes and insecticides) and cold weather. The guidelines also include a family history of asthma or allergy to be considered for the diagnosis of asthma [15].

**Pros:** There is evidence that using the GINA guidelines for diagnosis and management of children with asthma is effective and leads to improvements in the health of the affected children and their caretakers [16].

**Cons:** The Ministry of Health guidelines [17] are bulky and relatively complicated. This makes it difficult for lower cadres of health workers such as Nursing Aids to use them effectively in treating children.

**Policy Option 3:**

Sensitization and training of health workers on assessing children for asthma

This could be done through pre-service and in-service training, and continuing medical education. This will help in increasing awareness about the magnitude of asthma in children and also increase their knowledge and skills in managing these children.

**Pros:** There is an existing program for pre-service and in-service training of health workers

**Cons:** Although sensitization and training helps in acquisition of knowledge and skills, it does not automatically translate into better clinical practice. There will be need for continuous supervision and mentorship which involves financial costs.

**E. Implementation Considerations**

Key barriers to implementing the policy options above and the strategies to address these barriers are summarized in the table below.

<table>
<thead>
<tr>
<th>Barriers to implementation</th>
<th>Strategies to address the barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policy Option 1:</strong> Revise the WHO IMCI guidelines to include assessment of children with asthma.</td>
<td>Make personal contacts with responsible officers in WHO Child and Adolescent Health division Use official channel of communication, Innovations and Knowledge Transmission office (MakCHS), through an agency, use champions, engage key people through dialogue using well written briefs</td>
</tr>
<tr>
<td><strong>Main Barrier 1:</strong> No clear line of communication between researchers and policy makers</td>
<td>Provide evidence to and lobby national and international interest groups (conferences, media), pressure groups, civil society, sensitization</td>
</tr>
<tr>
<td><strong>Main Barrier 2:</strong> Some stakeholders may have a negative attitude of towards revision of the guidelines</td>
<td>Make personal contacts with responsible officers in WHO Child and Adolescent Health division Use official channel of communication, Innovations and Knowledge Transmission office (MakCHS), through an agency, use champions, engage key people through dialogue using well written briefs</td>
</tr>
</tbody>
</table>
### Policy Option 2:
The Ministry of Health to adopt the GINA guidelines for diagnosis and management of asthma.

<table>
<thead>
<tr>
<th>Main Barrier 1: Negative attitude to change</th>
<th>Lobbying and provide evidence, include champions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-barrier 1.1: Funding the process of change</td>
<td>Lobby the government and development partners for funding the process of adopting the GINA guidelines</td>
</tr>
</tbody>
</table>

### Policy Option 3:
Training and sensitization of health workers on assessing children for asthma

<table>
<thead>
<tr>
<th>Main Barrier 2:</th>
<th>Lobbying and provide evidence, include champions e.g. clinicians, people involved in medical teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Negative attitude to change (stakeholders in Ministry of Health and training institutions)</td>
<td>Lobby the government and development partners for funding the process of revising the guidelines</td>
</tr>
<tr>
<td>2. Funding for revision of existing training materials may not be readily available</td>
<td></td>
</tr>
</tbody>
</table>

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**F. Information about this document**

**How this document was prepared**
This document has been prepared by RN, GN, MØ and JKT with technical support from the MakCHS Innovations and Knowledge Translation Office. Findings and lessons learnt from studies that were done in settings that are similar to Uganda were also used widely.

**Sources of evidence**
Evidence was obtained from studies in Uganda and other similar settings in Asia. Consideration on the number of children that were studied was also made. Internationally recognized guidelines such as GINA and WHO IMCI guidelines were also used.

(A description of your sources of evidence, how the evidence was graded and selected, and a link to the full document (where applicable) and/or the reference list)

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Executive Summary

*Tuberculosis* (TB) is still a major problem globally more so in Africa. Uganda is one of the high burden countries that contribute to about 80% of the global tuberculosis. An estimated 40 to 70% of the world is vitamin D deficient and is largely undiagnosed yet is associated with diseases including TB. Vitamin D antimicrobial activity may play a role in prevention of such diseases.

The problem:
Vitamin D receptor gene has been identified as a candidate gene for TB susceptibility but reports in different populations have been inconsistent. Also, the association of the genetic polymorphisms and its functional immunologic process is often unclear. An estimated 40 to 70% of the world is vitamin D deficient but is not widely recognised by physicians and patients.

Patients presenting with active TB have significantly lower mean concentrations of serum 25-hydroxycholecalciferol than their contacts from the same ethnic group.

Size of the problem
- 44,300 new cases were reported in 2012
- the country has a problem of MDR in both new cases and
- a study done in the outpatients assessment centre,
- Seventy five percent of the new TB patients were none HIV.
- fifty percent of TB patient were below thirty years of age
- Despite the year round sunshine, there is high prevalence of low vitamin D levels in both the TB patients and healthy individuals yet not considered important
- The prevalence of low vitamin D levels in TB out patients at Mulago was 24.4% and prevalence in the health subjects was 26.8%
- There are still few studies that have been done in the population to unfold the relationship between vitamin D receptor gene polymorphism and vitamin D status

Factors underlying the problem
Neglected TB program which compromises treatment outcomes
Unknown Host genetic factors
Environmental factors (social demographic and economic) which include crowding and poverty life styles, most patients were driver’s teachers and peasant farmers
HIV infection
Inadequate information on vitamin D status of the population
Limited information in the community about the disease
No sustainable mechanisms for addressing TB disease

Recommendations
**Recommendation 1:**
Carry out a survey study on the vitamin D status of the general Ugandan population in order to know if the population have the recommended optimal levels of vitamin D in order for policy makers to come up with nutritional guidelines.

**Recommendation 2:**
Do more studies on TB and vitamin D metabolites.

**Recommendation 3:**
Create awareness to clinicians and health workers of the dangers of low vitamin D levels.

**Recommendation 4:**
Increase fortification of foods with vitamin D.
Brucellosis is a zoonotic disease of veterinary, public health and economic significance in most developing countries. The explosive human population growth and environmental changes have resulted in increased numbers of human-animal interactions which presents a potential zoonotic threat that may cause spillover of infections from wildlife to cattle in areas around national parks. Our study done in Kiruhura district looks at one health approach to address this problem through integration of services by both public health and veterinary professionals.

Context and importance of the problem: In communities where people depend on animals and their products as the source of livelihood, human-animal interaction is close which poses a threat to zoonotic disease. There is therefore a need to greatly recognize that animal and human health are closely linked. Control measures such as animal vaccination and health education targeting brucellosis at the human-domestic animal-wildlife interface could work provided that they are designed and adopted by the local population.

Critique of policy option(s): There are few studies on integrated human and veterinary health care for zoonotic diseases which is limited by knowledge of disease, poor infrastructure and human resource. Those commonly described often deal with delivery of health care under special circumstances such as human disease outbreak. Therefore, there is need to focus on zoonotic diseases, provide adequate information, improve infrastructure and human resource to enable effective collaboration with all stakeholders as well as communities.

Findings:

Overall, it was believed that although integration of services by the two professionals was important, there is need to improve human resources, facilitation of the necessary activities such as sensitization of the communities about brucellosis, and provision of vaccines and diagnostic kits which are expensive unavailable. Government involvement and community participation were identified as important for sustainability and ownership of the integration process.

Policy recommendations:
- There is need for collaborative efforts from all stakeholders by testing the integration process
- Include brucellosis information in already existing outreaches programs in the communities
- Increase number of veterinary officers and public health workers to enable better service delivery in communities.
- Equip government health facilities in brucellosis endemic areas with diagnostic facilities and equipment, kits and reagents such as the simple and rapid diagnostic tests (Rose Bengal plate test) for screening brucellosis since most health facilities do not have laboratory facilities that offer more advanced laboratory testing for brucellosis.
- Facilitate public health and veterinary sectors to continuously sensitize communities about the disease through multiple communication channels such as radios, churches etc.
Based on the current laboratory methods available, a definitive diagnosis of drug Resistant Tuberculosis (DR-TB) requires Mycobacterium tuberculosis bacteria the causative agent of Tuberculosis (TB) disease to be isolated on culture, identified and anti-TB drug susceptibility testing (DST) completed. Rapid identification allows the use of appropriate treatment regimen in the course of care which has an important impact on improved TB control.

Conventional culture and DST methods require prolonged lengths of time to confirm mycobacterial growth and detect drug resistance. During this prolonged wait couple with culture contamination, patients may be inappropriately treated, drug resistance strains may continue to spread and amplification of resistance may occur.

It was against this background that the current study embarked on isolation, identification and establishing the susceptibility profile of the contaminants to Polymixin B, Amphotericin B, Nalidixic acid, Trimethoprim and Azlocillin. This has shown a promising reduction in contamination rate of Lowenstein Jensen sputum culture media. So early and rapid diagnosis of TB and drug resistance will therefore have obvious benefits for patients and Public health including better prognosis, increased survival, and prevention of acquisition of further drug resistance and reduced spread of drug resistant strains to vulnerable populations.

A review of National TB reference Laboratory Report showed that the contamination rate of Lowenstein Jensen (LJ) media had gone very high up to 20% yet the acceptable limit is 5%. All the measures like decontamination using N-acetyl-L-Cysteine-sodium hydroxide method, proper sterilization of media and equipment was unable to resolve this discrepancy.
Suppression of the growth of Mycobacterium tuberculosis in LJ culture media by these contaminants increases the turn-around time of TB culture results from eight weeks to utmost sixteen weeks hence delayed diagnosis and treatment initiation. Although many studies have been conducted to isolate, characterize and establish the susceptibility patterns of these non-tubercle bacterial contaminants to routinely used antimicrobials, no attempt has been made to incorporate the antimicrobials into the LJ solid culture media so as to reduce or prevent its contamination during TB culture.

Am fully convinced that when these drugs are incorporated in the LJ media the contamination rate will be greatly reduced hence turnaround time of TB diagnosis and correct treatment initiation.
OPB 113: Verifying community knowledge of nutri-medicinal indigenous plants used to manage HIV/AIDS opportunistic ailments

Nakibuuka M. M., Kamatenesi-Mugisha M., Ndukui J. G. and Namutebi A.

In Uganda, approximately 1.1 million people are infected with HIV/AIDS. The rural areas demand for HIV/AIDS health care is greater than the conventional health sector can sustain. Medical treatment for HIV/AIDS has advanced rapidly but good nutrition is still key for treatment. Use of foods from plant sources, such as vegetables rich in micronutrients/antioxidants, supplements and herbal remedies prevents oxidative stress and slows down progression of HIV/AIDS. Rural communities opt to use medicinal plants to manage some of these ailments and infections. It is now increasingly vital to validate use herbal plants as community health treatment and establish their safety. This study documented 194 plants used as herbal and nutri-medicinal plants in management of HIV/AIDS related opportunistic ailments in Namayumba, Wakiso, Uganda. Total anti-oxidant capacity (TAC) of 50 of these plants used as nutri-medicinal plants was determined. Acute toxicity tests were performed on S. aethiopicum, A. hybridus and B. spilosa selected to treat anemia, immune suppression, appetite and weight loss (Table 1).

Table 1: Informant consensus (FIC) for the ailment categories

<table>
<thead>
<tr>
<th>Ailment Category</th>
<th>*Number of taxa (Nt)</th>
<th>Number of use reports (Nur)</th>
<th>FIC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Cough and fever</td>
<td>77</td>
<td>131</td>
<td>0.42</td>
</tr>
<tr>
<td>Anemia, Immune suppression, Appetite and weight loss</td>
<td>70</td>
<td>411</td>
<td>0.83</td>
</tr>
<tr>
<td>Chronic diarrhea and vomiting</td>
<td>63</td>
<td>280</td>
<td>0.78</td>
</tr>
<tr>
<td>Oral candidiasis</td>
<td>35</td>
<td>57</td>
<td>0.39</td>
</tr>
</tbody>
</table>

*A plant species mentioned in more than one category; *FIC = Nur-Nt / (Nur-1), value between 0 and 1, whereby high value indicates a high rate of informant consensus

The DPPH anti-oxidant capacity of the plants ranged from 1.59 (Solanum nigrum) to 30.63% (Mormodica foetida). A second method showed FRAP anti-oxidant capacity ranged from 0.08 mM/ L (Spathodea campanulata) to 9.86 mM/ L (Amaranthus hybridus).

Aqueous and ethanolic extracts of Bidens pilosa were found to be of limited toxicity with a LD_{50} value of 3,559 mg/kg. Aqueous and Ethanolic extracts of Solanum aethiopicum were found to be of boundless toxicity with both LD_{50} values above 5,000 mg/kg. Amaranthus lividus ethanolic extract registered a LD_{50} below 5,000 mg/kg, with the aqueous extract having a relatively higher LD_{50} value of 5,754 mg/kg. These nutri-medicinal plants (treat more than one ailment) and represent a strategic contribution to management of nutritional disorders and opportunistic ailments.
Table 2: Characteristics and percentage respondent’s knowledge of selected plants in Namayumba, Wakiso used to manage anemia, Immune suppression, appetite and weight loss

<table>
<thead>
<tr>
<th>Species identity**</th>
<th>Growth Habit</th>
<th>Part used</th>
<th>Habitat*</th>
<th>Mode of preparation and administration</th>
<th>No. of use reports</th>
<th>PRK*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amaranthaceae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Amaranthus</em> lividus Doddo (Lu)</td>
<td><strong>Herb</strong></td>
<td><strong>Leaf</strong></td>
<td>C</td>
<td>Steam with water and eat</td>
<td>14</td>
<td>4.68</td>
</tr>
<tr>
<td><em>Amaranthus</em> hybridus Ebuga (Lu)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32</td>
<td>10.7</td>
</tr>
<tr>
<td><strong>Asteraceae</strong> Vernonia amygdalina Delile Omululuza (Lu) Omubiririzi (Ru)</td>
<td><strong>Shrub</strong></td>
<td><strong>Leaf/Roots</strong></td>
<td>W</td>
<td>Pound, squeeze in water and drink frequently</td>
<td>58</td>
<td>19.39</td>
</tr>
<tr>
<td><strong>Bidens pilosa</strong> Ssere (Lu)</td>
<td><strong>Herb</strong></td>
<td><strong>Leaf</strong></td>
<td>W</td>
<td>Steam and eat as vegetable</td>
<td>19</td>
<td>6.35</td>
</tr>
<tr>
<td>Blumea perrottetiana Kakulya (Lu)</td>
<td><strong>Herb</strong></td>
<td><strong>Whole plant</strong></td>
<td>W</td>
<td>Steam; dry; make powder and add to tea or food</td>
<td>29</td>
<td>9.69</td>
</tr>
<tr>
<td><strong>Tagetes minuta</strong> Kawunyira (Lu) Mukazimurofa (Ru)</td>
<td><strong>Herb</strong></td>
<td><strong>Whole plant</strong></td>
<td>W</td>
<td>Boil and drink as tea before meal</td>
<td>9</td>
<td>3.01</td>
</tr>
<tr>
<td><strong>Solanaceae</strong> Capsicum <em>mysorensis</em> (Roth.) T.Anders Kamulari (Lu)</td>
<td><strong>Herb</strong></td>
<td><strong>Fruit</strong></td>
<td>C</td>
<td>Eat fruit with food</td>
<td>10</td>
<td>3.34</td>
</tr>
<tr>
<td><strong>Physalis peruviana</strong> L. Entuntunu (Lu) Entuutu (Ru)</td>
<td><strong>Herb</strong></td>
<td><strong>Fruit</strong></td>
<td>W/C</td>
<td>Eat ripe fruit</td>
<td>33</td>
<td>11.04</td>
</tr>
<tr>
<td><strong>Solanum aethiopium</strong> Nakati (Lu)</td>
<td><strong>Herb</strong></td>
<td><strong>Leaf</strong></td>
<td>C</td>
<td>Steam; eat as vegetable</td>
<td>26</td>
<td>8.69</td>
</tr>
<tr>
<td><strong>Solanum anguivii</strong> Lam. Katunkuma (Lu) Obutura (Ru)</td>
<td><strong>Herb</strong></td>
<td><strong>Fruit</strong></td>
<td>C</td>
<td>Steam; eat as vegetable</td>
<td>14</td>
<td>4.68</td>
</tr>
<tr>
<td><strong>Solanum gilo</strong> L. Entula (Lu)</td>
<td><strong>Herb</strong></td>
<td><strong>Fruit</strong></td>
<td>C</td>
<td>Steam; eat as vegetable; chew fresh</td>
<td>30</td>
<td>10.03</td>
</tr>
<tr>
<td><strong>Solanum lycopersicum</strong> (L.) H. Karst.</td>
<td><strong>Herb</strong></td>
<td><strong>Fruit</strong></td>
<td>C</td>
<td>Eat ripe fruit</td>
<td>10</td>
<td>3.34</td>
</tr>
<tr>
<td><strong>Solanum nigrum</strong> L. Ensuga (Lu) Eshwiga (Ru)</td>
<td><strong>Herb</strong></td>
<td><strong>Leaf</strong></td>
<td>W/C</td>
<td>Steam; eat as vegetable</td>
<td>5</td>
<td>1.67</td>
</tr>
</tbody>
</table>

†Also used as an energy booster; **: Identity - family, species, Ethnic language (Lu-Luganda; Ru-Runyankole); Voucher specimen code; *: C-Cultivated, W-Wild; #PRK-Percentage Respondent’s knowledge
Herbal remedies are medicines made up of plant parts (such as leaves, roots, flowers, stem barks) or fungi. Traditional medicine comprises of practices, approaches, knowledge and beliefs not based on scientific evidence, that are applied to treat, diagnose and prevent illness within a society. The importance of medicinal plants sector can be gauged from the fact that herbal medicines serve the health care needs of about 75-90% of the world’s population (Robinson and Zhang, 2011). According to the world health organization (WHO), the goal of health for all cannot be achieved without herbal medicines.

The safety of herbal medicines has been a major concern to both national health authorities and the general public. There is a widespread misconception that natural means safe and a belief that remedies from natural origin are harmless, yet some medicinal plants are inherently toxic (Fennell et al., 2004). Herbal remedies just like pharmaceutical medicines will have an effect on the body and can potentially be poisonous. They should therefore be used with the same care and respect as pharmaceutical medicines. Therefore, safety of herbal medicines is an important public health issue and a fundamental principle in the provision of herbal products for health care and a critical component of quality control. Efficacy of traditional medicine is a concern as sufficient data is not available to support its use.

What is the policy issue/debate?

The main policy issues regarding herbal medicine use include among others;

- Improper dosage formulation, safety and efficacy
- Recognition of traditional medicine and traditional medical practitioners
- Value addition
- Intellectual property rights

What Government officials and health policy makers have ignored is the important role that traditional medicine and traditional medical practitioners can play in strengthening and supporting the fight against HIV & AIDS and other diseases. Globally between 40,000 and 50,000 plant species are used for medicinal or aromatic purposes in both traditional and modern medical systems (Liverpool, 2004). At present, only a tiny minority has been assessed scientifically; although of these many have been shown to be clinically effective, there is still a huge gap in knowledge of phytochemistry and pharmacological action of phytomedicines.

Policy recommendations

1. Despite the growing interest in the safety of herbal medicines, national surveillance systems to monitor and evaluate adverse reactions associated with herbal medicines are rare. Therefore, national pharmacovigilance systems linked to national drug regulatory systems alongside a national safety monitoring programme for herbal medicines should be established. Pharmacovigilance is essential for a thorough evaluator of drug safety. It should be emphasized that even though traditional medicine use does not ensure the safety and effectiveness of herbal medicines, it is a useful guide for identification of new pharmacologically active substances in plants.

2. Training in better health practices, and undertaking research into safe and effective herbs and facilitating standardization of herbs to match world health standards is another form of support that should be provided (figure 1).
Fig 1. Value addition – better preparation and dosage formulation methods are essential for herbal remedy use.

3. The research also indicated that there is need for protection of intellectual property rights (Patent rights). Assistance should be given to Traditional Herbalists wishing to use Intellectual Property System to protect their knowledge. Traditional Herbalists should receive education and advice on intellectual property right issues and a systematic documentation procedure should be put in place and compile a database for reference for the future generations.

4. Collaborative linkages between Traditional Herbalists and modern health practitioners need to be enhanced. Through these linkages, the level of effectiveness of local herbs, as well as the appropriate dosage could be scientifically tested and verified. Policy makers should be sensitised to formulate national policies on traditional conservation and use of Non timber forest products including medicinal plants and adequate allocation of resources.

5. This project can lead to production and preparation of traditional medicines as formulated products that can be officially used to treat ailments associated with HIV/AIDS, thus adding value to natural medicines. The value of documentation is to keep safe custody of our indigenous knowledge and save most of the useful Ugandan plants if proper plan for domestication of nutri-herbal remedies is in place.

6. The root cause of many health problems is poverty. Hence a national policy on utilizing medicinal plants need to be developed soon which should ensure that all herbal medicines on the market are safe, effective, of good quality, reasonably priced and prescribed and utilized rationally.

Fig 2. Due to lack of transport in village settings, people use stretchers to take patients to hospital.
Tuberculosis (TB) is a chronic disease and the second leading killer in the world due to a single infectious agent. Uganda is one of the 22 high burden countries with an incident rate of 166 cases per 100,000 in 2013. In 2013, the TB mortality rate was 13 deaths per 100,000 in HIV negative patients and 25 deaths per 100,000 in HIV positive patients. In 2013 about 27% of Uganda's TB cases went undetected.

The gold standard for laboratory confirmation of TB disease is laboratory culturing for tubercle bacilli. However, this is a very slow process and bacteriological verification may take between four to eight weeks. Currently, sputum microscopy is widely used for diagnosis of PTB in low-income countries but despite being much more rapid it has a much lower sensitivity than culture. Indirect methods that measure the host immunological response parameters, such as measurements of antibodies, PPD/TST, IGRA etc actually measure secondary host responses of which interpretation may be blurred by, for example, exposure to environmental mycobacteria or earlier infection with bacteria of the MTB complex which is cured and/or contained by the host as a latent infection. Earlier BCG vaccination may also interfere with the interpretation of these tests. BCG, the current vaccine for TB does not provide long term protection and its effectiveness against PTB, particularly, in developing countries leaves a lot to be desired.

The poor performance of TB diagnostic tests leaves large numbers of patients undetected and impedes the expansion of Directly Observed Treatment Short course (DOTS). This combined with the general inefficacy of the BCG vaccine against PTB erodes faith in public health services, increases morbidity and allows the continued transmission of TB.

The ability to accurately identify individuals with TB infection and determine the disease status is important. In addition, more needs to be done in the area of vaccine development such that the efficacy of the BCG vaccine is either improved or a new vaccine altogether developed.

- The identification of HLA alleles in individuals exposed to TB in Uganda as well as determining which of those alleles are associated with the various TB outcomes will help in screening individuals in high-risk areas in Uganda for susceptibility to TB and also to predict their resistance to TB infection or their progression to active TB.

- The identification of the common alleles in the Ugandan TB population will be useful in the development and evaluation of TB vaccines that will effectively work on a broader range of the high risk individuals in a Ugandan population.
EXECUTIVE SUMMARY

Upper gastrointestinal bleeding is a medical emergency unless proven otherwise. It is a common cause of morbidity, health cost, and death, worldwide. However in Uganda there are no clear decisions, plans, and actions undertaken to address this specific health problem as is the case among some neighboring countries or countries from the West. We attributed this to lack of adequate information to enable this. We carried out a study in rural Uganda in 2014 to draw concern to this problem. We found that the rate if upper gastrointestinal bleeding in this rural health facility was 10 times what has been reported in the West and was mainly due to chronic schistosomiasis. Moreover, upper gastrointestinal bleeding was recurred in half of the patients seen. These cases were poorly profiled by the health management information system, associated with substantial need for blood transfusion services, emergency care, and chronic care services within the health unit. We propose that the HMIS system needs to be updated to capture is diagnosis, as is the case with the International Statistical Classification of Diseases and Related Health Problems (ICD-10). This will enable better morbidity and mortality statistics. Like other countries, country appropriate diagnosis and treatment guidelines need to be formulated to improve care, reduce morbidity, death, and health related costs.

Background and problem

Vomiting blood, passing black stool or passing blood in stool, and/or having low blood levels defines upper gastrointestinal bleeding. Those who bleed from their upper gastrointestinal tract may do so insidiously or acutely with a massive life threatening bleed and/or with repeated episodes of bleeding after an acute bleed. Each repeated episode carries with it a new risk of hospitalization and death. Because of this it is considered a medical emergency.

Globally upper gastrointestinal bleeding remains a common cause of hospital admission and death even in developed countries were it has been shown to be a cause of increasing health economic cost. Two types of upper gastrointestinal bleeding are recognized including variceal upper gastrointestinal bleeding and non-variceal upper gastrointestinal bleeding. Variceal upper gastrointestinal bleeding is the most lethal and is the most common type in Sub Saharan Africa. Causes of variceal bleeding include schistosomiasis, hepatitis B infection, hepatitis C infection, and alcoholic liver disease. In Uganda 3 out of every 10 have chronic schistosomiasis and 1 of 10 have chronic hepatitis B infection or alcoholic liver disease. Meaning at least 1 of 10 persons is at risk of
variceal upper gastrointestinal bleeding. However, there is no data on upper gastrointestinal bleeding from the Ugandan national health information management system (HMIS) or other rural health care providers that a responsible for health statistics for most of Uganda's population. The little data we have from Uganda are from a hand full of studies carried out at large hospitals in the country. It is therefore predictable that there are no up-to-date country guidelines on upper gastrointestinal bleeding and/or use of support systems like blood transfusion services as is the case with other neighboring countries within the River Nile basin.

To address this problem we asked two questions:
1. Is upper gastrointestinal bleeding a common problem in rural Uganda where diseases like schistosomiasis and/or hepatitis have been reported as very common?
2. Who are those that are affected? Or what are their characteristics?

Methods
For this questions we carried out a cross sectional study at Pakwach Health Centre IV in rural Uganda over the period June to August 2014. We enrolled, interviewed and examined 107 patients aged 12 years and over, with upper gastrointestinal bleeding (past or present) at outpatients and inpatient departments of Pakwach Health Centre IV. All tests including laboratory investigations, ultrasound examination, and endoscopy was carried out at Pakwach.

What did we find?
A. 84 of 348 patients screened at outpatient's department over 6 weeks, reported upper gastrointestinal bleeding. This gave a prevalence of 24%.
B. 23 patients with acute upper gastrointestinal bleeding were enrolled at inpatients over 6 weeks. This gives an average of 3-4 patients with acute life threatening disease every week.
C. The estimated rate at this unit was 30-70 case /1000 patients /year this contrasts with the West where the reported rates are less than 0.5-1 /1,000 patients per year.
D. Half of our study participants were age between 40-60 years, of female sex, had a previous laboratory diagnosis of Schistosoma mansoni infection, and experienced 2 or more lifetime episodes of upper gastrointestinal bleeding.
E. More than 80% were breadwinners and these supported over 4 persons in their household.
F. All reported frequent contact with the River Nile and 80% had ever received praziquantel or experienced an episode of upper gastrointestinal bleeding within the last 5 years or received a blood transfusion for upper gastrointestinal bleeding.
G. No patient had ever had appropriate tests (complete blood count, ultrasound, or endoscopy) to find out the cause of they're bleeding.
H. There was inadequate reporting of upper gastrointestinal bleeding in the HMIS system.
I. There was a high utilization of blood transfusion services as this was the only available intervention.
J. Up to half of our participants had recurrent admissions for upper gastrointestinal bleeding.
K. The most common cause of bleeding was oesophago-gastric varices.
L. A platelet count-spleen diameter ratio <936 could be used as an alternative diagnostic tool to where endoscopy is not available.
System challenges

A. HMIS does not adequately capture upper gastrointestinal bleeding due to inherent design limitations.
B. Absence of guidelines for adequate diagnosis, treatment, and/or follow up of patients presenting with upper gastrointestinal bleeding.
C. Inadequate health level appropriate medications or facilities and/or human resources for cost effective delivery of diseases like upper gastrointestinal bleeding.

Proposed solutions

A. Update the HMIS system to include codes for diagnosis of upper gastrointestinal bleeding at lower health units.
B. For referral units we recommend the adopt the ICD-10 in line with the rest of the world and in preparation for health insurance payments
C. Develop and establish health level appropriate diagnostic and treatment guidelines.
D. Identify health facility needs required to implement such guidelines.
E. Ensure drug and equipment guidelines are congruent with the diagnosis and treatment guidelines. There include ultrasound machine, a complete blood analyzer, and vital sign monitors.
F. Under take a multi-sector approach to prevention and treatment of upper gastrointestinal bleeding in Uganda (vaccination, prophylaxis, screening, water and sanitation hygiene, health education, health care worker training, health research, etc.).
OPB 117: Comprehensive Internationalisation of health professionals’ education

Susan Nassaka, Kintu Mugaga, Samuel Maling, Henry Oboke

Health professionals’ Education has to adapt to the pace of globalisation; it involves a higher degree of responsibility towards the international community because the parameters which governed the training of health professionals in the past have changed. It is therefore required important that MESAU institutions be perfectly attuned to the importance of internationalisation. There should be committed, confirmed process through action to infuse international and cooperative perspective throughout the teaching, research and service missions of these institutions.

There is evidence that Medical schools in the MESAU consortium have responded to globalisation; they admit international students for both degree programmes (undergraduate and graduate level) and occasionnal programmes, they have joint degree programme with Universities across borders and international collaborations in research. In addition to establishing international partnerships, MESAU institutions have made efforts in to internationalise health professionals’ education as exhibited in the study by; recruiting international students (N= 88) representing 83%, facilitating staff and students to attend international conferences (N= 71) 66.4%, transfer of credit with 32.7%, internalisation of the curriculum (N=56, 51.4%).

Although, research findings indicate that there is positive correlation between internationalisation and the quality of education, research, and service to the community, there are no clearly documented policies and procedures in place to guide comprehensive internationalisation. There is need for the leadership in these institutions to integrate internationalization strategies in the vision, mission of the university and create an environment that enhances internationalisation and monitors the standards of these programs.

Context and importance of the problem

MakCHS and Karolinska Institutet celebrated 12 years of partnership in February 2015. The partnership involved exchange of 200 student/teacher at undergraduate level (Nursing, Medicine, Occupational therapy, Physiotherapy, public health sciences, speech and language therapy and Dentistry), Double PhD programme (29 double degree thesis have been defended so far) and collaborative research. Karolinska is not the only international partner, University of Bergen, Norway, Minnesota University, Lund University, University of California San Fransco, Johnhopkins University, Uppsala University are some of the many international partners.

The main rationale for establishing of these partnerships has been to enhancement of exchange of knowledge, students, Faculty, collaborative research and capacity building. In deed the partnerships have opened academic mobility windows for staff and students through student exchange, Joint PhD and short courses and international conferences.

However, there are limited documentations on policies and procedures, and no monitoring tools in place to assess neither the outcomes of these partnerships nor the influence of internationalisation strategies on the quality of education, research and service to the community. The institutions lack structures and infrastructure to support internationalization process. For example only one institution had an international office.
Some institutions had inadequate internet access and had no clear policy on transfer of credit for clinical placement abroad yet credit transfer is the monetary unit for academic mobility.

Despite that only one institution (MakCHS) had an international office, there is

Policy recommendations.

1. Engage in campus dialogue about definitions of comprehensive internationalisation and practical meanings so as to enable institutions refine vision for the same and develop a culture.
2. Design clear criteria for systematic recruitment of international students so as to maintain the quality of admissions.
3. Develop an internationalisation strategy and communicate to the whole university how this will be achieved.
4. Establish functional international offices, train international officer(s)
5. Increase student/teacher mobility programmes in all programmes.
6. Involve more students in collaborative research projects so that their capacity is improved
7. Harmonise curriculum at regional level so that there is free movement of health professional students and graduates.
8. Improve accessibility for virtual mobility programs like online ground rounds
9. Establish tools to regularly review the outcomes of international partnerships.
Lives of about 6.6 million people who dwell in the cattle corridor of Uganda where livestock production is the main agricultural activity are being threatened due to climate change. Climate variability and changes in extreme weather have significant impacts and are among the most serious challenges to society in coping with a changing climate (CCSP, 2008). Climate change is characterized by
variations of climatic variables in mean and extreme values. Extreme climatic events, such as heat waves, floods and droughts, can have strong impact on society and ecosystems and are thus important to study. Research findings revealed significant changes in rainfall and temperature extremes which are slowly changing the agro-ecosystem of the cattle corridor. For example total number of wet days showed weak increasing trends while frequency of heavy precipitation days showed non-significant decreasing trends (P > 0.05). Number of consecutive dry days, CDD was on the rise slightly increasing. Percentage hot days and warm nights were significantly increasing (P < 0.05). Number of warmest nights (TNx) and hottest days (TXx) was also significantly increasing (P < 0.05). Farmers’ perceived changes in rainfall patterns and temperatures were in close agreement with the observed trends. The observed increasing temperatures, coupled with declining CWDs and increasing CDDs will most likely result into increased heat stress to livestock, drying of most surface water sources and changes in pasture species composition. Adaptation strategies included fencing off grazeable land, use of drought tolerant pasture species, and utilization of crop residues, excavation of individual shallow wells, water harvesting and conservation among others. Limited access to climate information and insecure land ownership rights were key barriers constraining adaptation of especially female farmers to climate change.

Climate change: a challenge to livestock development

The cattle corridor must get concerned of climate change because it’s considered among the most fragile regions in the country (NEMA, 2001). Livestock which entirely depend on grazing of natural pastures are the main contributors to survival of livelihoods in the cattle corridor. Climate change and increased variability of rainfall and temperature have further complicated the situation of sourcing quality feeds for livestock. Scarcity of livestock feeds results into poor livestock condition, a drastic reduction in both quality and quantity of products like milk, retarded growth especially in young animals and in extreme scarcity, death. Therefore increasing livestock productivity in the cattle corridor means enhancing farmers’ adaptation to impacts of climate change and variability. However, a clear understanding of farmers coping and adaptation strategies and perceived changes in rainfall and temperature variability are a prerequisite for planning effective adaptation strategies to climate change.

Shortcomings of the current land tenure system and access to information to guide coping and adaptation strategies

Traditionally, most of the land in the cattle corridor was owned communally. The communal land ownership system is slowly changing into private individual ownership with increased individual rights to land. However, this transition has come with a number of challenges including community conflicts while demarcating boundaries among others. In worse situations, some human lives are lost during conflicts. Research results indicate that it’s almost impossible to fence off grazing pastures for livestock and plant drought tolerant pastures species when land is owned by the entire community or landlord. Fencing or paddocking was perceived as an effective adaptation strategy in ensuring availability of pastures during severe drought periods by controlling grazing. Farmers highlighted that by partitioning the available grazeable land into paddocks, some pastures within specific paddocks can be reserved for the anticipated dry season. However, without land ownership rights such adaptation developments can’t be successfully implemented.

It was further revealed that fencing off communal land in most cases is interpreted as land theft and can attract attention from the public and criminal charges preferred to the concerned individuals/persons for trespassing. Lack of reliable information concerning rainfall and temperature and how these are most likely to change in the future complicates farmers’ decision making as they plan for adaptation. It was cited there no clear definitive platforms/pathways known to farmers where they can demand for climate information.
KEY MESSAGES TO POLICY MAKERS

Frequency of rainfall and temperature extremes like consecutive dry days (CDDs), percentage hot days and warm nights are increasing

Loss of livestock due to shortage of pastures perpetuates poverty and increases household vulnerability to food insecurity

Insecure ownership of land and lack of access to climate information constrain adaptation

Improved access to climatic information by farmers while streamlining existing communal land tenure systems can effectively facilitate adaptation to climate change in the cattle corridor of Uganda.

Policy recommendations

Research findings demonstrate that adaptation to impacts of climate variability and weather extremes in the cattle corridor are mostly constrained by lack of secure rights to land ownership and lack of information concerning climate extreme events such as severe droughts. The following are key policy recommendations;
1. Ensure secure ownership rights to land by streamlining and increasing individual entitlements/rights of land ownership in a communal setting.
2. Majority (68%) of farmers reported never to have ever received any early warning information concerning climate extremes. Therefore policies that guide and ensure free and easy access of timely climate information to male and female farmers in order to help them devise better and appropriate strategies is urgently needed. Platforms/channels like use of mobile public announcements among others could be used while delivering information across villages.
This policy brief addresses issues related to farmers' limited access to relevant information that can enhance adaptation and mitigation to climate change in Uganda. Based on findings from a research study that explored communication strategies that can enhance mitigation and adaptation to climate change in the Lake Victoria Basin, the study revealed that there was a general lack of information on mitigation and adaptation measures to climate change amongst farmers, which has contributed to reduction in agricultural production and increasing poverty levels. For the media coverage, findings reflected that the coverage is event–driven and largely based on local sources with government officials as the key actors, while climate is framed as a local/national issue, where government has the responsibility for climate action, with climate change ranking low on the media's news agenda.

**Recommendations**

**Government and district authorities:** to use multi-media communication strategies (including mobile phones) for campaigns to increase farmers’ access to information on measures for mitigation and adaptation to climate change as a means of increasing production and reduction in poverty levels

**Training institutions:** review of the curricula of journalism training institutions to include more focus on the relationship between good environment management and sustainable equitable development. In addition, need to build journalists’ capacity to practice global journalism by exposing journalists to global environment and climate debates

**Media Research:** Media and communication industry are very dynamic, which calls for more research on participatory communication strategies that can be used to have various stakeholders participate in influencing decisions on environmental management.

**Journalists & Editors:** To network more with researchers and scientists to get up-to-date environment and climate information to share with stakeholders like farmers.

**Introduction**

Although climate change is a major global concern, this is critical to African countries, like Uganda, that have agro-based economies and dependent on rain-fed agriculture. These have been adversely affected by climate change. It is acknowledged that the impacts of climate change cannot be predicted with precision, but information on how these hazards can be mitigated or means of adaptation is available. However, the rural farmers often lack the resources, including information, to mitigate and adapt to these changes. The main objective of the study was to identify communication strategies that can enhance mitigation and adaptation to climate change in the Lake Victoria Basin. The study examined the access to communication channels and sources of information on climate change; the levels of knowledge and awareness about measures of mitigation and adaptation; and also analysed the treatment of climate issues in the media in Uganda.

**Context and importance of the problem:** An assessment of Climate Change impact by the *National Development Plan* (2010:316) reflects that Uganda is amongst the most vulnerable and least climate resilient due to poverty and low income diversity, with climate change expected to affect negatively agricultural production, food security and the livelihoods of many people. This will retard Uganda's social and economic development, thus climate change being a big setback to reduction of poverty levels and achievement of the other MDGs. Limited awareness at all levels about the causes of climate change is noted as a major constraint and among the strategies recommended to address this shortfall is the need to increase climate change awareness, as well as conducting climate change research for better adaptation and mitigation. This research study sought to fill these two gaps identified thereby enhancing the realization of the objectives in Uganda's National Development Plan.
Under the Makerere University Research Program 2010-2017, Climate Change is one of the areas identified under the priority research theme of ‘Environment and Natural Resources Management’. The research study also helped to meet the guiding principle of Makerere University being part of the global, regional and national research networks, for example, the researcher became part of the Global Media Climate Network of researchers.

Policy Implications:

- Enforce policy on programming quotas for media to have more informational and educational programs, rather than entertainment. This would cater for increased farmers’ access to climate information and improve agricultural production and incomes that can lead to reduction in poverty levels
- Increase funding for public awareness campaigns on climate change so as to improve national food security
- More funding for media and climate change research so as to monitor how local information needs are being met
- Curriculum review to mainstream environment issues so as to equip journalists to report on these issues competently.

Conclusion: Communication and information are pre-requisites for any behavioural change to take place, so development communication requires identification of those communication channels that offer opportunity for participatory communication by the target group. Most farmers reported radio as the main source of information, as well as interpersonal channels. Mobile phones were also readily available. Government and other development workers should make use of these multi-media channels to ensure better information access to farmers on measures for adaptation and mitigation to climate change.

There are very few research studies that have been done on media and climate change in Uganda, so these study findings added substantial value to the scanty literature available and are a useful guide for policy formulation and review.
Opb 204: Uganda’s Salt Industry: The Current Status And Future Prospects At Lake Katwe

Executive summary
Despite the huge salt production potential of Uganda from Lake Katwe, the renewable resource remains highly untapped as output levels are 7.5% of the estimated potential output. The key obstacles inhibiting the growth of the salt industry relates to the lack of investment and low level of technology adoption and infrastructure. It is recommended therefore that a mix of strategies aimed at rejuvenating the sector to achieve optimum harnessing of the sector be adopted. This would diversify the export market of Uganda and promote industrialization in the short-to-medium term.

Introduction
Uganda is well endowed with commercial salt reserves evident in the raw material deposits of Lake Katwe. It is well known that salt is a very important commodity for all human beings. Today, 95 per cent of Uganda’s salt for domestic consumption and the related industry is imported from the neighbouring countries despite the existence of this “white elephant”. Over the past 40 years, efforts towards the full exploitation of the resource in Lake Katwe to contribute to the economic development of the country have been futile due to the lack of scientific evidence. Therefore, rudimentary and unsustainable methods of salt mining and processing continue to prevail at the lake hence small and impure yields. Moreover, the methods pose great health and safety risks to the miners, mostly women who provide over 70 percent of the labour force. More recently, joint scientific studies involving researchers from Makerere University Kampala, Uganda and KTH Royal Institute of Technology, Stockholm, Sweden have undertaken to back up and/or justify the economic venture in Lake Katwe salt raw materials. The scientific research results show positive developments seeking to develop much improved methods for purification of salts from the lake deposit to standards safe for domestic and commercial applications.

Current status
Currently, the average salt production in Uganda is about 3,000 metric tonnes per year and has been declining over the years. This production is about 7.5 percent of the industry’s potential which has been previously estimated at 40,000 metric tonnes per annum. With an average annual population growth rate of about 3.6 percent in Uganda, it is estimated that the demand for domestic and industrial salt will increase. The industry, mainly at Lake Katwe, relies on solar salt mining which is artisanal in nature with very low technology application and infrastructure. Due to the heavy dependence on the natural environment, production generally takes place only between 6-7 months each year. There is need for a major reform of the sector into a modern one that will boost output from the sector and become competitive on the export market. Thus, seasonal variations greatly affect the production process and hence...
output levels. It should also be noted that besides common salt, also known sodium chloride, various types of economic salts can be produced from Lake Katwe raw materials. Furthermore, transformation of the present traditional salt industry into a more vibrant sector to spur production, boost revenue, and employment requires huge investment.

Conclusions and future outlook

Uganda undoubtedly has enormous potential to rapidly develop her salt industry into a buoyant sector and increase salt production to meet the rising demand for the “white gold” within the regional market. However, this potential can only be realized if the industry is supported to build the structures, framework and the needed policy instruments as has been given to other sectors. As a major first step, a comprehensive strategic policy that engages all relevant stakeholders-academia, government, local communities, and investors is recommended. This would address major concerns of the local communities who fear losing their livelihood when big companies are given access to the salt mines to extract and process salt. Moreover, a successful strategy would also require a well-functioning legal and legislative instrument for the sector. Finally, there is need to induce direct foreign investment into the sector through incentives to potential investors via a mix of policy instruments.
OPB 207: The Prospects and Challenges of Promoting Efficient Biomass Energy Technology Diffusion in the East African Lake Victoria Basin (LVB) Communities

Authors: George A. Migunga 1, Josephine W. Ngaira 2, Jacob Mbego 3, and Wilson Okaka 4

There are looming prospects and challenges of promoting efficient biomass energy cook stoves technology diffusion in the east African Lake Victoria basin communities. The vital policy, knowledge, skills, funding, capacity, and research gaps need to be plugged to achieve target environmental and natural resources sustainability. With budget support from SIDA to IUCEA, this collaborative study identified the barriers to adoption of technology innovations, prescribed and developed joint solutions with the end-users, and made prototypes which were preselected for innovation funding after the Arusha EAC exhibition event. The objectives of the innovation are to design, develop, exhibit, disseminate, and commercialize the cook stoves with improved designs that ensure efficient biomass energy conversion and smart utilization.

Sustainable Environment and Efficient Biomass Energy Stoves

Common Policy Challenges
- Massive income poverty; policy gaps; information gaps; research gaps; skills gaps and gender inequality are key barriers to technology innovation adoption/ diffusion.
- Biomass is the major energy source for homes, businesses, and institutions.
- Biomass energy demand outstrips its supply beyond sustainable yields.
- Most biomass energy stoves in use are inefficient, wasteful, and unhealthy.
- Cultural attachments favour traditional biomass (inefficient) cook stoves.
- Malnutrition and disease effects
- Civil society (CSO) capacity building
- Environmental education programs.

Key Policy Reform Issues
- Policy consultations, development, communication, debates, application, monitoring, evaluation, and review.
- Policy commitments, awareness, budget, relevance, and enforcement.
- Policy priorities, innovations, PPP, research, outreach, and curriculum.
- Gender equality and women’s role.
- Biodiversity loss and poverty links.
- Curb domestic violence such as VAW.
- Environmental degradation, massive climate change losses and damage.
- Cancerous official (state) corruption.
- Access to energy finances and credits for individual, family, community, or institutional biomass energy projects.

More Messages
- Special funds are vital for biomass energy research, policy, and saving projects.
- Research and policy gaps should be bridged.
- Women leaders in energy efficiency policy.
- Energy farming projects.
- All policy coordination.
- Social forestry projects.
- Public communications.

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Most of the waste collected in sub-Saharan African cities is biodegradable but it is usually dumped in landfills, creating environmental and health challenges for residents. However, there are biodegradable waste treatment methods that could mitigate these challenges. This study analysed anaerobic digestion, composting, vermicomposting and fly larvae waste treatments using life cycle assessment (LCA). The impact categories assessed were energy use, global warming and eutrophication potential. The results showed that anaerobic digestion performed best in all impact categories assessed. However, management of the anaerobic digestion process is critical and methane losses must be kept very small, as otherwise they will cause global warming.

Context and Importance of the problem
Landfilling is the dominant urban waste treatment method in sub-Saharan Africa (SSA) countries (Ketlogetswe & Mothudi, 2005). Given that the largest fraction of the waste generated in these countries is organic waste (Hoornweg & Bhada-Tata, 2012), its treatment in landfills, which in most cases are open dumps (Henry et al., 2006), leads to environmental, social and health problems (Mbuligwe & Kassenga, 2004). Furthermore, the capacity of most landfill sites has already been exhausted and land for further construction or expansion of landfills in urban areas is no longer readily available within close proximity to cities. All these shortcomings make it necessary to look for alternative treatments for the wastes generated. At the same time, soil degradation is a widespread phenomenon in SSA (Henao & Baanante, 2006). One reason for this is the loss of crop nutrients from the field each season through crop harvests with no replacement (Mubiru et al., 2007). This problem could be alleviated by treating biodegradable waste using suitable methods and then applying it to crop fields as a fertiliser or soil conditioner. It is therefore urgent that other more environmentally suitable waste treatment methods be explored for the biodegradable waste. Some common technologies available to treat biodegradable waste include anaerobic digestion (AD), composting, vermicomposting (composting using earth worms) and fly larvae composting (FLC). However it is not clearly known which of these methods is the best performing from environment point of view. Therefore the aim of this study was to investigate these different technologies using the lifecycle assessment methodology.

Critique of current policy
The current policy of landfilling waste though relatively cheap and convenient has numerous disadvantages. Some of these include: Landfills are a source of environmental pollution mainly in the form of methane and leachate generated from them; Land to establish landfills is becoming more scarce/ expensive especially close to the city; People oppose having landfills close to their homes for several reasons and vital resources example plant nutrients are lost when waste is landfilled.

Policy recommendations
- Ban landfilling of organic waste and have this waste treated using alternative technologies.
- Encourage separation of organic waste from the other waste through massive awareness of the importance of this activity. Organic waste should then be collected and taken to be treated using alternative methods.
- Provide subsidies and intensive training programmes to increase the viability of the alternative organic waste management technologies.
African soybean productivity is the lowest in the world with an average yield of 1073 kg ha\(^{-1}\) representing 45% of the world's average (2371 kg ha\(^{-1}\)) (FOASTAT, 2010). This fact is partly due to the non-availability in African tropical soils of \textit{Bradyrhizobium Japonicum}. Bradyrhizobium strains required by most of the exotic high yielding soybean cultivars for nodulation. Being a crop with high protein content (up to 40% in the seeds), soybean requires a huge amount of nitrogen, especially at pod filling stage (Machido et al., 2011), 100 to 200kg ha\(^{-1}\) (Sinclair and de Wit, 1975; Cattelan and Hungria, 1994). Nodulation is key in soybean production because nodules have capability of fixing a large quantity of atmospheric nitrogen while in symbiotic association with \textit{Bradyrhizobia}, over 300 kg of Nitrogen per hectare has been reported when plants are adequately inoculated (Bezdicek et al., 1978; Peoples \textit{et al.}, 1995; Anuar \textit{et al.}, 1995). In addition, due to its ability to fix nitrogen, soybean has capability for soil fertility improvement (Yusuf \textit{et al.}, 2006), their residues (haulms) obtained after harvesting improve the soil condition, and on decay supply nutrients to subsequent crops (Muhammad, 2010).

**Context and importance of the problem**

1. To increase yield in soybean production in Africa, soybean varieties are grown with the application of N fertilizer. This approach has shown poor efficiency in tropical soils, its efficiency on soybean, is usually less than 50 percent, soybean has even been characterized as being rather non-responsive to the application of N fertilizer (Mengel \textit{et al.}, 1987). Besides, N fertilizer is very expensive and non-affordable by smallholders, thus if soybean were to depend only on this N source the profit for farmers would be low or non-existent (Cattelan and Hungria, 1994). It is also important to consider the environmental threat borne by the application of N fertilizer.

2. Another approach uses Biological Nitrogen Fixation (BNF), whereby the \textit{B. Japonicum} which is not indigenous in the African tropical soils is supplied in the form of inoculants either directly on the seeds before sowing or after germination. This approach has also shown several limitations; factors such as unfavourable storage conditions from fabrication point to application points (Keyser \textit{et al.}, 1993), disparity between cultivars for which these inoculants are made and those being cultivated in African tropical areas (Machido \textit{et al.}, 2011), competition between indigenous and exotic strains (Ge and Xu, 1982), deficiency in phosphorus of many African tropical soils (Sanginga \textit{et al.} 1995), non-availability of commercial \textit{B. japonicum} inoculants (Tefera, 2011), lack of sound system for transportation and distribution of inoculants, lack of programmes to assist and teach farmers how to apply BNF (Kueneman \textit{et al.}, 1984) and the time and additional cost it causes, have been reported to lead to this situation.

**Critique of policy option(s)**

1. Although BNF has enabled large progress in African soybean productivity and partly solved the environmental threat brought about by the application of N fertilizer, its limitations made it poor management practice for sustainable and effective soybean production in African tropical areas. Thus the need for developing soybean cultivars able to effectively nodulate with indigenous Bradyrhizobium strains.

2. Researchers at IITA have found that the development of cultivars that are able to nodulate with indigenous and readily available Bradyrhizobium strains is the soundest approach to alleviate the challenges faced by Africa's soybean production; cultivars with such capability are termed “promiscuous” cultivars (Pulver \textit{et al.}, 1985) or freely nodulating soybeans. Abaidoo \textit{et al.} (2000) detected \textit{Bradyrhizobium} spp. populations in approximately 74% of the African soils. Success in a breeding program firmly relies on the parental materials used to initiate the breeding scheme, thus knowledge on cultivars regarding the traits under selection is an obligatory starting point of breeding programmes.
3. This study screened germplasm available at Makerere University Agricultural Research Institute (MUARIK) for their ability to effectively associate with indigenous Bradyrhizobium strains. It was found that among the 65 germplasm screened, 12 were responsive and those 12 have all a local (African) origin either they were bred in IITA or in Uganda or from Zimbabwe, germplasm from AVRDC or USA were not responsive.

**Policy recommendations**

- Breeders must take into consideration the results of this study to select parental materials to initiate their breeding program.
- Direct selection can carried out using these materials for quick release of promiscuous soybean cultivars that suit the best Ugandan agricultural conditions.
- Farmers can even directly pick from these twelve freely nodulating soybean cultivars to grow and improve their productivity.
- These must preferred not only for yield improvement, but also for to improve soil fertility for subsequent crops and avoid soil pollution due to the application of fertilizers.
Executive summary

In the rangelands of southwestern Uganda, pastoralism is being transformed into an agro-pastoral system. In an effort to increase productivity, agro-pastoralists are crossing their Ankole cattle with Holstein Friesian to obtain crosses with higher milk production potential. However, nutritional requirements of the crosses are higher than those of Ankole cattle. Pastures which are the main source of feed may not supply the needed nutrients, especially during drought periods when the quantity and quality of forage drop significantly, hence affecting milk output. With low milk production and coupled with reduced forage quality, a deficiency in protein intake is likely to occur in calves, hence affecting their growth performance and age at breeding and calving.

Currently, the calves are allowed to suckle after milking has been done and are then grazed on pastures. However, farmers lack well established calf paddocks. All these result in inadequate nutrient intake, which in turn adversely affects the growth rates of calves. Yet, good calf rearing is essential for ensuring availability of future replacement stock. The current calf feeding regimes in the rangelands where tropical grasses constitute the primary diet make it unlikely that calves get balanced nutrient supply that meets their requirements.

Thus, this study determined the effect of lalab hay or home mixed concentrate (HMC) supplementation on the growth performance of the Ankole x Friesian crossbred calves grazing natural pastures. Daily liveweight gain (DLG) of calves that were supplemented with HMC was significantly higher than that of calves that depended entirely on grazing natural pastures. No differences were observed between calves supplemented with lablab hay and HMC. It was recommended that agro-pastoralists should provide protein supplements to crossbred calves grazing natural pastures so that they can grow faster and reach reproductive age quickly.

Problem statement and justification

The agro-pastoralists in the rangelands of south western Uganda depend entirely on natural pastures as the main feed resource. However, during the dry seasons forage becomes very scarce and a major constraint to cattle productivity (Okello and Sabiiti, 2006). There were efforts to improve pasture productivity and persistence using trials with selected farmers (Sabiiti and Tegnegne, 2004). Although it was shown that over sowing of natural pastures with forage legumes improved pasture productivity, persistence during the dry season and milk productivity of cows, many agro-pastoralists have not adopted the technology. The reasons for not adopting such technologies are not yet well established. Livestock feeding systems in the rangelands will have to change so as to match with seasonal changes in forage availability and quality, and the nutritional requirements of the emerging crossbred cattle if better productivity is to be realized.

Thus, this study determined the effect of lalab hay (LH) or home mixed concentrate (HMC) supplementation on the growth performance of the Ankole x Friesian crossbred calves grazing natural pastures. Forty five weaned crossbred calves aged six months from five farms were used. The farms were identified using names of the owners, namely Jovia, Joshua, Jonathan, James and John. Nine calves on each farm were randomly divided into three groups and assigned dietary treatments. The diets comprised: grazing calves on pastures only; grazing plus supplementation with 2kg DM/head/day of a home mixed concentrate (HMC); and grazing plus supplementation with a mixture of 2kg and 0.3 kg DM/head/day of lablab hay and maize bran, respectively.

Results

Apart from the farms of John and James, forage DM yields on calf paddocks increased as the rainy season progressed from September to early December, and thereafter decreased till early March. Mean forage yields were significantly higher on Jovia’s farm. Forage from Jonathan’s farm was of better quality due to higher crude protein content. Although Jovia’s farm had higher forage DM yield, it was of poor quality due to higher crude fibre content. Daily live weight gain of calves supplemented with HMC was better than that of calves that depended entirely on natural pastures (Table 1). There were no significant differences between calves supplemented with LH and HMC.
Table 1. Daily liveweight gain of crossbred calves under different dietary treatments

<table>
<thead>
<tr>
<th>FARMER</th>
<th>Lablab</th>
<th>Concentrate</th>
<th>Grazed only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jovia</td>
<td>271</td>
<td>442</td>
<td>346</td>
</tr>
<tr>
<td>Joshua</td>
<td>348</td>
<td>422</td>
<td>334</td>
</tr>
<tr>
<td>Jonathan</td>
<td>603</td>
<td>721</td>
<td>417</td>
</tr>
<tr>
<td>James</td>
<td>438</td>
<td>559</td>
<td>317</td>
</tr>
<tr>
<td>John</td>
<td>457</td>
<td>554</td>
<td>372</td>
</tr>
<tr>
<td>Mean</td>
<td>423</td>
<td>540</td>
<td>357</td>
</tr>
</tbody>
</table>

Recommendations

The study revealed that providing protein supplements to crossbred calves grazing natural pastures enables them to grow faster and reach the reproductive age quickly. Thus, improved nutrition will further enhance the productivity of crossbred cattle, and in turn boost household income from milk. Basing on these results, it was recommended that agro-pastoralists should be facilitated so that they can:

1. Set up calf paddocks with better pastures. Agro-pastoralists expressed their inability to meet the costs of fencing materials like fencing posts and barbed wire.
2. Establish fodder gardens of leguminous forages for supplementary feeding of calves as well as milking cows. Leguminous forages tolerant to the climatic conditions in agro-pastoral areas have been identified. Planting materials of these forages should be made available.
3. Acquire knowledge and skills in forage conservation and pasture management. Farmers need training in livestock feeding and feed/pasture management.
Chimpanzee populations are being threatened by human activities through degradation of their forest habitats as a result of increase in human population and consequent demand for both food and timber products. Chimpanzee numbers are declining because of hunting for bush meat, killing of animals to capture infants for pet trade, disease, loss of habitat to agriculture, mining, and fragmentation of their habitat leading to the isolation of small populations which are likely to become genetically unviable in the long term. This species is found at a low density wherever it occurs (less than 1/Km$^2$ of forest on average across much of their range) and has a relatively slow reproductive rate, with one infant born every 4-5 years. Because of these threats, chimpanzees are considered as an endangered species.

As in all the areas where chimpanzees exist, conserving chimpanzees in Uganda pauses serious challenges. One major challenge is that there is uncertainty about the threats to chimpanzee populations occurring outside protected areas, which are threatened by habitat destruction and fragmentation. For instance there are chimpanzee populations still found outside protected areas, particularly in Hoima, Kibaale, and Masindi Districts of Western Uganda, but their size and threats to their populations are both largely unknown. Secondly, even within protected areas, chimpanzees are impacted upon by illegal human activities, such as charcoal burning; pole cutting, and pitsawing and the consequences of these activities on chimpanzee populations are largely unknown. The last census of chimpanzees in Uganda gave an estimate of 5000 individuals with approximately 2100 individuals living in National Parks (Kibale 1000, Rwenzori 500, Bwindi 500, Queen Elizabeth, 35) and more than 50% of the total residing in forest reserves of western Uganda. These forest reserves, which are managed by the National Forest Authority allow some human activities to be conducted alongside conservation. Activities allowed include; pitsawing, pole cutting, and collecting of non-timber products.

**Context and importance of the problem**

Unfortunately studies have shown that allowing people access to resources within a protected area increases the vulnerability of that protected area to other illegal activities. Furthermore, degradation of habitats through human activities such as pole cutting and timber harvesting has significant effect on the population of chimpanzees.

For example from 2000 to 2010, chimpanzees in Itwara forest reduced from an estimated population of 120 individuals to approximately32 individuals. Despite the concern, Uganda National Forest Authority is not doing much to ensure that chimpanzees in forest reserves are duly protected from the effects of forest degradation. This policy brief is intended to inform government on the concern and accordingly advise on what should be done in form of policy shift.

**Critique of the policy options**

At the moment National Forest Authority is mostly concerned with ensuring availability of enough wood stock to cater for the country’s timber needs and export. Much as the mission of the authority mentions conservation of wildlife, it has not been put in practice. Evidence of this is got from the many illegal human activities that are ongoing in the forests. Hunting, grazing, pole cutting and gardening are among the common human activities ongoing in the forests. These human activities affect the status and distribution of wildlife and have the potential of causing adverse effects to the endangered chimpanzees. Forest Patrol to ensure that illegal activities are stopped at each forest reserve has been left to very few people; for example Itwara (8700 Hectares) and Matiri (5472 Hectares) each have one resident ranger to oversee the daily operations at the reserve including law enforcement and holding community conservation meetings. While Buhungiro and Kibego do not have a resident ranger. The implication of this is that illegal activities are ongoing in these forest reserves without any limitation.
Policy recommendations

We propose the following recommendations for policy changes basing on the study about the influence of human activities on the status and distribution of chimpanzees in forest reserves of Itwara, Matiiri, Buhunigo and Kibego, which concluded that status and distribution is negatively affected by human activities.

1. The conservation status of Itwara forest which was found to have a substantial number of chimpanzees be raised from reserve to National park level.
2. National forest authority should implement the nature reserve concept as prescribed in the forest management plan.
3. The one square mile enclave of private land in Matiiri be purchased by government and gazetted as part of a forest reserve.
Rangelands synonymously referred to as pastoral lands or grazing lands cover a substantial portion of Uganda’s land mass. These areas are regarded as marginal in terms of crop production due to their inherently low rainfall amounts leading to seasonal scarcity of water and low soil fertility. Historically, the major land use in the rangelands of Uganda and sub Saharan Africa at large was through Pastoral nomadism, a practice where pastoralists would move through predetermined routes in search for water and pastures. Due to their characteristic high spatial and temporal variability in precipitation, the functioning of the ecological system in rangelands was and is still dependent on complex inter-relationships between people, animal life, plants and the physical environment. In the face of increasing human population which has made seasonal migration of pastoralists almost impossible, sedentary pastoralism where pastoralists keep considerable herds of livestock in a defined area and on permanent basis has taken over nomadism. Sedentary pastoralism has had significant impacts on the ecological functioning of rangelands and has resulted into low livestock productivity and poor ecosystem functioning. In the view of the flagile nature of rangelands there’s need for practices that mimic the traditional structure of rangelands in current production systems. This policy brief analyzes the current livestock production systems, policy actions and gaps, and suggestions towards conservation-production approach for livestock production systems in the rangelands of Uganda.

Context and Impacts of Current Livestock Production Systems in Rangelands
The current livestock production systems in rangelands lie on an extreme scale which poses a threat to conservation of other biota. The current practices are characterized by gazzetting of grazing lands and intensification of grazing. Intensification of grazing has led to destruction of above ground vegetation (i.e. trees and shrubs) through browsing, trampling and impeded germination. More so, it has become a common practice for farmers to cut trees and shrubs as a way of expanding land for pastures. Deforestation in these lands is escalated by the high price for charcoal. There is lack of approaches that promote production of livestock on one scale and conservation of woody biodiversity on another scale. The impact is now evident in increasing water and pasture shortages, wind throws of infrastructure, silting of water sources among others. This is because woody species are pivotal in climate amelioration for the good functioning of rangelands. These plants provide shade which regulates the biophysical processes of the livestock, enhance water infiltration thus regulating water flow in rangelands, act as nutrient pumps for proper vegetation growth while supplementing food, fodder, medicines sources of the community. Therefore unless the two scales are balanced to have a sustainable livestock-tree/shrub production system, the current operation cost of rangelands will be on the rise.

Appraisal of Current Policy Options Regarding Rangelands Management
The existence of a Rangelands Management Policy and National Forestry Authority provides a ground for advancement of options that can enhance conservation and production approaches in rangelands. The rangelands management policy of Uganda highlights areas of focus to be restocking of areas affected by civil strife, improvement of management practices through regular livestock census, cattle breeding policy, livestock improvement, improvement of animal nutrition, disease control, sectoral intervention programs such as diary master plan, meat master plan study, animal production programs, promotions of wildlife ranching, livestock health research institute and national animal genetic resource programs. On the side of plant conservation the National Forestry Authority of Uganda focuses on supervising the portfolio of Central Forest Reserves on a sustainable basis, and to supply other high quality forestry-related products and services in accordance with sound financial and commercial practices. From the current policies it is evident that there is lack of a chain that can connect conservation and production practices in rangelands. As a result pastoralists lack a
central coordinating unit which can oversee integration of conservation of especially upper storey plant species and livestock production to attain an ecologically sound rangelands ecosystem.

Policy Recommendations
These policy brief suggests the following recommendations;

1. The National Forestry Authority or Local Governments should be empowered to oversee conservation of woody biodiversity in grazing lands.
2. Research is needed to determine the stocking rate of woody biodiversity and livestock in an integrated production system.
3. There is need for establishment and empowerment of community based platforms among pastoralists to oversee conservation of woody biodiversity in pastoral lands at a local level.
The main objective for this study was to explore the erosion data from across Uganda gravel roads. Gravel/dirt/rural roads constitute a larger part of the total road networks in developing countries and are top-listed for accumulation of wealth for such countries like Uganda. Generally, quantitative methods through experimental designs were used. Data was generated from various experiments like sieve analysis, measurement of road rill/dune sizes, Atterberg tests, and dry-density tests were considered for the analysis and exploration. These were conducted to reflect the characteristics of road subgrades and sediments from these roads. A comparison of one of the original erosion models, USLE/RUSLE was done with the erosion model developed for the maintenance of gravel roads, EMMOG and conclusions reached.

Findings showed that the dry densities were average but not standard and comparable to those in other specific areas of the world. It was unique to engage these tests on sediments (eroded soils from road surfaces) and make conclusions therefrom. For example a small percentage difference between the two samples (sediment and borrow pit) was realized. It signified the fact that most soils used in the construction and maintenance are eroded. The data maps well to the erosion characteristics on these roads and data models could be used for future estimations. Finally, it was observed that the EMMOG reflected the erosion/deposition characteristics better than the USLE/RUSLE.

The study suggested that there was need to improve on the soils used in the construction/maintenance of gravel roads. There is also need to follow the actual design standards. Knowledge from this paper shall also help in road construction and maintenance designs.

**Context and importance of the problem:**
- Murram/gravel roads constitute a bigger percentage of Uganda’s road network.
- Bad shape of roads especially in rainy seasons that require actual follow up of experiments on damages. It also requires an indicator model that helps in maintenance before damages become extreme.
- Poor soils that require blending before use. Poor or no compaction done to improve on the CBR values.

Actual erosion and the influence of weather on roads, has been the main concerns for this study. Most studies on erosion and deposition are generally concerned with agricultural land and not engineering structures like roads and most specifically the non-gravel roads. Such roads form a big portion of Uganda’s agricultural-based roads. Similarly, several models on erosion and deposition have been formulated but they do not actually cater for the erosion on the murram or gravel roads.

Moreover, erosion from the features formed after some erosion is greatly ignored. This remains a challenge for most road managers and users in terms of construction and maintenance costs. This further raises the accident risks in terms of floods, landslides (duning), road squeezing (rilling or gullying), and rutting, among others. Modeling erosion from such features on these roads is an outstanding process that needs attention. Once the effects of the features like dunes and gorges formed after the first erosion are timely catered for, it can help a lot in road safety processes like managing accidents in time and in managing maintenance of roads in a better way. Similarly, Uganda’s economy is generally agricultural, and gravel roads are the center of transportation of the agricultural products.

**Critique of policy option(s):**
- Standard road designs exist but not followed during construction for example the poor blending and no or minor compaction.
- Unique exploration of data and follow up of detrimental road-features development.

**Policy recommendations:**
- Serious blending of soils used in the construction of murram/dirt roads
- Genuine, simple and cheap construction designs like compaction, concretizing ditches should be compulsory during the construction process.
- Use or application of the Erosion Model for Maintenance of Gravel Roads (EMMOGR)
Fig. 1: Bad Shape of Roads During and after Rains
The traditional source of energy in Uganda for domestic use has been firewood and charcoal. Charcoal has been used more in urban areas. With increasing urbanization in Uganda the demand for charcoal has risen. Charcoal requires cutting down of trees and the problem has become rampant in the country. This has led to deforestation in the country and is affecting the environment. It is in fact believed that the changing weather pattern and the reduction in rivers and lakes in Uganda is a result of deforestation.

Besides, as urbanization grows, with increasing slums there is a growing problem of managing waste. In many parts of urban areas, waste is everywhere because there is no system to collect and manage it. Nakulabye Briquettes Making Technology was formed with a view to addressing both these problems.

*Photo showing the problem to manage waste in Kalwere market place near Kampala*

There is need for the country to stop environmental degradation by reducing the number of trees being cut to reduce charcoal. The changing weather pattern with more dry weather and extended dry seasons is evidence of the problem. The epidemics like typhoid, cholera, Ebola all break out because of the challenge of managing waste. A lot of water is disposed off in water channels and people use these channels to wash clothes and even the utensils we use to eat. These issues need immediate attention. A large number of individuals and organizations have been thinking about how to address these challenges; NBMT came up with a solution of making briquettes out of waste while at the same time providing a cheaper solution to people’s energy problems. At our organization we consider waste as **NBMT-GOLD**.
Travelling on Uganda’s roads, charcoal is one of the key products if not the only product on some of the roads.

It is important that government comes up with various measures to solve these problems that are affecting our environment. Policies on afforestation to encourage people to plant trees, putting laws in place to stop people from cutting down trees.

Government should come up with a waste management policy to ensure that waste in urban areas is collected in identified places and even sorted out where applicable.

Government should support entrepreneurs who are providing alternatives to charcoal as energy source product. This can be in form of training and extending credit,

Government should put laws in place to gradually ban the usage of charcoal which is not only inefficient in usage but of a high cost.
Crop diseases are afflicting a number of food crops in Uganda and are leading to considerable yield loss and subsequent loss of household income. The loss in yields is leading to famine in areas that are heavily affected by these diseases. Cassava is one such crop that is affected by a number of diseases that include Cassava Mosaic Disease (CMD), Cassava Brown Streak Disease (CBSD), Cassava Green Mite (CGM), and Cassava Bacterial Blight (CBB). These diseases are spreading to many parts of Uganda and other areas in East Africa. Cassava being one of the staple foods of many households is being ravaged and this is increased through

- unrestricted transfer of planting materials from one household to another
- lack of technical knowledge about the symptoms of affected plants and planting material
- Nonexistent policies governing the breeding and dissemination of improved cassava varieties to the public
- little national knowledge about the rate of spread of these diseases, the areas that are highly affected and the potential areas in which they are likely to spread.
- Less effective tools for frequent nationwide disease survey and analysis of disease data.
- lack of effective information dissemination channels to farmers in the countryside
- existence of few agriculture specialists to offer services at household level for combating the spread of these disease.

In order to develop timely interventions, National Crop Resources Research Institute (NaCRRI) has been mandated to carry out yearly surveys about these diseases. Currently, NaCCRI dispatches teams of surveyors who manually examine cassava plants for disease symptoms and record all the required data on paper forms. This a tedious and a hugely manual task thus it affects that coverage of these surveys in addition to leading to collection of potentially inaccurate data due to human tire and subjectivity. Given the large volume of collected data it takes long to be sorted and finally analyzed for trends thus taking long to inform policy. In this project, we present ongoing work in using digital imagery and artificial intelligence to help in automation of some of the tedious tasks during survey data collection, analysis and prediction. In the latest survey carried out in December 2014, we collected close to 25,000 images of disease affected leaves, stems and roots. We collected geo-location data with these images to help in the mapping applications.
**Context and importance of the problem**

Effective capture, sorting, filtering and cleaning of large disease datasets will greatly help in more accurate and timely analysis of information about cassava diseases. This information will be used in the surveillance and monitoring of the spread cassava diseases, provide more accurate predictions thus prompting interventions in terms of policy formulations, breeding of disease resistant cassava varieties and better information to farmers. The existing tools for country-wide cassava disease surveys are undermined by low man power and ineffective data collection, storage and analysis procedures. This has led to poor policy formulations and late interventions that have failed to curtail the spread of cassava diseases.

**What is achieved with the management and analysis of the survey image dataset**

During the survey, the teams captured approximately 25,000 images of folia, stems and root cuttings. This raw data was captured using smart-phone cameras. This data is intended to be used in a number of computer applications that include: disease severity scoring applications using Artificial intelligence, disease spread prediction applications over space and time (spatial temporal modeling applications), visual symptom extraction algorithms, disease geo-mapping applications, automated whitefly counting applications.

Cleaning up of the raw data and storage of clean data using this semi-automated management procedure was achieved. There was an extraction of close to 60% of clean and usable data from the raw dataset. The intended applications can now use the cleaned and stored datasets. The analysis of the data will present more accurate information for the intended purposes and can help in formulation of informed policies for curbing the spread of cassava diseases.
In Kampala city about 60% of animal manure generated is discarded leading to health and environmental challenges. However this manure can be used as fertilizer in crop production and currently about 30% of generated animal manure is for this purpose mainly in the form of composted animal manure. The manure could also be vermicomposted or anaerobically digested and the vermicompost/digestate used in crop production. This study evaluated the performance of different organic fertilizers namely vermicompost, digestate and composted cattle manure on growth and yield of maize. The experiment was carried out at Makerere University Agricultural Research Institute Kabanyolo for two seasons (October 2013 to February 2014 and March to June 2014). No significant difference (P > 0.05) in the different organic fertilizers was noted in both the growth and yield of maize in each season. However a significant difference (P < 0.05) in both crop growth and yield was noted in the different seasons with the performance in season two generally being better than in season one. The interviews conducted with farmer groups showed they generally preferred using composted manure over other organic fertilizers for a variety of reasons. It can thus be concluded that this fertilizer is best for Kampala thus should be promoted by the municipal authorities to address the rampant poor disposal of manure in Kampala.

Context and importance of the problem

Urban agriculture plays a prominent role in the food security of cities in many low income countries. On average, over 35% of the households in sub-Saharan African cities, including Kampala, currently engage in some form of urban agriculture. Of these, an average of 13% is engaged in livestock production and 36% in crop production. However, in Kampala, the latter has been significantly affected by soil degradation, leading to reduced yields. This is because nutrients lost from the field each season through crop harvests are not replaced. A remedy to this problem could be to encourage use of animal waste as fertilizer on the soil to improve its fertility and increase crop yields. Animal waste can be used as a fertilizer in many different forms, with the most common being direct use. Alternatively, the manure can be vermicomposted, anaerobically digested or stored/composted before use. However, it has not yet been clearly established which of these options would be most beneficial in producing better crop yields when applied to soils in Kampala. The objective of this study was thus to evaluate the performance of different organic fertilizers, namely vermicompost, digestate and stored cow manure, on maize yields.

Critique of policy option(s)

The animal waste produced in Kampala mainly consists of animal faeces (poultry droppings) and urine. Most of the animal manure generated in the city is discarded in some way (60%) or is used as fertilizer on crop fields (32%). Many farmers discard the manure as there is no comprehensive national urban policy and institutional framework to regulate the use of manure in the country. In addition the smallholder farmers attach little importance to manure management. The urban crop-producing farms also ignore the resources in the manure, resulting in soil degradation and reduced crop yields. In Yaoundé city, Cameroon, on the other hand, most of the manure generated is used as fertilizer on crop fields within the city, while about 10% is sold as fertilizer to other provinces. This has been attributed to the higher level of awareness among urban farmers in Yaoundé of the contribution of manure to soil fertility.

Policy recommendations

- Put in place a comprehensive national urban policy and institutional framework to regulate the use of animal manure in the country
- Animal manure is a resource and it's important that urban farmers are made aware of this
- Encourage addition of value to manure through vermicomposting and anaerobic digestion as this brings additional benefits
At each of five schools in Kamuli district, Uganda; SL program established model school gardens to produce food for pupils' lunch at school; generate planting materials (seeds, cuttings and seedlings) that are distributed to pupils' homes or to other start-up schools. Every recess term (June–August), university students offering agriculture-related degree courses spend 10 weeks doing field-attachment involving: helping improve the school gardens; teaching agriculture and related science subjects based on the national curriculum; working with the community on their agricultural and nutrition projects. The goal for the university students is to get exposed to real world issues such as food and nutrition security, soil fertility, access to water, health and sanitation and learning other cultures. The impact of SL program include: a) improved child nutrition by building children’s and parents’ awareness of nutrient-dense foods—fruits and vegetables; b) strengthened quality of existing lunch programs in three schools; c) transferred agriculture, health, sanitation knowledge and skills to children and their families; d) helped improve school children’s and leader’s attitudes about opportunities in agriculture; e) provided information on various crops and high yield production techniques that helped several children to develop gardens on their own, now helping them pay their secondary school fees; f) generated food for school lunches, planting materials for the children, and teaching about agriculture—all contributing to more sustainable school lunches and knowledge transfer to children and their families; g) sold high-value garden products to assist in purchasing inputs for school lunches.

Context and importance of the problem:

Universal Primary Education (UPE) was introduced in Uganda almost two decades ago. In effect, the central government provides teacher salaries, stationery and scholastic materials; and capacitating grants for infrastructure such as classrooms and latrines. Feeding of the pupils at school is a responsibility of parents. In many areas of Uganda, especially rural ones, parents cannot afford to feed their children both at school and at home. However, with the insistence of local and central governments, most parents with children in UPE schools have had to accept to provide for a school lunch basically composed of one cup of maize-meal porridge. This cup fills the stomach of the child and silences the hunger, enabling the child to stay longer at school. But this cup provides only 50 Kilo calories. Ideally, the child is still hungry, but to the onlooker, since the child’s stomach is distended and the child does continue with school business, all looks fine.

The Required Dietary Allowance (RDA) per child of 6–12 years age bracket according to the World Food Programme (1999) is 700–900 Kcal for a lunch meal, if the child is to have normal growth and development. The focus of Service learning is to attempt to boost this basic lunch of porridge and solve the invisible hunger by providing a real meal that not only gives the children a full stomach but also gives more nutrients for better growth and development. The lunch meal currently given by the service learning program provides 800 Kcal.

When a child is hungry she is less likely to attend school, if she does attend, she cannot listen and learn effectively (CSRL, 2012). Her end of term grades will be low, she most probably will fail the national exams, and she would then fall out of school. With another youth, they will become young parents, and because they lack resources, their children are born into food insecurity which extends to school where there is no food, and the cycle continues. To break the cycle, both girl and boy children must stay at school for as long as is possible. In this way, they can pick up more skills and knowledge; prepare for a better future than their parents did and therefore, expect to jump out of the poverty–hunger cycle.

Critique of policy options:

Currently, UPE is a government program which emphasizes school attendance by all school-age children. Universal primary education policies and the associated large school enrollment rates mean that most schools today need to focus on improving the quality of education. Among the biggest challenges are: poor quality teaching, unsanitary conditions, hunger which hinders the ability of children to learn. This hunger hits the young and virtually disables their brains, bodies (through stunting) and future.

Policy recommendations:

a) Promote school gardening for all UPE schools where there is no school lunch programme;

b) Institutionalize service learning/experiential learning as an educational concept/strategy;

c) Promote entrepreneurship training for all pupils/students.
**Fig. 1:** Pupils of Namasagali Primary school having a simple lunch of porridge

**Fig. 2:** Pupils of Nakanyonyi Primary school having a lunch of "Nyoyo"

**Fig. 3:** Pupils of Namasagali Primary school having a lunch of "Nyoyo"

**Fig. 4:** University students preparing a crop garden as part of the service learning programme
Fig. 5: In and Out-of-school Youth leaders after being trained in entrepreneurship at Namasagali College

Fig. 6: A pupil explaining growing of Orange Fleshed Sweet Potatoes during a Field Day

Fig. 7: Service Learners participating in construction of a teachers house at a UPE school

Fig. 8: Pupils managing a poultry project to produce eggs for their lunch programme
Smallholder farmers in Uganda are increasingly taking up production of High-Value Non-Traditional Export Crops. This is in anticipation of better income to reduce poverty. A study was undertaken to establish how farmers choose the High-Value Crops that they combine with the traditional crops (namely Maize, Beans, Coffee and Bananas) and the profits they realize from the decisions they make. Results show that farmers’ choices of crops and their combination leads to incomes that are 3.12 – 4.15 times lower than what they would have earned if they were well guided and supported. This is attributed to fear of risks at the expense of higher incomes. It is therefore important to formulate policies that will reduce risks, and create awareness among farmers to increase their adoption in order for them to earn more from better paying crops.

Context and importance of the problem

Prior to planting any crop each season, farmers make decisions to select the crops from a list of choices that either they plan to raise as cash crops or food crops. The choice depends on the family goals, expected returns, external influence, climate, soils, experience and knowledge to raise the crops. Dependency on one enterprise is risky and increases uncertainty. Diversification is therefore one of the ways used by farmers to mitigate risks and uncertainties. However, there is a lack of clear understanding of the basis for crop diversification by small-scale farmers in Uganda. Farmers invest their time and money but still fail to get expected incomes due to low factor outputs. Both output and input markets are highly unstable and remain highly unknown. Farmers don’t know with certainty how to combine the enterprises to get the highest income out of their limited and scarce resources. This is because they lack adequate support to improve their livelihoods, hence remain poor. This partly forces farmers to use inputs inefficiently and use methods that to them are risk reducing. There are scientifically proven methods to address the problem of how different enterprises can be combined on a farm to realized maximum benefits.

Currently farmers earn between Ushs. 711,518 and Ushs. 935,133/hectare/ season on average from their plans based on their own intuition. Their plans are comprised of Beans, Maize, Okra, French beans, Hot pepper, Bananas and Coffee. If farmers are supported to re-allocate their land, with the same resources, profits will be between 3.12 - 4.15 times higher. Their plans show that they fear risks and prioritise food security. They need support to embrace risks and be in position to earn much more than what is being earned under the current scenario.

Recommendations

- Since farm plans are sensitive to yield and price changes (which constitute risk), it is imperative to sensitize farmer to embrace risk in the farming business. If empowered they will shift away from crops with lower returns.
- Farmers also need to be supported to join or form groups/associations/cooperatives to have higher bargaining power for better prices and also enhance contractual market arrangements that will stabilize the prices.
- Yields of traditional and high value crops should be increased and stabilized through research. This should be done through result demonstrations organized by the National Research Organisation (NARO), private sector players and Non-Governmental Organisations.
- In order to further mitigate risks, more research to come up with varieties which are drought tolerant to stabilize production and yield will be critical. This can be handled by The National Agricultural Research System (NARS) that includes; NARO, Universities, Community Based Organisations, and Non-Governmental Organisations. Appropriate irrigation techniques will also be paramount to stabilize crop yields.
Grain legumes are vital components of livelihood, food and nutritional security of many people in tropics. Specifically, cowpea, chickpea and pigeon pea are exceptional grain legumes due to their tolerance to drought. However, the high damaging effects of a specific category of beetles called bruchids together with unsafe measures for their control compromises food and nutritional security as well as safety of food consumed in our communities. This policy brief thus highlights on available safe and good practices of handling grain legumes after harvest that can reduce food poisoning, support food and nutritional security among communities in Uganda. There is a need for massive sensitization on dangers and appropriate use of synthetic pesticides in stored grain legume produce, while demonstrating and supporting availability of chemical free innovations in communities for prolonged storage of grains.

Introduction

Grain legumes include a range of crops that are major sources of plant proteins in our diets. Cowpea (Vigna unguiculata), Chickpea (Cicer arietinum) and Pigeon pea (Cajanus cajan) are among the grain legumes that occupy an important place in food and nutrition of people in tropics (Abate et al., 2012). In Africa the three legumes are cultivated on over 11 million ha (43% of total area under pulses), of which 89.0 % is under cowpea production, 4.7 % chickpea and 6.3 % pigeon pea (FAOSTAT, 2011). They represent an important component of agricultural food crops consumed and are considered vital crops for achieving food and nutritional security for millions of poor people in the continent. These leguminous crops are important in farming systems of resource poor smallholder farmers due to their high drought tolerance compared to other food legumes (Odeny, 2007; Barrera-Figueroa et al., 2011).

High volumes of grain legumes are lost during post harvest handling. At farm level post harvest losses occur at different stages of crop handling (harvesting, drying, threshing, winnowing, storage, transportation, packaging and marketing). However, highest post harvest losses in legumes usually occur at storage stage. Overall, grain legume post harvest losses threaten food, nutrition and income security, thus aggravating hunger and poverty among small scale farmer households. Post harvest losses also results in wastage of expensive and scarce inputs including water, loss in market opportunity and nutritional value (Damte and Dawd, 2006).

In chickpea, cowpea and pigeon pea production, the highest grain loss during storage of 80 to 100 % is attributed to a group of beetles called bruchids (Ndoutoume-Ndong and Rojas-Rousse, 2008). Female bruchids lay eggs on the grains before harvesting and hatched larvae burrow into and feed on the grain contents, making them unfit for planting (Haile et al., 2003). The bruchids infestation and their excreta reduce the quality of these grain legumes and their products while their metabolic activities favour mycotoxin producing fungal growth thus making grains unsuitable for human consumption (Okello et al., 2010; Aslam et al., 2006; Haile, 2006).
Until now the management of bruchids in storage of these legumes has heavily depended on the use of synthetic pesticides which are detrimental to human health and environment, and may not be sustainable to rural resource constrained farmers. The uses of chemical free innovations are better alternatives to the dangerous and expensive synthetic pesticides in management of storage bruchids.

Current status of post harvest handling of grain legume in Uganda

According to our recently (2014) conducted household survey in Northern, Eastern and Southwestern parts of Uganda, all grain legumes across sampled regions were handled almost in the same manner. Results revealed that these targeted legumes were mostly being dried on bare ground while in some cases were left to dry in the field. These practices expose the grains to contamination with mycotoxins and bruchids infestation respectively. Mycotoxins are toxic compounds produced by specific types of moulds and these compounds have ability to cause cancer in our bodies. Majority of households (over 60%) in northern region of Uganda were using synthetic pesticides to manage grain damaging beetles called bruchids in stored legume grains. Similarly a substantial number of households in southwestern (30%) and eastern (27%) regions were also using synthetic insecticides. Unfortunately, all the grains (whether for food or planting or sale) were treated with synthetic insecticides. ‘No wonder there are increasing cases of food poisoning in Uganda especially in schools and even at household level’.

Majority of households in Uganda store the grain legumes in the same living house mainly in polyvinylchloride bags. However, some of the synthetic insecticides such as Aluminium phosphide tablets that were used are classified as fumigants and were applied in grains stored in bags. This shows that people misuse insecticides and get exposed to toxic chemicals for a long time in their homes.

In southwest and Eastern regions of Uganda, majority of households (over 80% and 58% respectively) were using numerous local innovations and these need to be standardized for up scaling. These were; use of wood ash, Cowdung ash, goat pellets, finely crushed burnt bricks, pesticidal plants, airtight created conditions, frequent sun drying of grains. Some of these innovations and other chemical free innovations (such as metal silos, super-grain bags, use of vegetable oil) have been validated for management of bruchids elsewhere and need to be adapted to our conditions in Uganda.

Policy recommendations

- Massive sensitization of farmers on the safety and appropriate use of synthetic pesticides in stored grain legume produce should be supported at all levels (local levels and National level).
- Demonstrations on use of appropriate chemical free innovations for storage of grain legumes should be supported at local levels and wide scaled up.
- Since effective chemical free innovations for storage of grain legume produce are available, agro-inputs dealers should be encouraged to make them available to stakeholders involved in grain legume value chain through establishing subsidies, import tax exemptions on such innovations.

“Yes, it is very possible to avoid incidences of food poisoning, food and nutritional insecurity in our communities through use of scientifically proven chemical free innovations in storage of legume grains”
OPB 310: Utilisation of the Elderly Women’s Lived Knowledge in the Management of Aflatoxin in Groundnuts
Muwesa Ruth

The study examined the construction of the elderly women’s lived knowledge and its utilization in the management of Aflatoxin in groundnuts. A case study of Basooka Kwavula Farmers’ Cooperative, Bugodi village of Baitambogwe Sub-county, Mayuge District in Uganda was used. The respondents were 101 of which the elderly women were 56% and 44% were other household members. The elderly women are the repositories of traditional and lived knowledge, which may be worth looking at given the aim of the PEANUT Collaborative Research Support Program (CRSP) to bring scientific knowledge to the farmers.

The methods of data collection were questionnaires, focus group discussions and key informant interviews which brought out the gendered knowledge and gender division of labour in undertaking shelling and sorting of groundnuts. Observation, photography, and social mapping were also used that enabled deeper examination of the subject matter.

The study findings revealed that: the elderly women’s lived knowledge is created, authoritative and utilized in the tasks undertaken in the controlling of Aflatoxins in groundnuts. The elderly women used their experience in the gendered roles as they prepared groundnuts as well as controlling Aflatoxins in groundnuts. Young children particularly girls valued this knowledge and took it as the gospel truth while the men depended on science.

In conclusion, in order to control Aflatoxins in groundnuts, the scientific community should value the importance of elderly women’s lived knowledge and should use their experience. This has a relationship with agriculture leading to the construction and utilization of their lived knowledge a key to development which is now valued and documented.

Context and importance of the problem:
Labour allocation depends basically on the elderly women’s lived knowledge that can be applied in the management of Aflatoxin in groundnuts. In groundnut growing areas in Uganda, it has been realized that there is a dearth of information about women’s knowledge, attitudes, practices, and constraints in relation to dealing with the Aflatoxin menace at each stage especially at the shelling and sorting of groundnut production (Harris, 2000). A limited number of studies have been conducted on Aflatoxin contamination of groundnuts in Uganda, (Lopez & Craftford; 1997, Sebunya & Yorte, 1990; Kaaya, Warren & Adipala, 2000, 2001). However, the information collected is not documented about the elderly women's lived knowledge in the management of Aflatoxin in groundnuts. More so, literature in regard to farmers' knowledge on the management of Aflatoxin in groundnuts is insufficient, and/or not clear, (Epieru, 2004).

This study questioned the extent to which labour allocation in household activities, such as shelling and sorting of groundnuts, utilizes the lived knowledge that elderly women have and apply as they undertake differentiated roles from those of men. In order to examine why labour is allocated to the elderly, among all the choices of labour providers in the household, the study contends that the rules and beliefs in the household dictate that the longer the experience of the members, the better the lived knowledge. The extent, to which such long experiences of the elderly women enable them to have access to knowledge, is examined in ways that reveal the authoritative means to instruct and share skills in the control Aflatoxins in groundnuts. This research therefore set out to examine how the elderly women's lived knowledge was utilized in the management of Aflatoxin in groundnuts at the post-harvest stage of shelling and sorting within the household.
Focus Group discussion

These findings also revealed that:-

i. The findings showed that both males and females shell the groundnuts as Kaaya et al, 2006 contends. As Kaaya et al, 2001, 2006, Sebukyu, 2002 reveals that men have more access to the knowledge and use of tools than the women. This is a gender division of labour as Harris et al, 2000 writes. This shelling and sorting of the groundnuts is done mainly at home whenever the grain is needed especially for source or being used as an accompaniment when having tea for visitors.

ii. The shelling of groundnuts using machines is mainly done by the men in this community. Findings reveal that men have more access to the tools than the women. The researcher also finds out that the machines for shelling need a lot of energy and more heavy that the women cannot use them more so the elderly women save for those women who are referred to as “kyakula sajja” literary meaning those women with the men's energy and power.

iii. Findings further revealed that the lived knowledge of the elderly women was highly appreciated and is taken as the gospel truth by the young respondents. The strategies for controlling Aflatoxin have to be the knowledge being passed on from generation to generation. However, the study revealed that, as respondents reached the age of 20 years they tended not to believe in the elderly women especially the boys, but for the girls the knowledge remains the best.

iv. Both men and women value the elderly women’s lived knowledge in managing their lives. The household members appreciated the gift of being with the elderly women in the same home stead. They all believe that the elderly women's knowledge help in the management of Aflatoxin in groundnuts.

v. The fact that the elderly women are mostly older than all the household members, their knowledge is taken to be authoritative, In this way, it is passed on while managing the Aflatoxin in the groundnuts and thus having it controlled.

vi. Gender division of labour is also observed when the shelling and sorting is given specifically to the young and the elderly. Furthermore, this work is done especially
during the working in the house, compound and at the cooperative place where Mrs. Kirabira is the chair person. This confirms the findings of Kaaya and Harris 2006.

vii. The utilization of the elderly women's knowledge contributes to the labour allocation in the post-harvest of groundnuts. The study further reveals that labour allocation is also the gender division of labour in the shelling and sorting of groundnuts.

viii. Groundnuts are food as well as cash crop. It is a gendered crop which have the attributes of gender relations. Women are the owners of the crop at the planting and post stage when money is not involved but change when cash is changing hands.

Above: Shelling and sorting of groundnuts

Critique of policy option(s):

The funds were the main limitation for the study to be carried out in time. Some respondents expected to be first bought or given money so that they could give the information. This hindered the researcher to have a big number and just stopped on 101 respondents. However, the researcher secured a temporary job to overcome the funds problem which worked wonders.

Secondly, there was problem of time limited due to the methodology used. The ethnographic research tried to be on its full capacity or expectations. However, the researcher overcame this limitation by going to the respondents and living with them for at least two days a month up to the time the study was completed.

There were some cases when men refused to be interviewed saying the study was for only women and especially the old. It took the researcher a lot of time to explain and even showing the student's identification in order to acquire information from some respondents. This was also followed by enticing the young household members as well as sharing information with the men. Furthermore, the respondents were good members of the Basooka Kwavula which laid a better baseline for being interviewed.
Policy recommendations:

i) This study has focused on the utilization of the elderly women's knowledge in the management of Aflatoxins in groundnuts. As such its scope was mainly on access to and control of that lived knowledge in the management of Aflatoxins in groundnuts, there is therefore need to move further and research on gender inequalities in the management of Aflatoxin in groundnuts.

ii) Another area of research required is to find out the gender roles in the management of Aflatoxin in groundnuts. This will give the differentiate roles of individuals in the management of Aflatoxins in groundnuts leading to the mainstreaming of the crop.

iii) Policy is a regulation or a bill to curb some of the bad habits in a given country, therefore, this study can used as a bill to help in regulating the Aflatoxins in groundnuts. This can use as a way of value addition to groundnuts so that Aflatoxins are curbed in the seeds. Recommendations for informing policy reform or planning and documenting the elderly women' knowledge. The legislator in charge of policy making should also value this knowledge because it is lived experience and therefore should be included in the policy process of the country.
The common bean (*Phaseolus vulgaris* L.) is the world's most important food legume for human consumption. The bean production in Uganda declined over the last decade as a result of stress factors in farmers' fields, most important being bean Anthracnose, root rot and draught. National Agricultural Research Organization (NARO) developed and released varieties that were resistant to bean anthracnose. Farmers had little or no access to these varieties. NARO used Community-Based Seed Multiplication to enhance farmers' access to improved bean seed. This paper examines the effectiveness of CBSM in enhancing farmers' access to improved bean seeds in Kamwenge district.

**Importance of the problem**

Community seed multiplication has been used as a means of seed exchange in Kamwenge, Uganda for five years since 2008 by distributing quality bean seeds to producer groups and training in collective marketing and business skills. The overall goal of CBSM is to increase farmers’ access to high yielding, stress tolerant bean varieties through decentralized seed production and distribution. Given the community based nature of this approach and the dynamism of the variables, its effectiveness is likely to vary with location hence the need for context specific studies to assess its effectiveness. Therefore, the efficacy of the approach in Uganda’s context and factors influencing its performance were examined in terms the effect of CBSM on farmers' knowledge and access to better seeds.

**Policy option**

Community based seed multiplication involves organizing individual small-scale farmers and farmer groups, into small but effective seed production units with the objective of supplying quality seeds for farmers’ own use and for sale to others. Farmers learn to produce and market quality seed on their own. They are guided by a resourceful person who should be an expert in seed production. The group manages a communal seed multiplication garden and members also grow seed individually in the fields. Members collect all produced seed in a central place to look for a buyer.

**Community based seed multiplication involves many benefits here are some:**

- **Farmers’ knowledge.** Farmers are encouraged to produce seed on their own. Their knowledge of the general agronomic practices improves.
- **Seed access.** Farmers get an opportunity to grow recently released improved seed that are tolerant to their environment.
- **Seed security.** Farmers are assured of good quality seed from within their neighborhood.
- **Mobilization.** Farmers are encouraged to involve as many farmers as possible with the aim of marketing their seed. They learn the technique of mobilization.
- **Stronger voice.** Community based seed multiplication strengthen farmers voice for marketing and enable them sell at premium price.

**Policy recommendations**

- **Scale up.** Community Based Seed Multiplication should be adopted and scaled-up to other parts of the country to boost to the seed industry. It should be
- **Training of extension staff.** Training of agricultural extension staff so that they can become core facilitators after the expiry of the project is vital for the sustainability of the seed supply through community based seed multiplication. The trained staff can incorporate the idea of Community based seed multiplication in their day to day operations.
- **There should be participatory identification of the varieties to be promoted in an area.**
- **Farmers training.** Extension workers should emphasize the right spacing of beans during their trainings. Use of attractive printed materials may capture the farmers’ attention.
- **Wider target.** Seed dissemination strategies should ensure involvement of as many farmers in the multiplication exercise as possible. This will require adequate funding. For individual groups a system of seed recovery and re-distribution for more coverage is needed.
- **Increase of bean income.** Strategies that increase incomes from beans like linkages to seed companies for better markets should be emphasized.
OPB 313: Traditionally Fermented Milk Products In Uganda: Who Is Responsible For Their Future?
Norah Gulaita

It has often been said by business experts that majority of small scale enterprises in Uganda do not survive to celebrate their second birth day. The case is not any different for traditionally fermented milk products. This policy brief highlights the challenges that the processors of traditionally fermented milk products in Uganda face and what needs to be done to improve the status of the industry.

Introduction
Fermented milk products are highly nutritious food items often recommended by nutritionists particularly to high risk groups like children and people living with HIV/AIDS. To achieve optimum utilization of these products, they should be available for use by those groups at all times. Accessibility to foreign traditionally fermented products such as yogurt is often times limited due to financial constraints. Processing of milk products using traditional methods provides a suitable alternative to increase consumption of fermented milk products. In Uganda, rural livestock farmers are increasingly using indigenous technologies for value addition as a strategy to maximize profits in livestock production and also avail cheap products to the rural community to increase consumption.

Scope of the problem
Whereas efforts are being made to increase production of traditionally fermented milk products in urban and peri-urban areas, their consumption has not picked up to make such enterprises viable. Research by Land O’ lakes (2002) indicated that some potential consumers of traditionally fermented milk products such as bongo are skeptical about its quality. In fact some of them refer to it as spoilt milk which is not worth consumption. Findings by Mugampoza others (2011) indicated that bongo sold around Kampala was relatively free of dangerous microorganisms making it suitable for human consumption. On the other hand, DDA (2009/2010) report indicated that the quantities of traditionally cultured milk are expected to rise. There was need therefore to establish the hygienic status of bongo to clear out the doubt.

What did the study address?
A study was carried in Pallisa district, Eastern Uganda to establish the challenges to commercialization of bongo production and what needs to be done to promote that industry.

Results
The findings from the study indicated that;

- The process of making bongo is slowly being forgotten
- There is no profit realized from processing and selling of bongo
- The breeds of cattle kept in the area do not yield enough milk so as to get any surplus for bongo production
- The traditionally processed bongo was considered to be of poor hygiene by many people
- Some people have a preference for other beverages that serve as alternatives to bongo

What else was done?
To verify the claim that bongo was not hygienic enough, some laboratory tests were performed. The tests proved that indeed bongo obtained from Pallisa district was of poor hygienic status.

Conclusion
Considering the above challenges, the future of traditionally fermented milk products in Uganda is dull. The industry needs to be supported in order for it to become more viable.

Way forward
Initial steps need to be taken urgently to address the major challenges affecting the industry. These include:

- Documenting the methods of traditional bongo processing to ensure continuity of information flow from one generation to another
- Education all the chain actors about the good manufacturing practices (GMPs) and their role in ensuring wholesome and safe products. This will be improve the image of bongo so that more people can consume it making a viable enterprise
- The district needs to be helped acquire improved breeds of cattle to increase milk production and ultimately more bongo.
Livestock provide a potential pathway out of poverty for rural producers and actors along the marketing chain in Sub-Saharan Africa. Animal disease outbreaks and their mitigation measures increase the cost of animal production, reduce milk and beef yield as well as the farmers’ incomes, cattle sales and profitability. FMD outbreaks affect cattle owning households and actors along the marketing chain by threatening their assets and making their incomes insecure. Despite 75% of the global cattle population residing in low and middle income countries, exports from these countries account for less than 15% of the global value. Use of veterinary cordon fences in Uganda may not work against FMD which is airborne and can be easily blown by wind from higher to low lying areas. Stakeholders in the livestock industry and policy makers need a means of assessing FMD’s economic impacts when evaluating prevention and mitigation measures. All actors along the cattle-beef marketing chain lose significant income streams during FMD outbreaks. There is need to improve the animal disease control infrastructure and increase funding to the livestock sector towards improving animal health and productivity. GOU should facilitate livestock farmers to establish adequate and sustainable water sources on their farms to discourage communal watering and grazing points that are associated with fast transmission and re-establish disease surveillance teams at the community level to ensure early detection, reporting and response.

Context and importance of the problem

The livestock sector contributes significantly to the world economy, provides a source of income and livelihoods. Livestock provide a potential pathway out of poverty for rural producers and actors along the marketing chain in Sub-Saharan Africa and contribute significantly to achieving food security for the rural poor. Animal disease outbreaks and their mitigation measures increase the cost of animal production, reduce milk and beef yield as well as the farmers’ incomes, cattle sales and profitability. FMD outbreaks affect cattle owning households and actors along the marketing chain by threatening their assets and making their incomes insecure. FMD influences the level of sales for cattle and cattle products, marketable outputs, and reduce the input utilization efficiency and outputs quality, increase disease prevention and control (vaccination and treatment) costs; and international trade restrictions.

Despite 75% of the global cattle population residing in low and middle income countries, exports from these countries account for less than 15% of the global value of LLPs trade because these countries are endemic for FMD. In Uganda 73% of the farmers’ expenditure is related to health particularly for treatment of infectious diseases such as FMD. However, interventions towards the prevention and control of FMD have not been very successful.

Critique of policy options

Use of the veterinary cordon fencing to control wildlife and livestock movement, active surveillance, test and slaughter of all infected and in-contact animals during outbreaks, and judicious application of vaccines enabled South African countries to control FMD.

South Africa achieved FMD control by implementing strict movement control, test and slaughter of all infected and in-contact animals during outbreaks, wildlife game proof fencing, limited vaccination of cattle in high risk areas of Kruger National Park and active surveillance for FMD. Botswana achieved effective FMD prevention by successfully by use of disease free zones; disease control fences to separate high risk areas zones from disease free zones and strict import controls, border security and quarantine measures. Whereas Namibia used veterinary cordon fence to separate the northern communal areas from the southern commercial farming areas.

Uganda’s FMD control policy comprises of annual mass vaccination in high risk areas, reporting suspected outbreaks, livestock movement control and use of animal check points plus ring vaccination, and closure of livestock markets. FMD control policies employed in Uganda are comparable to those in south African countries but have not been successful in Uganda due to challenges related to resource constraints in
regards to HRs, finances, field logistics, cold chain, and laboratory equipment, lack of surveillance and reporting systems and lack of collaboration with neighboring countries and lack of capacity to enforce strict movement control due to Uganda's porous borders besides the multiple serotypes and mis-match of vaccines with outbreak strains.

However, use of veterinary cordon fences in Uganda may not work against FMD which is airborne and can be easily blown by wind from higher to low lying areas given the terrain across the cattle corridor. Since FMD Virus is airborne, it can be blown from high to low areas. Control and prevention of FMD in Uganda requires strategies such as provision of sustainable water sources on individual farms to avoid communal grazing and watering that facilities rapid transmission. Creation of disease free zones is more applicable for districts with flat terrains and short savanna grassland rather than in districts with bushy and forested areas such as Nakaseke. Public education can be used in all districts in Uganda to enhance early detection, reporting and response and up-take levels have improved with the implementation of UPE and USE. If animal movement control is implemented effectively, it can help to prevent FMD spread as demonstrated in Netherlands (Velthuis and Mourits, 2007).

Stakeholders in the livestock industry and Policy makers need a means of assessing FMD's economic impacts when evaluating prevention and mitigation measures. Livestock markets are an important source of revenue for many district local governments in Uganda. Anything including FMD that interferes with the operations of these markets disrupts the flow of revenue and if prolonged may paralyze the operations of the sub-county and district local governments. All actors along the cattle-beef marketing chain lose significant income streams during FMD outbreaks. Unless FMD is controlled effectively, Uganda's livestock and livestock products deficit will continue to widen hence driving up prices and making these products unavailable and unaffordable.

Policy recommendations
1. Improve the animal disease control infrastructure including quarantine stations, holding grounds, stock routes, and animal check points.
2. Increase funding to the livestock sector towards improving animal health and productivity to meet the growing demand for livestock products for the fast growing Ugandan population.
3. Government of Uganda should facilitate livestock farmers to establish adequate and sustainable water sources on their farms to discourage communal watering and grazing points that are associated with fast transmission.
4. Re-establish FMD surveillance teams at the community level to facilitate early detection, reporting and response to abate spread to wider geographical areas that would make control more difficult and expensive.
OPB 316: Banana Xanthomonas wilt spread a threat to food security and livelihoods in Uganda

Mugisa Charles

Uganda is the Second World's largest producer of bananas after India, bananas are grown mainly by the resource poor farmers for both food and cash income. In Uganda bananas provide 25% of the carbohydrates and accounts for the largest food expenditure share. Southwestern Uganda produces 80% of the bananas in Uganda but its production is majorly constrained by biotic factors. Key among the biotic factors being Banana Xanthomonas wilt that is causing losses to the tune of US$ 200 annually hence endangering the livelihoods of poor, small-holder farmers. Current prevalence and incidence is still very high at 25% and 3% in southwestern Uganda. This is making farmers to loose large sums of money and food. If nothing is done to curb its spread the poverty and hunger targets of MDG1 will not be within reach by the end of this year (2015).

Context and Importance of the problem
Banana Xanthomana Wilt has over taken other banana production biotic constraints like Weevil's, Nematodes, and Fungal and Viral diseases. It has spread to all parts of the country including the southwestern Uganda that produces 80% of the bananas used and consumed in Uganda and is estimated to cause a total of US$200 annually. In 2010 Mbarara, Bushenyi and Ntungamo were referred to as threatened by BXW disease, mean prevalence stood at 34% to date it stand at 25% with reduction of only 5% after 4 years. Disease incidence for above districts in 2010 stood at 3.6% to date it’s at 3.24%, a reduction of only 0.36%. Farmers have a myth that using a mixture of urine and ash to treat infected bananas that has made them to nurse the sick plants.

From the above observations BXW management programmes seems to have yielded very little impact on the disease hence BXW spread is not relenting. This calls for modification or change in the mode of delivery of the information to the farmers in order to curtail the spread of the disease. If nothing is done to halt its spread it will put hunger and poverty targets of MDG1 out of reach by the end of this year (2015). This disease is not only threatening food security and livelihoods of rural poor farmers but it will also hamper, Presidential Initiative on Banana Industrial development that is located in this zone were the government has invested millions of money to add value to bananas.

Critique of policy option(s)
The current mechanisms of fighting BXW that include sensitizing farmers on cultural management methods reduced disease slightly but did not manage to completely wipe out the disease. The sensitization has mainly been through, radios, TVs, Agricultural survives, providers (ASPS) and Local leaders. Immediately after the disbandment of the NAADS programme all the BBW task force committees became none functional and no enforcement is being done.

Conclusions
- BXW is still a big challenge to banana production evident from current high prevalence and Incidence rates.
- Banana taskforce committees are no longer functional since the disbandment of NAADS programme which has made farmers to be negligent with the BXW management.
- High prevalence and incidence rates signify big Banana production losses.

Policy recommendations
- More sensitization be done about the disease, not only through radios, TVs, NAADS, political heads but also through religious leaders who are effective and cheapest mean of communication on the methods of managing BXW to their followers.
- Religious institutions with big chunks of land can be given planting material and finances to set up banana demonstrations on banana agronomy & management of BXW.

BBW task forces be reconstituted and UPDF that is in charge of wealth Creation /NAADS
Background

Garcinia buchananii (Baker) is one the indigenous fruit tree species that grows up to 25m tall. This tree that is found in the Lake Victoria Basin (LVB) districts in Uganda and Rwanda produces fleshy ripe yellow–orange fruits that have a sweat sour taste. The fruits have enormous food and medicinal uses. In fact scientist have patented (No.WO2013096878) the bark extract of G. buchananii as a remedy for diarrhea under the world intellectual property organization. Despite confirmation of G. buchananii as medicine for diarrhea, little is known about variability in the trees of G. buchananii in the different countries.

Physical characteristics

The sizes of fruits in terms of weight, length, width, pulp weight percentage and number of seeds per fruit of G. buchananii vary between Uganda and Rwanda. The fruits of G. buchananii in Uganda are bigger than those in Rwanda.

Chemical characteristics

With exception of titrable acidity and copper content in the fruits pulp of G. buchananii; pH, moisture content, total ash, crude protein, dietary fibre, crude fat, total carbohydrates, energy, vitamin C and beta carotene and minerals (K, Na, Mg & Fe) of G. buchananii fruits are significantly different between Uganda and Rwanda.

Recommendation

- The variation shows two cultivars of G. buchananii trees in Uganda and Rwanda which need to be investigated further as remedy for diarrhea.
Access to good quality seeds and post-harvest handling measures are still the major hindrances to food security in Uganda. Smallholder farmers who contribute significantly to the food security of our country have limited access to quality seeds. The seeds on the market are also many times counterfeit and farmers have limited technical ability to detect and distinguish quality seed from fake ones. Also lots of food produced is wasted as due to failure to harvest; post-harvest losses due to poor storage and preservation; market among other factors. These two factors have resulted in limited production as well as selling of produce to middlemen immediately after harvest at giveaway prices.

The government has attempted to address the challenge of access to quality seed through the establishment of the National Agriculture Advisory Services (NAADS) to offer improved seed and other technologies to farmers. And also through NARO to provide research. This NAADS however, has not benefited all farmers equally as resource constrained farmers have lost out. Besides, the challenges of storage and marketing still prevail.

Uganda's food security is still not the best compared to the rest of the world and sub-Saharan Africa. Near 1.4 million people, approximately 3.9 per cent of the total population is food insecure and the number of Ugandans experiencing food insecurity in terms of caloric intake is alarming. Uganda’s growth in food production has not kept pace with population growth, at an annual rate of 3.2 per cent.

Research shows that food production per capita has been declining since 2002–04, and dietary energy supplies, including the energy supplied by imported food, and has kept declining since 2003–05. This challenge has been worsened by food waste. About one-third of food produced for human consumption is wasted. Food waste in Uganda generally results from premature harvesting; poor post-harvest handling due to poor storage facilities and infrastructure; lack of processing facilities; and inadequate market systems.

This research has developed practical policy recommendations for improving food security and reducing food waste through food banking.

Food banks have many benefits in the pursuance of food security and sustainable livelihoods. They include:

- **Food sovereignty and community empowerment.** People’s right to healthy and culturally appropriate food that is produced through sound and sustainable methods is enhanced. Food banks empower farmers to define their own food and agriculture systems, thus the farmers are empowered to choose when and when not to sell their produce, with reduced pressures from the middlemen and market.

- **Improved food security and livelihoods.** Farmers get trained in better farming methods, are encouraged to save and are provided with food storage facilities. Mixed enterprises help farmers to spread risks and increase household incomes. Women in Lukhonge Sub-county testified that the food bank had helped them to save food that would be wasted at home, and...
that they have been able jointly market the produce at good prices and established their 
women savings and credit cooperation.

- **Sustainable and quality seed supply.** Farmers receive quality seeds through a revolving 
  seed loan that ensures constant seed supply as well improved access. Seed storage at the 
  food bank ensures security for the local seed gene and reduced impact of the organically 
  modified seeds.

- **Improved household food security planning.** Food banks enable households to efficiently 
  plan for their food production and harvests. Farmers are helped to ensure efficient food 
  consumption and food saving without compromising household dietary needs.

- **Enhanced farmer collaboration.** Farmers under the food bank collaboratively share ideas 
  and knowledge about food security as well as devising strategies for addressing common 
  challenges.

- **Community ownership.** Food banks are managed by farmers themselves. This provides 
  them with opportunity for decision making and power to influence their own food security and 
  agriculture systems. As a result, strong leaders with ability to identify, analyze and solve 
  farmers’ problems are developed.

**POLICY RECOMMENDATIONS**

- **Invest in establishment of community-managed food banks.** Farmers want to have food 
  banks decentralized to lower levels and managed locally with easy access. Government 
  investment in incentivizing farmers to establish community-managed food banks to enhance 
  farmers’ abilities to grow more food and to improve food saving attitude is highly needed. The 
  centralized Hunger project food bank in Mbale has limitations of distance as well as limited 
  farmer’s involvement in decision making.

- **Encourage local seed saving.** Whereas the trend is changing and farmers are encouraged 
  to adapt to use of organically modified seeds. They are not sustainable since they are rarely 
  reused more than twice. Sustainable food security will require investing in preservation of 
  indigenous species that are drought and disease resistant and farmers helped to sort and 
  save good quality seeds.

- **Initiate and encourage community-supported agriculture (CSA).** CSA ensures 
  partnership between farmers and consumers, in which the responsibility and rewards of 
  farming are share. This system has multiple benefits for farmers. First, it ensures that money 
  remains in circulation within the local community; second, it reduces buying imported foods or 
  foods transported from great distances with benefit for the environment. Third, provides ready 
  market for farmers’ produce; and fourth, protects farmers from exploitation by money lenders.

- **Invest in rain water harvest and management.** This will ensure longtime resilience by 
  farmers to climate change and ensure food production through-out the year. 
  Climate change is a reality and strategies to mitigate its effect are urgently needed.

The food bank in Mbale uses the national water grid at its demonstration farms and farmer field schools; this 
 system is expensive and not sustainable.

- **Food bank - University partnership.** Strategies need to be devised where agriculture 
  universities and institutions partner with community food banks to train and support farmers in 
  food security. This could support food security in form of utilizing agriculture students as 
  volunteers and interns in food banks; conducting research and documenting collections; 
  controlling seed quality; multiplying seed varieties of interest to farmers among other forms of 
  cooperation.

- **Policies and regulations.** Food policy on post-harvest handling and food waste needs to be 
  developed and strengthened to promote reduction in food waste and improve food access 
  and affordability. Policies to guide collaboration between farmers and buyers of farm produce 
  in community supported agriculture should be developed and enforced collaboratively with 
  maximum stakeholder participation.
SOURCES OF INFORMATION

This policy brief is a result of the recommendations from the study on food banks conducted on the Hunger project food bank in Mbale between June 2013 and May 2014. The study was sponsored by the Norwegian Loan Department Lanekassen in collaboration with the University of Agder, Norway.

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Executive Summary:

- Several farmers apply fertilizers in their fields but have often reported no significant yield response, resulting in the loss of fertilizer and loss of money.
- These fields are commonly of high and low soil fertility which associate with high and low soil organic carbon concentrations respectively.
- Soil organic carbon can be used as a soil fertility indicator to guide fertilizer use and boost crop yield.
- Critical SOC concentrations that farmers can target for highest gains to fertilizers and soil fertility building remain unknown.
- A study on soils (Ferralsols) in Kiboga district in central Uganda found out that a field with 1.9-2.2% registered high maize yield gains to fertilizer compared to low SOC fields.
- Farmers need to raise SOC to 1.9-2.2% for optimum yield response to applied fertilizers.

Policy recommendations:

- Farmers need to measure at least soil organic carbon (SOC) to get an idea on the status of soil fertility.
- Farmers targeting maximum maize yield with low fertility need to build soil organic carbon to critical ranges of 1.9-2.2% using good quality organic materials, adopting conservation tillage and eliminating bad practices such as biomass transfer, burning and post-harvest losses.
- Farmers with critical SOC range need to boost yields by applying about 50 kg N ha\(^{-1}\), 25 kg P ha\(^{-1}\) and 25 kg K ha\(^{-1}\).
The population of northern Uganda suffered the atrocities of the Lord’s Resistance Army conflict and was forced into internally displaced peoples camp (IDP) for over two decades (1986-2006). Although camps were ideally intended to protect the civilians, the ordeals of the former IDPs reveal the worse experience of displacement ever recorded ranging from social torture to insufficient food ratios (Dolan 2010). While in camps, the displaced households had to share shelter and lived in a compressed environment with squalid hygiene.

For the first time, the displaced persons in Oyam had to survive on handouts provided by humanitarian agencies. Thus malnutrition characterized children under five and elderly persons who could not dare the harsh camp lifestyle. Cultivation was restricted to limited plots along army patrolled roads thus limited food crop production. Socially, men were rendered inactive and could not fend for the families. Suspicion and mistrust rose among couples and annulment flared up raising the number of broken families in the region hence a sign of social insecurity.

Sometimes, family members settled in different camps and lost contacts from each other. Meanwhile each household reported at least loss of a relative during displacement. This implies loss of support from kin network hence a breakdown in the social structure. Similarly, access to social services like education, health and safe water source was limited. Education and health services were shattered and children could not access schools for fear of abduction.

Context and importance of the problem:

The LRA conflict has impacted negatively on the livelihood strategies of the victims who were displaced into IDPs. During the two decades of displacement, the IDPs had their livelihood assets shattered and survived on relief aid provided by humanitarian agencies. Most appalling was that community members lived in fear and suspicion because of abduction and forced conscription into the rebel army. This worsened the social capital and relationships that were cultivated over time hence loss of trust and support for each other.

The former IDP communities have remained in a vicious cycle of poverty by sticking to subsistence farming as opposed to market-oriented livelihood strategies. The situation has worsened by shifting from communalism to individual livelihood strategy due to loss of support by the kin and community members. Meanwhile, alcoholism has become an endemic problem in Oyam district. This originated from displacement challenges where majority of men resorted to excessive alcohol consumption due to inactivity.

To date northern Uganda districts of Acholi and Lango lag in terms of the social welfare index against all other regions of the country. Accordingly, northern Uganda districts of Amuru, Apac, Gulu, Kitgum, Lira, Oyam and Pader score the lowest life expectancy of 51 against 54.1 of national average, the average schooling years has remained low at 7.0 compared to 10.8 and the proportion of the population living below the poverty line increased (UNDP 2012). This implies low human capital base since majority of the population formerly displaced do not progress beyond primary level of education. It is thus important to rebuild the lost hope among former IDPs by reviving cooperative movement and cultivating the waned social capital to sustain their livelihoods.

Critique of existing policy option:

The government of Uganda has strived to restore the livelihoods of the former IDPs in northern Uganda, though approaches employed have some challenges. Amongst these have been the the Northern Uganda Rehabilitation Program (NURP) that embarked on the rehabilitation of physical infrastructure particularly education. This was followed by Northern Uganda Social Action Fund phase I and II (NUSAF). To some extent NUSAF program should be commended for striving to improve the livelihoods of the displaced persons though some communities could not meet the specified procedures due to limited knowledge like proposal writing. Currently the Peace Recovery and Development Program is functional; a framework guiding the post-conflict recovery program. These development strategies have not made significant impact on the livelihoods of the target group. The current PRDP for instance focuses more on the rehabilitation of the physical
infrastructures like the roads, schools, health facilities and underscores the benefits of social capital as an important component of the post-conflict reconstruction. Moreover, studies elsewhere indicate that the forms of capital (physical, economic, social, financial and political) coalesce to enhance sustainable development. Absence of social capital implies that all other forms of capital restored cannot be sustained due to lack of good will and responsibility that comes with team work and sense of ownership.

Currently, government of Uganda is piloting the senior citizens scheme to cater for the elderly in a few selected districts. The scheme seems promising but limited to a few districts thus there is need to roll out to all the districts. More important the community should be re-oriented to support the elderly persons through the extended family systems that prevailed in Uganda traditional set up.

Policy recommendation:

1. Small holder farmers in northern Uganda should be integrated in the market through setting minimum prices for their products tied to the world market prices. The support can also be through access to the markets by improving access roads and access to technology to add value.
2. Revitalization of cooperative movement is prudent. This will empower the rural farmers through the benefits that come with the principles of cooperative movement. The communities should as well be sensitized to embrace the benefits derived from the principle of cooperative.
3. The local leaders in northern Uganda should set by-laws regulating excessive alcohol consumption. This will make the former IDP communities more productive.
4. It is relevant that social capital component be factored in the Peace Recovery and Development Program (PRDP) for the rehabilitation of the war ravaged northern Uganda. This will promote the ownership of the physical assets restored after the LRA conflict.
5. In order to rebuild the lost social bonding that hitherto prevailed among Langi before displacement, the culture of ‘wii- otem’ and folktales should be revised. These forums were fundamental in communicating the norms, rules and values of ‘Lango’ from generation to generation.
This study begins by exploring the historical and contextual roots of the current debate, moving on to analyse relevant political cartoons and news stories that trivialise women’s intellectualism and public presence. These are examined in relation to existing literature which critically examines the policing of women’s sexualities in various ways on the continent. It concludes that the law seems to have re-shackled women, furthering their oppression, rather than securing their freedom, and the media’s depiction of women abetted this repression of women. I argue that these representations of women in the media often diminish women’s status and authority in the name of promoting decency via the law. To make this argument I drew on historical precedents, this misogynist portrayal of women in the media contributed to a backlash against women in the wake of their increased political emancipation and a rising moment in critical thinking about women’s position in society.

I showed that law and the impact the media has had on perceptions of women before and after the changes in the legislation shows how the media creates a culture that can oppress women. Both media sentiment and the law have been harnessed as tools to try and police and tame women who are seen to contravene patriarchal values and flout control of their bodies by choosing to wear miniskirts. This was prompted by the drafting of the first version of the ‘anti-miniskirt law’ officially the Anti-Pornography Act proposed by Simon Lokodo, in the Ministry of Ethics and Integrity. The ‘anti-miniskirt law’ prohibits anything that shows the sexual parts of a person as well as any erotic behaviour that can cause sexual excitement or any indecent act or behaviour tending to corrupt morals, among other things.

Context of policy
This legislation did not emerge in isolation though. It draws on a history of similar legislation in Uganda, as well as misogynistic attitudes prevalent in the press. These attitudes are exemplified by the justifications for including the banning of miniskirts, claims that miniskirts should be banned because women wearing them distract male drivers, who stare at women’s thighs and then cause traffic accidents. This study argue that patriarchal interpretations of women’s dress as a sign of degeneration contributes to the culture of misogyny in Kampala, a culture of misogyny that discourages women’s contributions to politics and the economy.

Critique of policy options
This debate on women, clothing and sexuality which drew on historical precedents and traditional attitudes was taken up not only in news stories, but also in cartoons. The cartoons, therefore, comprise a visual device that male artists, many trained at the Makerere Art School use to oppress elite women and thus maintain “the status quo through trivialisation”. Additionally, the media shifted focus from the important issues that women in ‘big offices’ championed. One of the results is the unprecedented rise in the mass circulation of images of elite women that focused on their appearance as erotic, which contributed to the general atmosphere of sexism. This has meant that Kampala’s streets became littered with publications of women sometimes scantily dressed but often naked. Then local vernacular newspapers such as Bukedde and Orumuri joined in. Today, tabloids such as Red Pepper, Entango and Onion have become popular because of their graphic representation of young women in sexually explicit positions.

In conclusion, the law seems to have re-shackled women, furthering their oppression, rather than securing their freedom, and the media’s depiction of women abetted this repression of women. I argue that these representations of women in the media often diminish women’s status and authority in the name of promoting decency via the law.

Policy recommendations
A commitment to gender equality has been made by almost all the world’s governments including Uganda. These governments use the International Covenant on Civil and Political Rights (ICCPR), International Covenant on Economic, Social, and Cultural Rights (ICESCR) and Convention to Eliminate Discrimination Against all Women (CEDAW) – all legally binding covenants and conventions that support gender equality and non-discrimination. This policy should be enhanced to advancing gender equality and equity and the empowerment of women. The Millennium Declaration, which commits to promote gender equality and empower women with the Millenium Development Goals (MDGs) should be rigorously be used in Uganda.
This policy brief examines post conflict policy making and reconstruction of health from a gender perspective. In response to war impact in northern Uganda, the Government embarked on reconstructing the region through various programmes, the most recent being the Peace, Recovery and Development Plan for northern Uganda (PRDP), presently in the second phase and seeking a third phase.

Using documentary and policy review and interviews at national and district levels, our research that no gender analysis was conducted to inform policy outcomes resulting in gender neutral policy documents and no efforts to ensure the participation of women during the consultative processes leading to policy formulation. Distances to health facilities and unequal gender power relations prevent women from accessing health care. As the government embarks on the process of preparing PRDP 3 it is important that a gender mainstreaming strategy is developed to ensure the resultant problems are addressed to achieve gender sensitive health reconstruction.

Background

Two decades after the war in northern Uganda, debates about the right approach to reconstruction continues, as all efforts to reconstruct the north and bring it to the same level of development with other regions of the country has failed to achieve the needed results. While Government’s efforts in developing northern Uganda specific programmes has been seen as a good show of political will to address the spoils of war, most of the programmes have evolved around infrastructure development and lack of focus on addressing the gendered impact of the war. The resultant challenges of not closing the development gap, specifically in health reconstruction shows that developing infrastructure alone does not automatically lead to good health and well being.

Development indices for the north remain poor compared to other parts of the country. For example, the national infant mortality rate is 76 per 1,000 live births, while that for northern Uganda is 172 per 1,000 live births; maternal mortality rates for the north is 700 compared to 435 deaths per 100,000 births for the rest of the country as at 2006. To address the challenges that exist with reconstruction efforts, the Government of Uganda with support from donors developed a comprehensive framework for recovery and development of northern Uganda; the Peace, Recovery and Development Plan (PRDP). The PRDP was launched in September 2007 to cover the fiscal year 2007/08 – 2009/10. The PRDP presents an opportunity to coordinate reconstruction in the north and raise resources; however, the initial conceptual confusion and lack of clarity on roles and responsibilities has impacted on the effectiveness of its implementation. In 2011 the Office of the Prime Minister carried out a midterm review of the implementation of the PRDP and found that positive progress had been made in the PRDP implementation, but with significant variation across the four strategic objectives. With regards to social services, communities and sub counties reported that with the assistance of the PRDP better services were now being delivered, though the need for greater emphasis on functionality was highlighted. Based on the gaps that remain the PRDP Monitoring Committee in June 2011 resolved that the implementation of the PRDP be extended for another three years; 2012 – 2015. In addition, it was agreed that PRDP2 be aligned with the National Development Plan. The overall goal of PRDP2 is to consolidate peace and strengthen the foundation for development in northern Uganda. PRDP2 maintained the 4 strategic objectives and adjustments were made to the programme areas in line with the needs of the people of

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13 Claussen, et al. 2008
northern Uganda\textsuperscript{15}. The PRDP2 was perceived as a well thought out plan that sought to close the gaps in PRDP1; however, a recent analysis of PRDP2 interventions by conflict affected communities in northern Uganda indicate lack of community ownership and participation; and lack of resonance with their local priorities. In addition corruption have it impossible to achieve the intended impact to make northern Uganda attain parity with other parts of the country\textsuperscript{16}. These and many other existing gaps prompted the Government to extend the PRDP for another three years; 2015/16 to 2017/18.

Findings

\textit{Gender gaps in planning and implementation:} In assessing health reconstruction and the level of the participation of women; there were no efforts at each of the planning stages of the different phases of the PRDP to ensure the participation of women. Although gender is identified as one of the guiding principles and a cross cutting issue for the PRDP, review of documents reveal that there were no descriptions of how gender issues were considered in planning, design and implementation of the PRDP. There is no evidence that a gender analysis was carried out prior to the development of the different phases of the PRDP. There is no evidence in the policy document to show that gender disaggregated statistics informed the policy. Thus the policy documents do not reflect the differential health impacts of war on women and men that could have enabled gender sensitive health planning. Although at the sub county level, there were indications that women participate in the planning, the level of participation could not be ascertained. Women are not a homogeneous group, they reflect the diversity of the entire population.

\textit{Lack of gender consideration by planners:} There is general lack of consideration for gender, which was attributed to lack of knowledge of gender among planners. The PRDP can be said to be gender neutral, gender-neutral policies do not recognize the relevance of gender in the particular sector and target group they are directed at. There were no deliberate attempts to ensure that the specific health needs of women were collected through the consultations, as a result the health needs of women were not reflected neither were they given consideration.

\textit{Community priorities different from policy options:} Generally, the focus of the PRDP1 was based on the needs of the people of northern Uganda as defined by the leaders at political and technical levels. While communities were said to have been consulted the final decision on what should be included in the plan lies with the policy makers. The experience at the sub county level throws more light on the policy making process and the intricacies involved. A focus group discussion with women reveals that most women were not consulted. However, the sub county indicated that communities were consulted probably the consultation did not include women. Despite the collection of inputs from communities and subsequent prioritization of needs by the sub county planners, the respective sector Ministers, the MPs and finally the President make the final decision on policy objectives\textsuperscript{17}.

\textit{Focus on infrastructure:} The main focus of the PRDP is infrastructure development; such as building health centers, health workers houses and in few cases health supplies. The challenges that remain includes long distances to access services; lack of equipment and supplies in newly built health centers; lack of adequate and qualified health staff; lack of incentives for health staff working in hard to reach areas; inability of women to take decisions to seek health care for major health problems and lack of participation of women in health planning. This further marginalizes their needs in the health plans.


\textsuperscript{17} Interviews with Officials at the OPM and Sub County level.
Policy recommendations

If the proposed PRDP3 will achieve the objective of closing the health gap in northern Uganda compared to the other regions of the country, the following recommendations should be considered:

- A gender analysis should be conducted in all sectors of the PRDP focus particularly the health sector. This will provide information about the existing gender gaps in health access and coverage and also reveal the underlying factors that prevent or facilitate women to access health, this will enable effective health planning.
- Improve on the participation of women: since the PRDP plans have been based on engagements with communities in northern Uganda, it is important that participation is strengthened to include the various categories of women and men and at the same time, ensure that women’s views are captured and integrated into the plan.
- There is need to strengthen gender mainstreaming beyond the number of women attending meetings towards women’s substantive participation; this should be enhanced by mainstreaming gender in the entire PRDP policy framework and not just mentioning gender as a principle that disappears in the rest of the document. This will lead to more gender responsive programming.
In 2011, the average number of children born per woman was about 7 in Uganda. In today’s financially strapped environment, sterilization is a best buy for women who want to stop giving birth.

Today, world population is 7 billion people, majority, 60% of the people are in Asia and Africa. These mainly due to remarkable high trends in unintended pregnancies of 41% and low Family Planning uptake, especially in Africa (25%) yet population growth rate 2.4% per year is high.

In 2011, Uganda has a huge unmet need for modern family planning (34%), contraceptive prevalence rate is quiet low 26% and total fertility rate of 6.2. Sexual and reproductive health issues are central to Uganda’s human development agenda due to Uganda’s very high number of births. On average every woman in Uganda gives birth to about 7 children and population growth rate is 3.2% per annum. This is extremely high for a low income country. As such reproductive health is highlighted in the Government of Uganda (GoU) five year revolving Health Sector Strategic Plan (HSSP-II and HSSP-III). Consensus among the policy makers and politicians that innovative use of modern family planning methods interventions have to be put in place to reduce the population growth rates in Uganda.

This is with regard to policy variables, education attainment especially of secondary education, is significantly correlated with likelihood to use sterilization contraception.

Female sterilization can reduce 44% of maternal deaths as it can influence reduction in the number of unwanted pregnancies, a basic tool to improve the health status of the people.

This policy brief seeks to recommend effective integration of the provision of female sterilization and tailored education messages into the national family planning program.
Context and Importance of the problem

In 2009, about 90% of national abortion, 41% unwanted pregnancies and 20% of obstetric-related mortality and morbidity could have been averted by use of effective contraception by women wishing to cease further childbearing in Uganda. The uptake of female sterilization was low if all contraceptive methods (4.1%) in Uganda despite its availability in health care facilities.

The study found that both contextual and individual factors have important influences on the use of sterilization contraception. At the individual level, age and a high level of education and having formal employment, were important factor in explaining the value of sterilization contraception.

Furthermore, exposure to and use of other family planning methods had no significant influence on willingness to use sterilization. In particular, women who had used pills as a family planning method were less likely to use sterilization services. Sterilization was feared. This particular result points to the need to intensify information, education, and communication (IEC) programs, especially as they relate to disseminating female sterilization benefits.

Critique of policy options

The 2010-2015 HSSIP III details specific targets with regard to availing family planning services in Uganda including sterilization, in practice there is inadequate funding that limits the ability of the health sector to roll out birth control services to every woman who needs them especially in rural settings.

Among the National Family Planning Program (NFPP) targets, between 2005 and 2009, the plan proposed to reduce teenage pregnancy from 37% to 20%; increase the contraceptive prevalence rate from 20 to 40% as well as increase the Couple Years of Protection (CYP) from 223,600 to 500,000 per annum, the unmet need for all married women still stands at 41% with a low Contraceptive Prevalence Rate of 26% in Uganda.

Policy recommendations

Integrate provision of female sterilization and tailored education messages into the national family planning program is very vital.

Policy should also target the less educated category of women with couple counseling to highlight the value of sterilization contraception.
Uganda has gone through nine years legislating against homosexuality while (re-)defining and protecting the ideal family as that which is heterosexual and traditional. The process started with the amendment of the 1995 Constitution of Uganda (as amended) in 2005; it culminated into the enactment of the Anti-Homosexuality Act 2014 which was annulled by the Constitutional Court of Uganda. Parliament has promised to re-enact the law to fight the ‘homosexuality vice’

This study has analysed the ways that Uganda’s anti-homosexuality legislation is based on the view of ‘homosexuals’ as foreign threats to the family and state, and does so by mobilising arguments that such legislation id important for the protection of the ‘traditional’ family which are under threat from factors unrelated to homosexuality.

It concluded and argued that the real purpose of the legislation was to reflect an image of patriotic duty that the NRM government wishes to communicate to the general public in Uganda, and ‘ennoble’ the government by portraying the ruling party as actively intervening in a perceived and constructed threat of homosexuality to the traditional family.

To make this conclusion, and argument, I critically analysed the ways in which sex and sexuality, ‘homosexuality’ and the ‘traditional’ heterosexual family are constituted as public issues and therefore worthy of legislative intervention. Linked to this, I examined how the in reality the traditional family no longer exists. Instead it is constructed as under threat by ‘homosexuality’, and therefore the family is in need of government protection through political rhetoric and slogans.

On the Relationship between the ‘Traditional Family’ and Anti-Homosexuality Legislation? We Must To Go Slow

By doing archival research, documentary analysis, legal analysis and cultural theory I analysed selected Court decisions on the sexual exploitation of children in Uganda. I also looked at government documents on the position of the traditional family as the basis for development in Uganda. I have also analysed debates on the floor of parliament during the passage of the Anti Homosexuality Bill No.18, comments by the President and debates in the print and electronic media. I have found that the way in which the words traditional families, and ‘who homosexuals are’, are used is false. These words actually do not represent the LGBGI as a threat to families or indeed the traditional family itself in Uganda. This implies that there is a potential for the law, in case it is re-tabled and passed, to be mis-used and invite costly legal challenges to it. Seen in this light, the Professor Oloka-Onyango & Others v AG Constitutional Petition No.8/2014 petition which challenged successfully challenged the legality of the anti-homosexuality legislation becomes only a starting point. Many more are set to come; the cost to the national treasury will be enormous.

Policy recommendations: It is recommended that:

- The ruling party stops using the ‘issue of the LGBTI’ to shore up a national sentiment for political reasons.
- Parliament desists from seeing same-sex sexuality and paedophilia as one and the same thing. This does not help the debate on homosexuality in Uganda which in itself is healthy and democratic.
- The debate on defining proper and improper forms of intimacy can be complicated. Criminalizing same-sex sexuality will not help it to grow since it inhibits debate; it pushes the gay community into hiding away from essential services available to all citizens of Uganda.
OPB 412: Virtue-Based Language and Communication

Cornelius Wambi Gulere

Promoting Virtue-based language
We are what we think, speak and do. Language based on virtues is essential in promoting the social behavior necessary for nation building. Since riddling is the most popular style of intimate communication and interaction among people of different ages and status, it ought to use virtue-based language for it to positively impact on social behavior. Every culture performs riddles in specific ways and for specific reasons including addressing political and social issues like conduct, relationships and authority. However, the level of power play that is aimed at trampling down the less knowledgeable and least innovative person to glorify the one that articulates in knowledge and intelligence (of reading between the lines and under the surface) is outstanding.

Setting precedents or models
Unraveling the meanings in a riddle act is based on a specific precedent or models, for example, the riddle precedent: “omuntunikir?” (What is a person?); allows for the discussion of the qualities of a human being. The tactic of using violent language in revealing the different perceptions of humanity is meant to mark the difference in perception among the performers. However, the exercise of verbal power, during riddling, is excessive with at times counterproductive consequences to the building of a peaceful and loving community. According to this riddle, a person is above all else, the footmarks that remain after a person has gone away. Meaning that, personality is best described in terms of the past that foregrounds the future.

The affinity to destroy (PHD syndrome)
Words like “kill” for “tell”, “throw” for “bear” and “wrestle” for “think” are deliberately used to show the power of the “conqueror” that undoes the riddle. The tendency is to subjugate rather than teach and delight. In this manner, the riddle mind, tongue and body becomes a conduit and purveyor of decadence, perversion and violence in the way it promotes verbal and physical violence, forceful language and perverse actions. It perpetuates the ‘pull him down’ (PHD) syndrome characteristic in many communities.

The spirit of winner takes it all
Evidently, riddling has the tendency of glorifying the winner at the expense of the loser even though the winner may not necessarily be the one that provides the most “correct answer” or correct vision and line of thinking. Since the answer is subjective and flexed by the proposer of the precedent, the correct or acceptable answer during any session remains a subject of contention. It is therefore desirable that riddling is adapted to take into consideration the esteem of those whose answers may not be immediately accepted and yet they are acceptable. This mindset would help in building democratic institutions where individual thoughts are listened to and given space to thrive and develop into mutual ideas.

Toning the language of belligerence
Riddling nurtures belligerence, antipathy and shame that grow into pathetic levels of competition, hatred and misinformation. The best is to nurture a riddling culture that uses language of virtues. Instead of “naamukubannumeey’ekigwo” (I beat/crush/throw him/her in a manly wrestle), statements like “naamughaekikopokyayiyakinhwayakimalamuyafunaamaınaamageziokuloghoozakukikoikonti…” (I give him/her a cup of tea and he/she drinks and finishes it and he/she obtains energy and wisdom to think through the riddle that …) have been innovated. Riddling in this way may serve as an innovative lesson on health, wealth, nutrition through respect, honesty, and care as opposed to devastation upon devastation.

The win-win state
Riddles as embodied truths augment the win-win situation by engaging people in productive discourses on matters that are helpful and enlightening rather than those that create antipathy and violent thinking. In practice, a riddle allows space for people to share their views. Consensus building is processed towards a logical agreement or disagreement. However, the language of unraveling and declamation, that is, processing and passing the judgment or revealing the preferred answer leaves but one winner even though everyone has a winning answer. Ideally, each answer is true but there is only one that carries absolute truth in the context of performance.
The problem at hand
Most riddle acts decry humanity (the human body) without discoursing on how humanity (the human body) could be enriched. Instead, they exhibit how the human body can be decimated and ruined as means to finding solutions to its own challenges. The very bodies that are projected as facing danger are also the ones that are ruined instead of being rescued from the identified dangers. As a result, there is an ever growing cycle of war, violence, corruption, decadence and vulgar language use at community and institutional levels (schools, gatherings, businesses). This is as a result of unregulated modes of socialization and communication such as Entertainment Theater, radio and television, political and religious assemblies, “kimansulo and katemba” shows, useriddling language that is hardly decoded by the audiences. Human communication such as these that thrive on the culture of rudimentary riddling that has not undergone careful rethinking and remodeling reproduce communities with similar mindsets.

Critique of the policy options
Refining the strategic language policies
The Government White Paper on Education has promoted Universal Primary and Secondary Education putting many children into schools and even allowing community elders to serve as resource persons in schools to cover the human resource and knowledge gap. Books and materials have also been written under the thematic curriculum scheme and all the 65 Ugandan indigenous languages are used in schools as official languages of instruction. Some of these languages are being taught or in the process of being introduced in schools as subjects at all levels of education. However, effort to transform the traditional knowledge and delivery systems to fit into the contemporary knowledge creation and innovation standards to address the Millennium Development Goals is minimal. Researching and writing in all these languages will release their potentials as the everyday building blocks of the society that is known to be “Uganda, the pearl of Africa”.

The medium and long term planning frameworks
The Uganda Vision 2025 and 2040 have not deliberated enough on the plan to promote innovative communication for better service delivery. Riddling has shown that the system of ‘garbage in garbage out’ works at all levels on the continuum of human development. Diseases like cancer, HIV/AIDS and malaria continue to destroy people’s lives because of the communication gaps; economic poverty and other forms of poverty such as corruption, negligence and wastage of public time and resources that still wait to be redressed. The questions are, how are skills of virtue obtained? Where is the school of experience for virtue if not in the language and style of human communications?

The school of virtual experience
There is glaring evidence that the school of virtual experience has from time immemorial been the riddling arena that teaches critical thinking, knowledge innovation and strategic socialization. It is therefore important that the communication competence of individual is well guided and focused through virtue-based riddling, unraveling and declamation. This will then elevate the people’s reasoning, actions and thinking towards building a virtuous globalized world as ‘families of nations’ devoid of negative forces that seek to destroy universal tenets of civilization. Focusing on isolated programs like modernization of agriculture, the army, enhancing science and technology without core communication competence drills does not translate into sustainable human development. A value-based culture of communication is paramount to the founding of sustainable communities in any part of the world.

Policy recommendations
- All Government in power ought to include inspirational public speaking as part of quality education, health and wealth creation campaigns.
- Parliament should enact and streamline laws on domestic violence, public security, and human rights basing on lifelong learning practices at home and in public spaces which include the creation of checks and balances on the culture of communication among the various speech communities.
• The National Planning Authority needs to establish research consortiums on social and public communication, in particular, riddle performances that sort out and proclaim issues using actions, words and statements of peace, love, care, sociability, maturity, innovation, critical thinking, virtue and productivity as opposed to decadence, hatred, violence, and anger.

• The Public Order Act and Electoral Commissions Act needs rules that require public speakers (e.g. during sermons, guild, and political campaigns) to bring out not only laughter and power-play but the communication of practical issues to be considered for the common good.

• The Ministry of Education and Sports and that of Gender, Labour and Social Development needs to coordinate families, schools and communities to practice virtuous acts and value-based vocabulary by enacting laws that forbid the usage of unethical language.

• The Ministry of Justice and Order should reprimand negative and violent language used in private and public discourses and acclaim language and activities that promote, use and create honest speeches, inspirational declamations and innovative unraveling (during riddling and public discourses).
Since early 1990s when the economy as well as higher education was liberalized in Uganda, there has been significant growth in the number of unemployed university graduates in the country. This rise in the number of unemployed graduates has been attributed to several factors including on the complaints from employers about the lack of skills in tandem with the requirements at workplaces amongst current university graduates. This scenario has prompted both scholars and policy-makers to wonder why universities (especially public ones where government has critical stakes) would produce unemployable graduates when there are statutory organs put in place to govern and manage them; thus, the genesis of this research. This study examined the influence of university governance on the employability of graduates from public universities in Uganda. The findings revealed that: first, the university-government relationship in Uganda was generally fair (not hostile) compared to what reportedly happens in some other countries. Second, public universities were still not appropriately accountable to their stakeholders, though both university-government relationship and accountability were significantly influencing the employability of graduates from public universities in Uganda. Lastly, the study revealed that public universities in Uganda, to a large extent, enjoyed institutional autonomy although this autonomy never significantly influences the employability of their graduates. From these findings, it was concluded that university governance has a role to play in enhancing the employability of graduates from public universities in Uganda. The study therefore proposed the following interventions: i) Government of Uganda needs to (a) develop guidelines for curriculum development for public universities, and (b), make internship compulsory and funded for all students; ii) University managers need to (a) strengthen the university-private sector forum; and also (b) improve on their accountability systems to all relevant stakeholders.

The Context

In Uganda, overall unemployment rate is estimated to be about 3.5 percent; but the unemployment rate of university graduates is estimated at 36 percent (Mayanja, 2012). This does not augur well for an economy struggling to get out from a state of more or less total collapse. It also paints a grim picture about the employability of graduates whom stakeholders look up to, for aligning Uganda to become knowledge-based economy. For public universities in Uganda to play a significant role in national development, they must endow their graduates with the skills that are required in the workplace. However, this does not seem to be the case. For example, there is nothing in the law that governs universities on what constitutes an ‘employable graduate’ or any agenda on the subject of ‘employability of graduates’. This could have contributed to the employers’ complaints about graduates being ‘bookish’, ‘lacking practical skills’, and being ‘interested in white collar jobs’ (Kigozi, 2007). Yet, these public universities have governing councils that are meant to direct their activities. This study, thus, focused on investigating how the governance of these institutions influences the employability of their graduates.

Activity Framework

The research was motivated by the fact that since early 1990s when higher education was liberalized, there has been growth in the number of unemployed university graduates in Uganda partly due to the complaints from employers that the current graduates do not possess certain requisite skills needed in workplaces. Yet, there are organs put in place to govern these institutions. Therefore, there was a need to establish how the existing governance system was influencing the employability of graduates from public universities in Uganda. Within this research project, the following activities were undertaken: i) establishing the influence of university-government relationships on the employability of graduates; ii) establishing the influence of institutional autonomy on the employability of graduates; and lastly, determining the influence of accountability mechanisms on the employability of graduates from public universities in Uganda. The study was underpinned by the systems and human capital theories that became important in the management of education due to the shift in thinking after the Second World War that education, especially higher education, was a key driver to socio-economic development (Psacharopolous & Woodhall, 1985). Compared with the scientific theories of the twentieth century which emphasized ‘one best way of doing things’ and which viewed
the university as a closed system, the systems and human capital theories were considered more appropriate ‘angles’ from which to view the issues of governance of public universities.

Results

Influence of University-government Relationships on the Employability of Graduates from Public Universities in Uganda

The result of the study indicated that the relationship between Government of Uganda and the universities is comparatively fair (not hostile) and thus conducive for work. However, Government has not yet developed comprehensive guidelines to guide curricula development in these institutions. This has made it difficult for the institutions to align their curricula to the needs of employers. This also implied that government is not adequately playing its supervisory role meant to protect public interests in these institutions.

Influence of Institutional Autonomy on the Employability of Graduates from Public Universities in Uganda

The results of the study indicated that public universities in Uganda enjoyed a reasonable degree of institutional autonomy because they are allowed to admit students, recruit staff, set academic standards, conduct research and maintain students’ discipline without government interference. However, the findings also revealed that government still denied universities the freedom to revise fees charged on students and the liberty to determine how to pay their staff. In addition, there is no policy to determine the degree of institutional autonomy that universities can enjoy. This has led government to decide on when to interfere and on what aspect of university governance to do so, at will. Nevertheless, the study found no indications whether institutional autonomy has any significant influence on the employability of graduates from the universities. Lastly, the study discovered that universities lacked adequate mechanisms and policies for actively involving employers in their governance. This curtailed their ability to know what the employers demand of their graduates.

Influence of Accountability on the Employability of Graduates from Public Universities in Uganda

The results showed that universities are still not adequately accountable to their stakeholders, particularly: government, students and employers. Second, the public universities still have very weak mechanisms for conducting students’ internships and carrying out tracer studies on former graduates. This seems to have abetted the accusations by employers that graduates from public universities lacked practical skills. Third, the study hardly found any official linkages existing between universities and employers; and where there were linkages, they were in place through the initiatives of individual heads of department and certain industry rather than through an institutionalized arrangement. This, the researchers noted, was inadequate for enhancing effective training of employable university students.

Recommended Policy Interventions

From the findings, four (4) key policy interventions were identified. These are: i) Government of Uganda through its national planning framework needs to (a) develop guidelines for curriculum development for public universities, and (b), make internship compulsory and funded for all students; while ii) University managers should (a) strengthen the university-private sector forum; and (b) strengthen their accountability systems to all stakeholders.

Developing Guidelines for Curriculum Development

The study found out that matters of curriculum development in public universities were largely left to the discretion of individual universities. This, the researchers noted, was inappropriate if Government wants its institutions to serve its needs. It is recommended that Government should guide curricula development in public universities by giving written guidelines on matters of curriculum, autonomy, and employability of graduates in order to protect the interests of the public in higher education but without interfering with the autonomy of universities. In today’s environment where universities are called upon to be responsive to
stakeholders, government should ensure that it allows ‘responsible autonomy’ which is accountable to stakeholders and ensures partnerships with stakeholders for better performance and output. Besides, university managers should create mechanisms for dialoging with government on their right to have enough funds to run their activities as well as to adequately remunerate their staff for improved performance.

**Making Internship Compulsory and Funded for all Students**

Internships do not only enable students to gain experience of the world of work, they also equip them with relevant knowledge and skills needed for future employment. To enhance the employability of the graduates from public universities in Uganda, Government should make internships compulsory for all sorts of graduates and fund it. For the privately sponsored students, Government should permit universities charge them fees that enable the universities to take them through internships.

**Strengthening University-Private Sector Forum**

University managers should create room for bringing in employers during curriculum development as well as in engaging students in the work of industry while the students pursue their courses. This will enable students to acquire the soft skills that can improve their employability since employers consider them as important as the technical skills.

**Strengthening University Accountability Systems**

Universities should strive to be more accountable to stakeholders by creating linkages and partnerships with employers and by putting in place more transparent management systems especially for the management of finances and human resources.

**Conclusion**

Universities are meant to produce individuals with necessary skills for uplifting the standards of living of the people of a particular country. For that matter, public universities in Uganda should produce graduates that society demands. But this requires the vigilance of university governing councils that must ensure that the institutions impart relevant skills and knowledge in their products.

**Source of Information**

This policy brief is based on the report of the study titled “The Influence of University Governance on the Employability of Graduates from Public Universities in Uganda” which was funded by Makerere University Council. It was a dissertation project for Stella E. Rwakoma.
Policy Brief

The major reason for carrying out this research was to solve the community problem of converting less convenient forms of biowaste into more convenient ones. The practical utility being to satisfy population energy needs, with the minimum possible amount of undesirable by-products and emissions. This was the chief reason to keep all those engaged in biowaste briquetting industry well informed on research progress including the briquette end user beneficiaries. It was realized that those engaged in the briquetting industry are just to briquette anything as long as it would work for them as fuel.

This is dangerous considering that plant waste contain a lot of mineral matter and volatiles which could pose a danger to those not only doing briquetting but including those using the products. The significance of this research was to provide the best information possible on biowaste characteristics that facilitate production of qualitative fuel briquettes not only for the industrial but the domestic end user as well. How much fixed carbon content there is in biowaste residue there is in bioresidue briquette determines its fuel performance. Pre-processing of agro residues through pyrolysis and or torrefaction uplifts fixed carbon values and this should generate high fixed carbon bio-wastes that are very low in volatiles and noxious gases but are as energy efficient as fossil fuels.

The research on Characterization of ten Uganda bio-waste residues under proximate analysis for briquettes production has generated the following milestones as novelty not only in the emerging briquetting industry of Uganda but also providing useful data on Uganda biowastes:

- New data has been availed by proximate analysis on characterized Uganda biowastes particularly useful for developing biowaste briquettes as a renewable energy resource

- Conversion technology of less convenient forms of biowaste into more convenient ones that can practically be utilized to satisfy population needs, with the minimum possible amount of undesirable by-products and emissions because biowaste characteristics are known.

- Uganda’s best residues for briquette production are Cotton seed cake, ground-nut husks, de-coated cotton dust, coffee husks, sunflower seed cake, palm-nut trash, rice husks, saw dust, and millet emerged in that order for briquette production based highest carbon value

- The other bio-residues rich in silicon content (rice husks, saw-dust, millet husks and those rich in fibre) can be briquettes but should be pre-processed first through pyrolysis and or torrefaction before briquetting because of their low fixed carbon content, high volatility and ash constitution

- It was also observed that some bio-residues pose competitiveness in the new briquette and animal feeds industry. In the event that such a challenge should emerge, then utilization for those bio-residues outside the competition should be considered.

- A regression model equation to help determine fixed carbon content in Uganda bioresidues has been generated

- The scientific community should find this research useful in understanding the major huddle in the Uganda briquette industry and also find the knowledge about Uganda biowaste characteristics helpful. Biomass specie characteristics vary with location of plant growth.
In the manuscript new information regarding the statistics about the biomass sector Ministry of Energy and Mineral Development (MEMD) – Uganda has been given in a journal with wide audience. Normally this data is a preserve of government reports and may not easily be accessed as in a journal article.

Mr. Byamugisha R. Gaston the corresponding author has been at the helm of the research, conceptualizing, biowaste samples collection from fieldwork, doing experiments and generating results data for analysis. He has also been the main author of the research paper.

Professor Byaruhanga K. Joseph has played the key role of the main supervisor. He has been instrumental at critiquing the research process and the authorship of this paper.

Dr. Kariko-Buhwezi Bernaed has been instrumental in guiding and assisting the main supervisor and played the key role of mentorship and critiquing the research work.
Many people in Uganda have been victims of fuel tank explosions through getting injured, destroying their property and more so, losing their lives. This is a result of accidents and fuel leakages that go undetected causing fire explosions leaving big numbers of people dead. The victims include those who ignorantly rush to fetch fuel or those that happen to be at the scene at the time of the accident thereby claiming their lives unknowingly. These include;

31 people perished on Saturday 29th June 2013 at 10pm near Hoima Road round about along the northern by-pass in kampala when an Ipsum bumped into a Fuel tanker.

On December 3rd 2000, 90 people died when a fuel truck caught fire in Bukeesalganga district.

In 2007, on the 26th of August, 27 people died in a mini bus when it collided with a fuel truck on MasakaJinja Highway. (KFM, 2014)

These and very many other are bound to increase if no better and efficient mechanisms are put in place to reduce on the occurrences.

To avoid such accidents, fuel leakages should be detected before they cause a substantial loss of revenue and/or people. This project presents an electronic mechanism of controlling this problem. The proposed circuit design helps to reduce on the probable dangers caused by these fire outbreaks after fuel leakages. The outbreaks may be a result of the fuel leaked through the welded joints of the tank. Also, after stealing fuel, the driver may unintentionally drive the truck while leaking the fuel and in the due process, an accident could be caused where the driver is left un-blamed. The outbreaks may also be at the remote fuelling stations in the fuel storage tanks as a result of leakages through the welded joints of the storage tank.

This design therefore consists of one or more sensors that can reliably monitor, detect, and send alerts upon occurrence of any fuel leakages. The alerts could be sent to the Police, the driver and the company responsible for the fuel in transit who will in turn act accordingly.

More so, with the companies loosing revenue as a result of fuel theft by the drivers or even the highway hijackers who divert the truck from the proposed route plans can be monitored from the web portal which can be placed in the monitoring room.

This whole design replaces the elementary method of detecting fuel leakages which has always been done through smelling the presence of these leaked, this has proved to be inefficient has it takes a lot of time to smell these fuels and before precautions are taken, they have already caused substantial damage to both property and lives of people.

Under the practical recommendations is to use XBee wireless transceivers for redundancy incase the GSM network goes down. XBee works in the 2.4 GHz spectrum, this transceiver works in a 40km radius, so, it can always send a message to the driver or any police station around in that radius range. I would as well call on support from any organization or institution to come on board for partnership to see that this projects is rolled out on a commercial scale to save the lives of Ugandans.
Pictures from the prototype design.
This policy brief recommends revision and harmonization of the design and marking passing sight distance thresholds for high-speed two-lane highways in Uganda based on observed passing behavior characteristics. The aim is to help reduce the risk of head-on accidents resulting from limited sight distance for safe completion of passing maneuvers.

**Problem Description**

There is a disparity between the design passing sight distance and the thresholds for marking passing zones on two-lane rural highways in Uganda. For example, the minimum design passing sight distance for a design speed of 110 km/h in a flat terrain is according to Ministry of Works and Transport (2010)’s ‘Geometric Design Manual, Vol. I’, is 730 meters. The corresponding thresholds for marking passing zones where actual passing maneuvers take place is 240 meters for a posted speed limit of 80 km/h according to the ‘Traffic Signs Manual, Vol. II’ of Ministry of Works, Housing and Communications (2004). The consequence of this disparity is that short passing zones are marked on two-lane highways than assumed in design. Short passing zones have operational deficiencies that result in passing maneuvers ending in no passing zones where sight distance is limited to avert a potential collision. Figure 1 illustrates the extent of the problem for different passing zones lengths based on passing behavior on high-speed National Roads. Short passing zones (290 and 355 meters) have higher passing maneuvers that either begin or end in no passing zone than begin or end inside the passing zone. Therefore, higher passing zone thresholds are necessary in both design and marking to reduce risks of collision especially for passing maneuvers that end in no passing zone.

Table 1 gives a summary of the passing distance components determined based on parameters derived from passing behavior characteristics at passing zones. The sight distance where computed for two types of passed vehicles; passenger cars or short trucks and long trucks. This is because, it was determined that passing long trucks took a longer time than passenger cars and short trucks. The new thresholds based on the models in the old edition of American Association of State Highway and...

Table 1: Components of the proposed Design Passing Sight Distance Thresholds

<table>
<thead>
<tr>
<th>Distance components (meters)</th>
<th>AASHTO (2001); MOWT (2010)</th>
<th>Hassan Model as proposed in AASHTO (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passed vehicle: Passenger car or 2-3 axle truck</td>
<td>Passed vehicle: 4-7 Axle truck</td>
<td>Passed vehicle: Passenger car or 2-3 axle truck</td>
</tr>
<tr>
<td>Perception reaction time and initial maneuver (d₁)</td>
<td>70</td>
<td>-</td>
</tr>
<tr>
<td>Occupation of opposite traffic lane (d₂)</td>
<td>242</td>
<td>144</td>
</tr>
<tr>
<td>Clearance at the end of the maneuver (d₃)</td>
<td>55</td>
<td>61</td>
</tr>
<tr>
<td>Opposite vehicle when the passing vehicle is at abreast position (d₄)</td>
<td>130</td>
<td>144</td>
</tr>
<tr>
<td>Passing sight distance (meters)</td>
<td>498</td>
<td>350</td>
</tr>
</tbody>
</table>

Recommendation

1. The design passing sight distance for highways with design speeds of 110 km/h should be harmonized with the marking thresholds for passing zones.

2. Highways whose traffic volume is predominantly small cars (passenger cars) and short trucks 2-3 axles and length less than 10 meters should be designed and marked using a minimum threshold of 500 meters. Examples include National Roads off the main export-import routes.

3. Highways whose traffic volume is predominantly long trucks 4-7 axles and length between 10 and 23 meters should be designed and marked using a minimum threshold of 590 meters. Examples include National Roads along the main export-import routes.

4. Installation additional signs and/or markings inside the passing zone to guide the driver on when a maneuver has high chances of ending in downstream no passing zone, where sight distance is limited to avert potential collision between the passing and opposite vehicles.
OPB 505: Attrition Intention Among Primary School Teachers In Mbarara District

Gyezaho Mary

During the Uganda pre-independence period, teachers seemed to like, enjoy and were proud of their profession. High teacher retention in Ugandan schools was experienced and the best education system in Africa during the 1960s. On average in Uganda, 7% of teachers leave annually either due to sickness or privately owned schools let alone other paying jobs. Further, absenteeism from classroom among teachers on any day has been reported at 10%.

This study was set out to establish a relationship between individual, organizational factors and teacher turnover intentions among primary schools in Mbarara district, Uganda. The individual factors that were reported to significantly have an attrition intention were spouses owning business, owning a car(s) and having less than 3 children; while organizational factors included lack of job security, inadequate teaching materials and no provision of extra-activities such as being a class teacher, timetable designing and extra teaching.

The study recommended that extra responsibilities on merit could be assigned to teachers, advises teachers to delay or have fewer children, increase on the fiscal budget of primary schools, nationwide study to be conducted on teacher attrition intention, encourage teachers to have extra income/businesses to improve their family capital base, provision of timely appointment letters and regularisation into civil service.

Context and importance of the Problem

There is a high rate of teacher turnover in Mbarara district seeking other jobs or green pastures. It is reported that the teacher turnover in Mbarara district is over 60% on average despite the efforts by the Ugandan government in ensuring teacher retention among others by provision of an additional 20% incentive allowance on top of their salary especially in hard to reach areas (Namirembe-Bitamazire, 2005) and setting up of loan schemes. The impact of this incentive is yet to be evaluated. Teacher turnover intentions had a direct effect on the students’ performance as schools continue to lose out on experienced teachers and replacement takes long or never. Teachers may quit over head teacher’s behaviour, low salary, poor work conditions, decision-making manner on the day to day running of the school, minor disagreement with the management among others (Deborah, 1993). In the Ugandan education system, several schools have sprouted such that human resource in terms of teaching skills was inadequate (Nshaho, 2010). However, the resources required to pay these skilled teachers were scarce for majority of the schools. This had caused brain-drain of skilled teachers from the teaching profession to other attractive jobs elsewhere. Under the UPE policy, the provision for teacher attrition and retention was not clearly spelt out, yet pupils’ numbers had more than tripled since the implementation of the UPE system in 1997, hence affecting the quality of education. Individual and organizational factors seem to influence teacher turnover intentions in Europe and America. However, individual and organizational factors that were influencing teacher turnover intentions among primary school teachers in Mbarara District as well as Uganda were not well known.

Despite considerably improved remuneration, there is still absenteeism among teachers. This profoundly affects the quality of teaching, children’s performance and the school environment. Most of the published studies done locally were on teacher turnover intentions in central Uganda, no similar research has ever been carried out on schools in Western Uganda in particular, Mbarara district. The Universal Primary Education (UPE) Policy (2006) had no clear strategy laid to motivate and retain the teachers in the UPE schools with overwhelming numbers of pupils to teach amidst limited resources, there was no provision on how attrition would be addressed. It is therefore hoped that the findings of this research would be used to inform policy (Minister of education, Permanent Secretary, Parliamentarians, District Education Officers, District Inspector of Schools, Head teachers) in their approach to address this dilemma. Stimulation of further research on the various educational institutions in Mbarara district and beyond about teacher turnover intentions would be initiated.
As a principle some copyright laws provide for exceptions and limitations or fair dealing which grant users the rights to use protected works without seeking authorisations. These exceptions are based on international agreements such as the TRIPS—the Agreement on Trade-related Aspects of Intellectual Property Rights. The fair use doctrine forms the foundation for facilitating research and education as it opens up content that would otherwise be inaccessible because of legal barriers. Similar provisions are made in the Copyright and Neighbouring Rights Act 2006. However, in recent times there is massive growth in unauthorised reproduction of works (photocopying, digital and internet downloads) that have greatly undermined the economic rights of the authors and publishers. In addition there’s growth in commercial piracy which has further undermined earnings from works by authors and publishers.

Article 26 of the Constitution of the Republic of Uganda 1995, the Copyright and Neighbouring Rights (CNR) Act 2006 and the CNR regulations 2010 guide copyright protection in Uganda. In addition, other legislations exist that facilitate the use and access of copyright works. These include the National Records and Archives (NRA) Act 2001, the Access to Information Act 2005, the Electronic Transactions Act 2011 and the National Library Act (NLA) 2003. Whereas the NLA demands the deposit of books and documents that are published in Uganda and made available to the public, the NRA Act provides that the provision of copies of public archives does not involve the transfer of any copyrights in them to the recipients (Article 18). To ensure increased access to deposited materials in libraries, archives and educational institutions institutional repositories (IR) have been set up that collect, organise and allow the retrieval of scholarly articles and books, theses and dissertations, conference proceedings and technical reports in electronic format. Through the Consortium of Uganda University Libraries (CUUL), universities have advocated and facilitated electronic resources and the use of Creative Commons as a strategy to increase access to information and resource-sharing. Whereas such work is used for educational, research and teaching purposes in the name of fair use, educational institutions, libraries and archives have not typically acquired copyright licenses to enable exploitations beyond fair use. A study to provide an opinion of the extent of copyright infringement is therefore crucial to ensure that increased access and use of copyright works does not limit the copyright owner’s expected rights/gains.

From the study, it was established that, frequently, individuals are directly involved in pirating books for sale. For instance, cases have been reported of an original version and a pirated (photocopied) version of a book being sold at different prices. Furthermore, lecturers in universities and custodians of copyright works including librarians, allow students to freely reproduce works, e.g. through photocopying. There is also a lack, on the part of rights holders, of awareness of the nature and scope of the relevant legislation. In addition, authors have not been vigilant with regard to the infringement of their copyright. This has made copyright works highly susceptible to copyright infringement. Educational institutions, too, have facilitated copyright infringement. For instance, most of the University libraries in Uganda own and manage photocopiers and provide services at a fee within libraries and some provide other reprographic services, such as microfilming and digitisation. It is not clear whether copyright clearances have been sought for works which have been digitised to be made available for public access. However, some authors are not willing to pursue their rights because of apathy, fear, and balancing the gains from pursuing court suits against popularity. One of the author’s rights is to produce copies of their works, distribute and reproduce them as well. This right is usually hijacked by people who reproduce the authors’ works. It is the role of the author to register his/her copyright, keep a record of such copyright, ensure that his/her rights are protected and raise a complaint or seek redress in case of infringement from relevant authorities, including collecting societies.

In Uganda, the collective society – Uganda Reproduction Rights Organisation (URRO) – is mandated by the government to license works including photocopying, scanning and other digital uses otherwise
known as secondary uses. Here, educational institutions (especially universities), libraries and archives, of all types – e.g. research, public, special and cultural institutions – are required to pay a license fee to URRO who act on behalf of the rights holders for the use of copyright works. The license from URRO provides the authorizations that universities require to copy from protected works beyond fair use or what the exceptions and limitations would provide. The fees that URRO collects from the licenses is distributed as remuneration/ compensation to authors for the loss as a result of reproduction--photocopying or digital copying of a protected work.

URRO is running a program to eliminate commercial piracy. The program includes copyright inspectors who crackdowns on pirates to rid the market of pirated books. URRO has been involved in confiscating pirated books and enforcing copyright protection since July 2013. The value of confiscated books is in the region of Shs 1.8 billion. URRO together with the Uganda Registration Service Bureau (URSB) is introducing the imposition of holograms on books to authenticate them and eliminate illegal reproduction. URRO works through rights holders’ organisations, such as Uganda Publishers Association (UPA), Female Writers Association (FEMRITE), Uganda Children Writers and Illustrators’ Association, and Uganda Textbook-Academic and Non-Fiction Authors Association (UTANA). UTANA was formed in 2012 to provide an advocacy forum for its members (authors), for continuous interaction, and for promoting the recognition and fair remuneration of authors as well as respect for their rights.

UTANA’s membership is open to authors and translators of Textbooks, Academic and Non-Fiction works including but not limited to: scholarly works, academic textbooks, school textbooks, manuals, biographies, auto-biographies, histories, works of general interest, scholarly articles and essays, handbooks, manuals. As a Right holders Association, and as a member of International Authors Forum (IAF), UTANA is required to co-ordinate and promote for the effective collection of payment on reproduction from textbook-academic and non-fiction works as per the law so established in the country. In effect, UTANA shall facilitate interaction, exchange and collaboration as a medium for debating and pursuing issues of interest to the promotion of textbook, academic and non-fiction authorship in Uganda.
Applications that use satellite links are immense: telecommunications, transport industry, navigation in cars, airplanes, smart phone, banking, etc. Any disruption in the satellite link can create havoc in the public. It is a well known fact that the Sun emits plasma that may enter the Earth’s space and cause electron irregularities in the ionosphere. This can cause rapid fluctuation of the signal, known as scintillation, and cause intermittent loss of the signal. The equatorial ionosphere has been known to be quite turbulent during geomagnetic storm periods. The purpose of the study was to investigate space weather effects on satellite signals within the East Africa region using GPS receivers.

Introduction:

Space weather storms can cause havoc on Earth!
Space weather storms can disrupt communications, transport and electrical power lines. When intense, extreme space weather effects can threaten the life of astronauts and even destroy satellites or disrupt their signals.

Effects on satellite communication:
These can be due to effects on the satellite, effects on the ground receivers on the Earth and/or effects on the signals propagating through the Earth’s lower and upper atmosphere. For now, we concentrate on effects associated with the satellite signals as they traverse the ionosphere to and from the Earth stations; and all this starts from the Sun!!

The Sun emits highly conducting plasma at supersonic speeds into the interplanetary space as a result of corona mass ejections (CME) and solar flares. This plasma is solar wind and consists of X-rays, ultra violet radiation and charged particles. When directed towards Earth, the plasma may leak into the Earth’s lower atmosphere and hence cause disturbances within the ionosphere, and may cause geomagnetic storms. This is space weather!!
Satellite communications

Satellite communications play a vital role in the global telecommunications industry and over 2,000 satellites orbiting Earth relay analog and digital signals carrying voice, video, and data to and from different locations worldwide. Signals from communication and navigation satellites traverse the ionosphere before reaching receivers on Earth.

During severe explosive events that occur on the Sun the energy of this radiation increases, and charged particles are ejected in large numbers, so that the ionosphere is not uniformly ionized, causing small-scale irregularities. Ionospheric scintillation, which is a rapid fluctuation in trans-ionospheric signal strength is caused by these small-scale irregularities and can disrupt satellite-based communications and navigation. This can cause intermittent “loss of lock” on the signals, i.e. the signal may be lost.

Satellite in orbit hovering over Earth

Rapid fluctuations of signal (scintillation)
Problem at hand:
The space climatology in Africa is not well established due to a scarcity of ground-based observations. The purpose of this research was to investigate space weather effects on GPS satellite signals within the East Africa region using GPS receivers positioned at Makerere University and at the University of Nairobi.

Results:
The results showed that:

- Scintillations which cause rapid fluctuation of the signal mostly occurred during nighttime: from local sunset to just after midnight.
- Scintillations were also observed to have a seasonal dependence and the effect was more pronounced during geomagnetic storms.

Conclusions:
Ionospheric scintillations occur at particular times of the day and during particular seasons.

Recommendations:
Even if it is not possible to do away with space weather effects, it may be possible for communications/navigation operators to do the following:

- Make schedules such that the peak signal demand does not occur during high scintillation periods;
- Use alternative means of communication and navigation during severe space weather periods.
The research study is intended to explore the use of Cymbopogon nardus as one of the alternative non-wood raw material for extraction of pulp for the production of paper. Alternative raw materials are being explored due to the increasing threat of the diminishing supply of wood for paper production resulting from increase rate of deforestation.

The study involved characterization of the raw material, identification of the appropriate pulping method and optimization of the pulping conditions as well as characterization and evaluation of the extracted pulp and paper made.

Cymbopogon nardus contained high amount of holocellulose, alpha-cellulose and low quantity of lignin, extractives and ash in comparison to wood and non-wood materials.

The soda AQ pulping and Kraft pulping methods were evaluated alongside their optimum conditions. Properties of pulp and paper derived by the methods did not show significant difference. The physical properties of pulp and paper made were very close to those of hard wood and some non-wood materials.

**Current Situation:**

- Worldwide the production and consumption of paper has continued to rise despite of the development in the internet and other new information technologies that had predicted a decline. The production of paper has grown from 367 million tonnes in 2005 to 400 million tonnes in 2012 an increase of about 9% in 8years (Research & Development, 2013). Although the rise of paper consumption in developed countries in Europe and North America is on declining rate but in the upcoming nations such china there is a growing rate of paper consumption. From 1998 to 2009, printing and writing paper demand grew only by 0.7% p.a. for developed countries given the shift to advanced technology. However, demand growth for the emerging markets such as Asia and Latin America remained strong, growing by 6.9% over the same period (Amba Research, 2009).

- Paper making process for long has mainly been using wood from tree stems which are cut, debarked, chipped and pulped. But there is a growing uncertainty of the future supply of wood as raw material for pulp due to increasing rate of deforestation in most part of world, more especially in Uganda. Forest cover of Uganda is estimated at 14% of the land surface and it is decreasing at rate of 2% per year due to land pressure resulting from increasing population that relies on agriculture and wood for fuel for survival. This has forced researchers and the paper industry worldwide to think of other non-conventional fibrous materials in the production of pulp (Marketing Initiatives, 2007). Environmental related climatic changes have also become national and international challenges and as a result possible sources of vital human needs, paper inclusive are being looked for from alternative extraordinary sources that offer less adverse impact on the environment. It is of interest to note that some environment advocates have already proposed the use of non-wood fibers in paper making as a way to preserve natural forests.

- Both wood and non-wood resources are currently exploited for the manufacturing of pulp, paper and soft boards. But still the major source of pulp which meets more than 80% demand is still wood from forests. However scientists all over the world in the last two decades have been involved in intensive researches for the alternative sources of pulp for paper industry.

- The non-wood materials that have been proposed as potential alternative sources of pulp and these included agricultural food crop residues, grasses, shrubs and tree leaves. These plant materials in many societies do not have immediate beneficial applications and since they contain cellulose in form of fibres, they stand as potential sources of pulp for paper industry. By isolating pulp from these non-
wood materials, reduction on the rate of clearing mature trees for pulp as well as reduction on the waste plant materials that tends to accumulate in towns and cities could be achieved.

**Advantages the use of Cymbopogon nardus in paper production**

- It has less environmental degradation effects.
- Less economic benefits to the local communities both in urban and rural areas.
- Vast quantities, Can always regenerate easily, have high yield per hectare per period of time.
- Have short growth cycles compared those of wood production.
- Most have lower lignin contents, which makes chemical and mechanical processes pulping easier.
- Poses to be less expensive.
- Collection and disposal poses as a problem to farmers and municipal authorities.

**Challenges**

- First the high handling costs due to the low density, leading to bulkiness of the materials.
- Threat of security of supply of the raw materials.
- Seasonal availability.

**Conclusions**

The choice of the pulping methods for paper production will depend on the end uses of paper being manufactured. Depending on the technical analysis of the production processes the *Cymbopogon nardus* grass is recommended for pulp and paper production.
A survey of graduates from universities throughout Sub-Saharan Africa indicated exploding demand for higher education which has resulted in over-flowing teaching environments. The situation becomes more complicated as infrastructure remains highly limited. Makerere University with about 280 programs both at undergraduate and postgraduate levels has an enrolment of 40,000 students and about 1500 academic staff. The distribution of these numbers across colleges varies.

**Problem statement**

In some colleges like Education and External Studies, Business and Management Studies, Humanities and Social Sciences there are very high student numbers resulting in what is called large classes, which educators have to contend with. Some educators are successfully use lectures to teach the large classes. More options in teaching of large classes include the use of Information and communication Technologies called emerging technologies. Even when these technologies are the available option, educators are not keen to use them, leading to the over reliance and dominance of lectures (Hennessy, et al., 2010). Not to argue that lecture is a bad method of teaching, it is argued that using the new technologies is equally necessary and useful and it is therefore important for an educator to gain proficiency in both. The crux of the matter is the ever increasing lamentations about the nightmare of lecture methodology with little or no trial of the alternative. The question for this study is: how are educators encouraged to engage in the practice of using emerging technologies in teaching large classes?

**Methodology**

This study used educational design research methodologies which enabled the researcher to work in collaboration and closely with other educators as practitioners to identify the research problem. What is on ground is the tendency of encouraging educators to use the lecture method simply because it has worked before and works well with every educators. However, this is thinking inside the book, it makes no harm for an educator to also become proficient in the use of emerging technologies in large classes. After all a soldier with two magazine bullets is well equipped than that with one. This study is about equipping the educators with what the use of emerging technologies, not to say that either or is better in teaching. An intervention was designed and implemented in three iterations (cycles) to the participating educators. Evaluation of the intervention outcome was done in each cycle to understand its effectiveness. Before a subsequent cycles, the intervention was always adjusted based on the feedback of participants. During the iterations data was collected through observation, focused discussion groups, online survey and in-depth interviews. The research methodologies, guided the design of activities that engaged educators in active participation in using emerging technologies in real and simulated environments.

**Theoretical view**

Situated learning theory- knowledge is culturally mediated and socially shared and distributed across people, tools and practicing communities. The theory emphasizes learning in a community of practice- a group of people sharing a career and collectively interacting regularly to share information and experiences in order to learn from each other through legitimate peripheral participation in community activities. Educators shared mutual engagement in using emerging technologies so as to collaborate and achieve shared repertoire.
From the figure, one beginning a journey to experience is at the edge of the circle the centre represents one more knowledgeable about a practice (experienced). As a new comer one participates in a practice from the edge. Through collaboration, interaction and interaction in with a community, a beginner is able to makes a journey to the centre and the community recognizes them as experienced. Through the same avenues of interaction, collaboration and engagement, one is able to learn more from a community. One enters a community of practice by a process of participation that is at first legitimately peripheral, but that increases gradually in engagement and complexity (Serrat, 2010).

Findings

Findings indicate that in this community of practice, approach encouraged educators to actively reflect on the practice, dialogue and negotiate meanings, collaborate and contribute to mentorship. The multiple perspectives, values and beliefs also presented opportunities for contextual knowledge validation. The following table represents what the platform was able to perform.

<table>
<thead>
<tr>
<th>Problem solving</th>
<th>Educators working together on a design and brainstorming where one is stuck.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requesting for information</td>
<td>Educators asking for information regarding where to find something or someone who can help among them.</td>
</tr>
<tr>
<td>Seeking experience</td>
<td>Educators accessing others who have dealt with a similar situation to share their experiences.</td>
</tr>
<tr>
<td>Coordination and synergy</td>
<td>Educators combining efforts to do something faster or more easily.</td>
</tr>
<tr>
<td>Discussing developments</td>
<td>Educators discussing ETs and their relevance as they emerge.</td>
</tr>
<tr>
<td>Documentation projects</td>
<td>Educators writing experiences down so that they help in solving similar future problems.</td>
</tr>
<tr>
<td>Visiting other places and people</td>
<td>Educators visiting places or other contexts so that one can learn from them.</td>
</tr>
<tr>
<td>Mapping knowledge and identifying gaps</td>
<td>Educators finding other who know different ET tools so they can add up missing links</td>
</tr>
</tbody>
</table>

From the table, educators were able to have easy access to problem solving strategies and easily ask for information from each other at their various levels of experience. They were also able to seek other people's experiences and work collaboratively through creating synergies. It was equally easy to discuss developments and thus keep up to date in the field of emerging technologies in education. Through this community, there was documentation of certain procedures which were later referred to in the subsequent iterations. Educators were able to even visit other places and find more useful experiences that helped them map the missing links.

Recommendations

It is recommended that communities of practice be intentionally established and promoted as they provide both immediate and long-time benefits to extend the practice of using emerging technologies to teach large classes, a challenge faced by many educators. To promote and enhance the educator use of emerging technologies in large classes, the institution should be able to do the following:

1. Content should be lived experiences not the theories
2. Context should be designed to enable multiple views, values and beliefs
3. Community should be supportive in reflection and interpretation of knowledge
4. Educators must be encouraged to actively participate in all alternatives.
Digitizing Ateso Oral Narratives is converting the analog cinematic video recordings of performances to digital forms; just as a scanned signature or photograph of a proprietor can be captured in a computer and transmitted digitally, say, on the net. Many oral performances are recorded, first manually, with notebook and pencil, accompanied by the pinhole camera, then as technology develops, with a cine-recording videotape. These are limited preservatives of the rich acts of performance.

In the study, many performers varied the oral narratives whenever the time and place of acting changed. The only way to preserve authenticity of oral performance is to digitize that narrative. This method in technology ensures a reliable and longer period of custodianship of the cultural heritage. Digital materials could be accessible to a variety of the users like the Ateso speakers in the Uganda and Kenya Teso districts and the Iteso in the Diaspora with relative accuracy and preserved originality.

Digital surrogates could be created of the recordings in analog of manuscripts, newsprints, Face-book exchanges of interesting photos, videotapes and so on. Authentic copies of a performance could be disseminated to various audiences and stakeholders and effective communication attained. The human error of misinterpretation and the psychoanalytic stance of narrative empathy might be reduced.

CONTENT AND IMPORTANCE OF THE PROBLEM
Throughout the study, the researcher was faced with the dilemma of inconsistency of the oral narratives. One performer would deliver the message using varied agility and tempo according to the context and motivation. Many sectors in leadership use oral narratives for communicating messages in Education, socio-economic policy statements, awareness message deliveries and so on. The accuracy of the delivered messages can be ensured through digitizing the messages. Let the message reach the intended audience with as little interference as possible. This accuracy should be maintained over a period of time and for short and long distances alike.

CRITIQUE OF EXISTING POLICY ON DIGITIZATION
A recent study in Makerere by Agnes Namaganda (November 2014), on ‘The learning experience of Makerere University Digital Music Archive’, revealed that “abrupt technological changes have rendered certain media obsolete hence limited access to music information.” The pace of digitization is slow due to scarcity of playback equipment, copyright issues, and inadequate technical skills. Besides, the attempts to digitize information are expensive and inaccessible to the aspiring users. It is envisaged that digitization will improve preservation and access to the musical cultural heritage. However, equipment and facilities are scarce, funding rare, training of staff inadequate, enforcement of appropriate laws difficult since many do not know the law, and provision of improved facilities need to be put in place for studying music in its various formats. What she said of music is true to Ateso oral narratives. In the Makerere University library, the active digitization of information is in full gear with the help of the University of Bergen.

POLICY RECOMMENDATIONS
- Digitize all research results on values of particular people as it is relayed by the surviving custodians in those communities.
- Establish information metadata bases should be digitized, disseminated and preserved.
- Solicit funding for digitization of Indigenous Knowledge including Oral narratives for the project to take off.
Incompetent laboratories continue to provide wrong test results to patients who receive wrong treatment and compromise their health care. The main reason for this is the current poorly integrated laboratory information systems such as poor records and documentation systems and stand alone data management. The existing mechanisms did not provide for real-time identification, investigation and corrective action of incompetent laboratories by the national External Quality Assessment (EQA) program and there are delays.

Clinical diagnosis provided by laboratories is a major component of health systems as it is the entry point for patient care. Quality improvement in clinical laboratories becomes necessary. External Quality Assessment (EQA) and Proficiency Testing (PT) programs are fundamental tools for quality evaluation and improvement in clinical laboratories by reducing inter-laboratory variation, analytical errors and improving the "state-of-the art" services.

Audience:

**What the policy intends to do:**

Improve the laboratory information and documentation system by integrating and quick sharing of standalone routine records using GIS applications. This facilitates fast tracking of lab performance, enables real-time detection and visualization of incompetent laboratories, support the initiation of appropriate investigation of root causes and provide appropriate decisions for corrective actions by national External Quality Assessment (EQA) program of Ministry of Health.

**Impact of policy on lab External Quality Assessment (EQA)**

Using geographical information system (GIS) application will link and visualize; laboratory profile data, and performance data for external quality assessment (EQA) schemes of CPHL and NTRL. When performance data are abstracted from lab records and transferred in real-time using ODK collect application on mobile phones to a virtual server with predetermined grading that instantly attached a colour coding to the grade, and visualised by Google earth application at a glance will provide real-time identification of incompetent laboratories.

*Using ODK on mobile phone to submit EQA results from lab register for Budondo HC IV to CPHL in real-time*

*Page for real-time data accessed at CPHL through a virtual server called ODK aggregate*
The real-time identification, investigation and corrective action of incompetent laboratories by the national EQA program will reduce delays in decision making, increase the benefits EQA provides as an Opportunity For Improvement (OFI) tool and the incompetent laboratories will not provide wrong test results to compromise patient care thereby enhancing the quality of laboratory service in Uganda.

Unintended outcomes

There may be the misuse of smart phones by the laboratory personnel. On the other hand, laboratory personnel have been trusted with more sophisticated mobile equipment such as point of care of care CD4 machines and are providing the service.

Potential stakeholders

Laboratory personnel, EQA units of CPHL and NTRL, Ministry of Health top management for approving the policy, Ministry of Health Resource centre in-charge of IT and data tools, Health facility in-charges, District Health Officers

Anticipated questions

1. What the cost involved in implementing the idea? The cost is estimated to be one quarter of the costs used to implement the DHIS2 project.

2. What is the internet coverage in the country? Apparently there 95% coverage of internet services in Uganda so the idea is applicable

3. What does it require to develop capacity for implementing the idea? It takes 10 – 30 minutes to understand how to use the technology set up. Procurement of smart phones to over 1700 public laboratories is possible. It costs less than 500 Ug. sh worth of internet mbs for 3 test result submissions.
Viral diseases among staple food crops are a leading cause of food insecurity in Africa. In Uganda particularly, the cassava crop is the second most important staple food crop and a source of livelihood to 75% of all farming households. It is estimated that losses in the millions (USD) accrue annually due to loss of cassava yield as a result of viral diseases in cassava. Therefore improving the surveillance systems is critical for ensuring sustainable agriculture through timely interventions.

Our work investigates the use of smart-phones for doing the crop health surveillance. The Mobile Crop Surveillance ($mcrops$), a project under the Artificial Intelligence in Developing countries Research group (AI-DEV) at College of Computing & IS, Makerere University, developed a smart-phone application that can be used to digitally capture crop health surveillance data in the field as well as capture image data and geo-coordinates of crops inspected.

"The data is automatically mapped in real-time as the survey proceeds."

Context and importance of the problem

Sustainable agriculture is impossible without effective surveillance and monitoring of crop diseases. Viral crop diseases are a major source of crop yield loss in the East African region and are responsible for food insecurity and poverty in many rural households.

The problem with existing standard crop survey methods is that they are expensive and untimely. Because of the expense, where the budget for survey is limited, this typically leads to a small proportion of the area of interest being surveyed.

The lack of appropriate non-expert techniques and tools for cheap, rapid and effective surveillance and monitoring of disease and vectors in the field and to evaluate the health of crops constitute significant barriers in the fight for sustainable agriculture for smallholder farmers.

Because data have been limited, there has also been little development to-date of spatio-temporal models of disease infection dynamics. Therefore the capacity for prediction of disease spread is limited; given a map of current disease prevalence, it is difficult for decision-makers to calculate the areas at risk within 6 or 12 months, for example.

The data needed to inform models of disease spread have until now been impractical to collect manually on a large scale.
FIGURE 1: A crop surveillance system with real-time mapping of field data. Using our system, images of crops are taken in the field with the relevant disease incidence and severity and real-time mapping occurs online.

What is achieved with our system

Each year, the National Crops Resources Research Institute (NaCRRI) undertakes a national cassava health survey. The surveyors currently use more traditional methods of data collection like paper forms that require extra resource to be digitized and suffer great wear and tear over time.

Further more, the existing standard crop survey methods tend to be expensive, untimely and within limited budgets, cover small proportions of the area of interest being surveyed.

Our system attempts to provide a solution to this problem by abstracting the data collection to collection over smart-phones. This has already been shown to work in other fields. Mobile phones provide the requisite portability, processing power and requisite checks to ensure sufficiently good data is collected. Sensors like GPS on the phone also mean the data can be mapped in real time.

We have worked with NaCRRI on a pilot to use both systems in parallel to ascertain the gains accruing from using the smart-phone based system.
EXECUTIVE SUMMARY

- The use of herbal medicines was at 37.7% (n=132), despite the fact that majority (75.4% (n=264)) of the participant agreed that herbal medicine use during pregnancy is highly prevalent in their community.
- The percentage use of herbal medicines by tribe was found to be highest among the western and central tribes of the country compared to the Northern tribes.
- Friends (n=135, 38.6%), family relatives (n=118, 33.7%) and radios at (n=55, 15.7%) are the major recommenders of herbal medicine use, however these may not have sufficient knowledge to advise pregnant women about their use and safety.
- Women have a poor attitude towards consulting health workers before using the herbal medicines.
- The method of extraction are not safe and haven't been approved by the National Drug Authority.
- The indications for using herbs could be danger signs of pregnancy that without proper medical care predisposes the mother and the fetus to complication that could lead to maternal mortality.
- It's undeniably true that herbs have some benefits which are currently unknown, however all these interesting speculations should be subjected to standardized scientific research for confirmation.

INTRODUCTION

The use of herbal medicine has been on increase in many developing and industrialized countries. The global use of herbal medicines during pregnancy is common, ranging from 7.0 to 55.0%. This is highly fueled by easy accessibility, affordability, availability and acceptability of traditional herbal medicines by majority of the population in developing countries.

Despite this widespread use and their reported benefits, they are not completely harmless. The safety of herbal drugs becomes of particularly importance in some subpopulations of individuals such as pregnant women and children, who are more vulnerable to the effects of drugs. Nevertheless during pregnancy exposure to herbal products is frequent in these subjects.

In Uganda there is a great tendency (80% in western Uganda and 74% at Mulago National Referral Hospital) for majority of women, to utilize traditional therapies at each stage of pregnancy and resort to the health services only if absolutely required.

This raises a public health concern since several studies have associated them to undesirable outcomes in pregnancy. In view of such studies relentless efforts have been made by health workers and policy makers to discourage the indiscriminate and unregulated use of herbal medicines during pregnancy however with minimal success as indicated by the high figures above.

For such efforts to be rewarding, they need more information about the knowledge base of pregnant women on herbal medicines, motivating factors behind their use and pharmacological properties of the commonly used drugs, which currently still scanty as a result of the insufficient research about herbal medicines in Uganda. This study therefore aimed at determining the prevalence of use, knowledge base and the motivating factors behind the use of herbal medicines among pregnant women attending antenatal clinic at Kiryandongo hospital and hence help narrow this knowledge gap.

WHAT DID WE LEARN (RESULTS)

Prevalence.
The use of herbal medicines was at 37.7% (n=132). Despite the fact that majority (75.4% (n=264)) of the participant agreed that herbal medicine use during pregnancy is highly prevalent in their community however only 37.7% admitted to be using them. This discrepancy indicates under reporting and later on, the poor attitude towards consulting and informing their health care providers.

Unlike other studies, no statistically significant relationship between the gravidity, the religious affiliation, respondents age, residence and the use of herbal medicines. However women who have ever used herbal medicines during the previous pregnancies were more likely to use them in the next pregnancy (p<0.005) The percentage use of herbal medicines by tribe was found to be highest among the western and central tribes of the country compared to the Northern tribes, this also could explains why Kamara et-al\(^3\) and Kamatenesi et-al\(^6\) who conducted related studies in the central and western parts of the country respectively had higher prevalence levels. This might also suggest that this practice is more prevalent among the western and central tribe compared to the northern tribes.

**Knowledge.**

Friends (n=135, 38.6%), family relatives (n=118, 33.7%) and radios at (55, 15.7) are the major recommenders of herbal medicine use, however these may not have sufficient knowledge to advise.

![Percentage use by tribe](image)

Fig; 1. pregnant women about the use and safety of herbal drugs yet the information from radios is majorly from local herbalists who with financial ambitions use a persuasive language to lure the public in to buying their products.

The fact that only 0.6% of the respondents reported to have received advice from a qualified healthcare personnel further indicates the poor attitude towards consulting health workers before using the herbal medicines.

Majority (70.5%) of the respondents who were currently using herbal medicines were willing to inform the health care provider if asked. This reflects a window for health workers to inquire in anon judgmental way and provide the right information to the mothers.

Although this study never assessed the methods of extraction and preparation, however basing on the respondents description of herbal medicines it may be right to assume that most of used method are not safe and haven’t been approved by the National Drug Authority. These may include poor storage methods, use of dirty containers, unsafe solvents like alcohol and unboiled water.

A big proportion of our respondents 55% were not aware of the potential detrimental side effects as they considered them to be safe, yet only 15% considered them as unsafe. Majority were using herbs during the first(29.5%) and second(40.2%) trimester(fig 2 and 3), this could be explained by the increased incidence of pregnancy related problems during this period, however this is crucial period during which most chemicals can exert their teratogenic effects on the developing fetus.
Some of the indications are minor ailments of pregnancy however others are danger signs during pregnancy as fevers could indicate among many, malaria in pregnancy, epigastric pain preeclampsia yet stomach pain and fevers could be signs of chorioamnionitis. Without proper medical examination, investigation and treatment as could be with the use of herbs predisposes the mother and the fetus to complications that could lead to maternal mortality.

Attitudes
Women who have ever used or are currently using herbs are more likely to consider them effective (p < 0.05) and would prefer them to convention medication (p < 0.05) this further suggests traditionally proven efficacy that needs proof by standard scientific studies. There may be benefits of these herbs, which are currently unknown however all these interesting speculations should be subjected to standardized scientific research for confirmation, active compound identification, and evaluation of their effects on the fetus, mother and the outcome of labor.

The reasons for this preference included herbal medicines being cheap and easily accessible (21.2%) , low side effect profile, herbal medicines being more effective than conventional medicines (66.9%) and because it is traditional to use herbal medicines during pregnancy (4.6%).

Recommendations
Health care personnel need to be aware and continuously educate themselves of the potentially beneficial as well as harmful effects related to herbal drug use.

Although the information on safety of herbal medicines during pregnancy is not complete, it is safe to advise pregnant mothers not to expose their unborn child to the risk of herbal medicines. Pharmacological and case control studies will be vital in assessing the efficacy and associated with herbal medicine use during pregnancy.

More national surveys on this topic are required to ascertain to true extent of this practice. This can be included in their antenatal cards.
Maternal and neonatal morbidity and mortality arising from inadequate health services is an important global health concern. The burden of maternal deaths occurring worldwide has been estimated at 358,000. However, 99% of these deaths still come from developing countries. For example in Uganda, maternal mortality is estimated to 438/100,000 live births. As a result Uganda is not on track to achieving its MDG 5 target.

One of the factors associated with this maternal and fetal mortality is the occurrence of home deliveries in developing countries as they are largely unplanned, accidental and unhygienic. While key indicator Millennium Development Goal (MDG) 5 include reducing the maternal mortality ratio by three quarters between 1990 and 2015 and increasing the proportion of births attended by skilled health personnel. A key strategy to reducing maternal and neonatal deaths is the ‘health-centre intrapartum care strategy where qualified skilled workers manage labour effectively and referral systems for specialized care when needed, and an effective postnatal care package.

Community based cross sectional study was conducted among mothers with birth in the last 12 months during June-august, 2014. Aimed to determine factors associated with health facilities deliveries in Kabale municipally, Uganda.

The study found that 54.39% of the mothers delivered in health facilities. Of 87.9% mothers who gave birth at home, 80.0% of them were assisted by family members and relatives. The common reasons for non health facility delivery were closer attention from (33.41%), long distance to health facility (37.5%), unexpected labour (16.59%), negative attitudes of health workers (21.6%) and presence of TBAs (11.46%). Low institutional delivery service utilization was observed in the study area. Majority of the births at home were assisted by family members and relatives. Mothers and husbands’ education, occupation of mothers and their husbands, distance to taken to reach health facility, socio-economic status and age of mothers and were found to be associated with delivery service utilization. Strategies with focus on increasing uptake and building knowledge of the mothers and their partners would help to increase utilization of the service. Increase health facilities to shorten the distance to health facilities, further research to deeply identify factors that hinder facility deliveries would improve utilization of the health facility deliveries.

Context and important of the problem
In Uganda only 57% of all births occur in health facilities, the condition is more serious in rural areas where only 36% of the deliveries occur in health facilities compared to 79% for urban areas. In southwest region where Kabale municipally is located, 59.6% of the women deliver at home while 40.4% deliver in health facilities and is the second leading region with home deliveries after Karamoja.

Critique of policy options
There have been a number of policy and strategic guidelines to promote health facility deliveries in Uganda. However, they have not been effective in achieving intended targets. For example there has been mass recruiting of health workers, community sensitizations these therefore, calls for evidence based interventions

Policy recommendations
- Responsible authorities should strengthen the referral system (Ambulance system) to ease transportation of women in labour
- Developing health education plan that encouraging women the importance of delivering in health facilities and risks related delivering outside of health facilities
- Health education and mobilization efforts should also be focused on encouraging mothers and their spouses to plan early for delivery to address the negative effects of delay in reaching of health facility
- Health facility delivery promotional interventions should be focused on populations of women with characteristics known to hinder delivering in health facilities for example women far away from health facilities those with low education and socio-economic status
PPB 112: Prevention of Human brucellosis a disease of animals in humans is possible: Strategies for action

Tumwine Gabriel

Brucellosis is a disease of animals that also affects humans when human come in contact of infected animals and animal products like milk or meat [1]. In Uganda, animals especially cattle have been reported to have the disease to in a range of 10.2 to 25.7% [2]. Since the disease is got from animals, therefore, people who work closely with animals for example farmers, veterinarians and butchers are at high risk of getting the disease [3]. About 12% and 7% of butchers in Kampala and Mbarara slaughters place were found to suffer from brucellosis [4]. Study in Kiboga district among humans in agro-pastoral communities revealed that over 17% of the tested people were infected with brucellosis.

Many people continue to suffer from the disease but it is silent and among the neglected disease as it has signs and symptoms similar to malaria, typhoid fevers and diseases that cause fevers[5, 6]. In most cases, because it shows itself like malaria, people tend to treat the disease as malaria. Many people and medical doctors confuse the disease with malaria. The infected person always reports cases of not getting better even after treatment for malaria.

In Uganda, where over 80% of people depend on agriculture and out of this, majority depend on animals for their livelihood. People continue to suffer from this silent disease and yet it is preventable and curable. There are challenges of its early detection and also poor health infrastructure in rural Uganda where the disease is more common especially among the animal keeper. People commonly get infected when they consume locally prepared milk products like local yoghurt, share water sources with animals, assist animals when delivering. Due to weak animal movement laws in Uganda, there is trans-boundary transmission of the disease.

Strategies for action

**Sensitization of the population especially the population at risk**

Since the disease is from animals, those who work close to animals should sensitize and made aware of the disease. People be encouraged to wear protective gears when handling animals. Consumers of milk and meat should be encouraged to drink/eat well cocked milk and meat and avoid looked untreated milk products. This can be carried out through radio talks and use of villager health workers.

**Establishing and strengthening of Laboratory facilities at Local Government levels**

Many health centres rarely test for Brucellosis. Many clinicians rely on clinical signs for prescription of treatment. Brucellosis is confused in most cases to be malaria and therefore treated as malaria. So need to encourage laboratory technicians to always check for brucellosis when the person complains with clinical signs in addition to carrying out malaria test.

**Establishing disease prevention zones and animal health check points**

Animal check points should be established at all entry points. All animals transported should be screened for brucellosis among other Transboundary diseases and restriction of animal movement from the disease control zones.

**Regular surveillance of brucellosis in humans and animals**

Surveillance should be done frequently at least once a year. Both humans and animals should be considered in the surveillance program since the disease in affects both.

**Screening and treatment of infected persons**

Screening of humans and treatment of the disease is possible. The government and other health support systems should include brucellosis drugs in their packages. Build local expertise in the detection and treatment of the disease.
Policy Recommendation
Effective brucellosis prevention and control should involve human sensitization for awareness of the disease and infrastructural capacity building through early and regular detection of the brucellosis in humans and animals, early treatment of infected persons as well as establishment of brucellosis control strategies of screening and restriction for animal movements to limit disease transmission.

Further readings
   2002.
This is a research project being undertaken by the AI-DEV research group at the School of Computing and IT. We present several methodologies based on cutting edge crop surveillance techniques. These include smart-phone enabled field based diagnosis of plant diseases, the use of spectrometry techniques in performing non-invasive diagnosis of disease in asymptomatic crops as well as spatial temporal models for disease spread and incidence.

**Proof-of-concept work done**

Presently, we have done proof-of-concept studies on Cassava Mosaic Disease (CMD) that provide sufficient evidence that computer vision approaches can distinguish between these viral diseases in cassava plants. This work was done in collaboration with the National Crop Resources Research Institute (NaCRRI) in Uganda. This system has two components.

- First, software running on the mobile phone can process an image taken by the phone's camera and determine statistically the probability of different viral diseases.
- Secondly, this diagnosis can be uploaded to a server where results can be seen in real-time on a map. This is important for national bodies in charge of disease monitoring.

**FIGURE 1:** Automated diagnosis of CMD in a cassava field using a mobile phone. An image is taken of the crop in the field and software on the mobile phone specifies whether the crop is diseased or not by looking at specific features in the image of the leaf.
Significance

The present system of doing diagnosis depends on an expert usually from the national research organizations visiting individual fields and applying his skill and knowledge to diagnosing disease. Owing to limited resources (time and experts), this system proves inefficient.

Our proposed system will free up expert time, so experts have more time to concentrate on other research. It will also provide farmers with quick feedback on the state of health of their crops; this has implications for combating the incidence of food insecurity and prevention of yield loss through early interventions.

Moving forward…

1. We intend to test this system on a wider scale throughout the different regions of the country to benchmark its performance.
2. We intend to extend the system to cover not only CMD but also other viral cassava diseases.
3. We intend to work closely with NaCRRI to extend the system to detect disease in crops that are not yet symptomatic using spectrometry.
Background

Canarium schweinfurthii also referred to as an african olive fruit is an indigenous fruit trees in tropical African. The fruit tree grows to 36-50m (150-160 feet) high (Fig 1) in the equatorial forest in east, west and central African countries including Uganda. Its fruits are sold in local markets in both rural and urban areas. They are eaten raw or cooked/parboiled as snacks after softening in warm water (Fig 2 & 3). However, with increased advocacy for commercial agriculture to establish large crop plantation like sugar cane, maize, rice and cotton; C. schweinfurthii fruit trees are at risk of extinction. These important trees are cut down because of limited knowledge on the nutritional and bioactive components of fruit. Providing information on the nutritional and bioactive components will enhance its commercial potential.

Nutritional values

The fruit of C. schweinfurthii is fleshy with over half of it weight being edible pulp (Fig 2). The fruit pulp is rich in nutrients such as calories, dietary fibre, fat and mineral like potassium and magnesium. About 40 fruits of C. schweinfurthii can produce approximately 100g of edible pulp that is enough to provide twice the total dietary fibre, adequate vitamin C, half the total fat, a quarter of total calories and a fifth of potassium and magnesium required by 15 year old person. The pulp also contains vitamin A and sugars like glucose and fructose. Calories are major energy sources and dietary fibre reduces occurrence of such disorders like constipation, colon diseases, diabetes, cardiovascular diseases and obesity. Vitamin C enhances body immunity and prevents colds and cancer while potassium is important regulating body fluids and prevention of heart diseases.

Edible vegetable oil

The pulp of C. schweinfurthii contains about 30% vegetable oil. Fruits in this range are used in extraction of vegetable oil for various food, cosmetic, pharmaceuticals and biodiesel applications.

Medicinal value

The pulp of C. schweinfurthii also contains bioactive components like alkaloids, tannins, coumarins, sterols and triterpenes, volatile oils, higher fatty acids, reducing compounds, flavanoids and anthocyanins with health benefitting properties. There is scientific evidence that these bioactive components have health promoting benefits such as antioxidant, antimicrobial, anti-inflammatory, anticancer, and cardiovascular protection activities.

Recommendations

- The fruits of C. schweinfurthii can be eaten to provide essential nutrients needed by person on daily basis for food and nutritional security.
- Consumption of the fruits of C. schweinfurthii can also enhance the health of the population by reducing risk of heart diseases and cancer.
- The fruit of C. schweinfurthii can be used for development of food products like pickle, jam, wine and vegetable oil for food, cosmetics, pharmaceutical and biofuel application. This in turn creates employment and also improves household income among the suppliers of the fruits for the processors.
- Enhanced value of C. schweinfurthii fruits of will definately promotes its conservation on farm.
Globally, road traffic injuries are the eighth leading cause of death. Furthermore, they are the leading cause of death among young people aged 15–29. More than a million people die each year on the world’s roads, and the cost of dealing with the consequences of these road traffic crashes runs to billions of dollars. Road traffic deaths are predicted to globally increase at 67% and 83% in low-income and middle-income by 2020 if appropriate action is not taken. There are notable differences in the way different road users are affected by road traffic collisions as half of the world’s road traffic deaths occur among motorcyclists (23%), pedestrians (22%) and cyclists (5%).

Although in Uganda there are policies in place on improving road safety among boda-boda riders and passengers, their implementation is not monitored and evaluated to assess for effectiveness.

This policy brief seeks to recommend a multi-sectored approach in training boda-boda riders prior and during their business and also increase awareness among the riders and the public on road safety measures.

Context and importance of the problem

Over the years there has been a significant growth in the use of motorcycles as a commercial public transport mode. While offering certain transport advantages in the form of easy manoeuvrability, ability to travel on poor roads, and demand for responsiveness, commercial motorcycle service growth has also led to an increase in road traffic injuries.

In 2010, the average cost of maintaining a boda-boda patient was determined at 700,359 UGX and in total boda-boda injuries consumed 62.5% of the budget allocation for the directorate of surgery at Mulago National Referral Hospital. This highlights the high burden of commercial motorcyclist related accidents on the country’s already poor health system. In the same year, there were an estimated 10.7% of road traffic crash victims with permanent disability.

Although over the years the death rate from road traffic injuries has declined from 71% in 2007 to 46.5% in 2011, the Uganda Police reports an increase in road traffic injuries from 19,867 in 2007 to 22,272 in 2011.

Road traffic injuries put significant financial strain on families as they are driven into poverty by the cost of prolonged medical care, the loss of a family breadwinner or the extra funds needed to care for people with disabilities. Road crash survivors, their families, friends and other caregivers often suffer adverse social, physical and psychological effects and this makes them an issue of public health importance that needs to be addressed.

Critique of policy options

In a bid to reduce on road traffic accidents in Uganda, the Government has set up laws like the Uganda Traffic and Road Safety Act of 1998, laws on speed limits, drink-driving, and motorcycle helmet use to improve road safety. Furthermore, the Ministry of Works and Transport has developed a motor cycle and tricycle policy to allow for their better management and control while the National Road Safety Council (NRSC) was created to sensitize the public and raise awareness on factors associated with road traffic injuries and deaths.

In principle, all commercial motorcycles must be registered, operators must possess a driving license, not carry more than one passenger and also use and provide customers with protective helmets; in practice, a large number of operators are not compliant with the legislation. This has been attributed to a combination of weak institutions, infrastructural deficiencies and the powerful influence of anti-reform stakeholders. In
addition, some laws like the law against drunk driving, is not implemented on commercial motorcyclists as only car owners are subjected to the breath testing campaigns.

Policy recommendations

1. This policy brief suggests a multi-sectored training approach for the boda-boda riders. The traffic police in collaboration with the boda-boda leadership bodies, Municipal councils and relevant non-governmental organizations, should plan, organise and hold training sessions for all existing riders and those wishing to join the commerce so as to increase their level of knowledge on road safety measures.

2. This policy brief further suggests a multi-sectored sensitization campaign for both the boda-boda riders and their passengers. This campaign will increase awareness through the information provided on risk factors for a road traffic injury, safe road use practices and basic resuscitation skills in case of an injury.

Fig. 5: In and Out-of-school Youth leaders after being trained in entrepreneurship at Namasagali College

Fig. 6: A pupil explaining growing of Orange Fleshted Sweet Potatoes during a Field Day

Fig. 7: Service Learners participating in construction of a teachers house at a UPE school

Fig. 8: Pupils managing a poultry project to produce eggs for their lunch programme