NATIONAL RESEARCH DISSEMINATION CONFERENCE

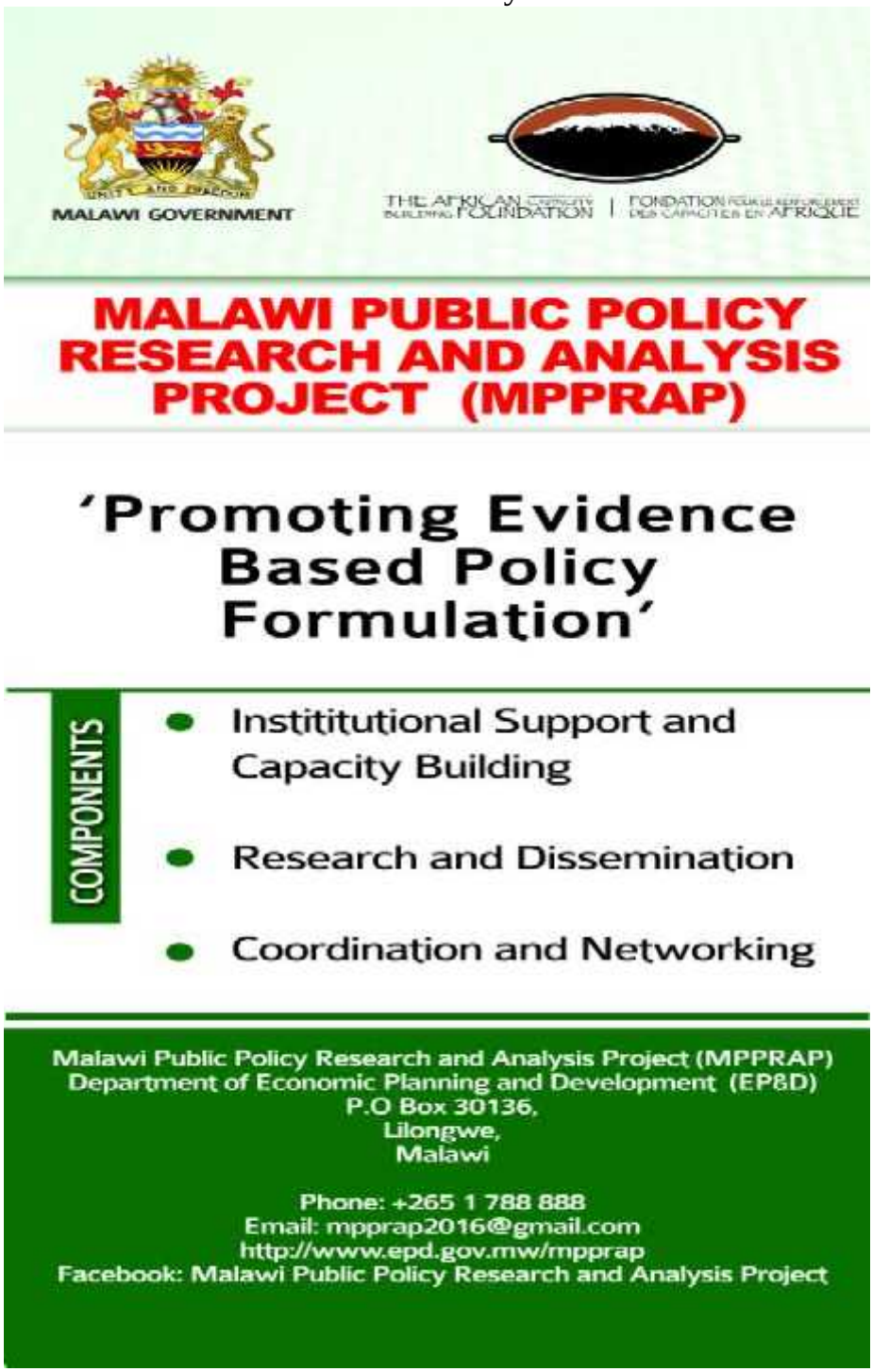
RESEARCH AND INNOVATION: A CATALYST FOR SUSTAINABLE DEVELOPMENT

Co-organised
by
NATIONAL COMMISSION FOR SCIENCE AND TECHNOLOGY (**NCST**)
& MINISTRY OF FINANCE, ECONOMIC PLANNING AND DEVELOPMENT THROUGH MALAWI PUBLIC POLICY RESEARCH AND ANALYSIS PROJECT (**MPPRAP**)

PROGRAMME AND BOOK OF ABSTRACTS

28th & 29th September, 2017: Nkopola Lodge;
Mangochi Malawi

Theme: Research and Innovation: A Catalyst for Sustainable Development



PROGRAMME AND BOOK OF ABSTRACTS

28th & 29th September, 2017

Prepared by

Symon Mandala, Gift Kadzamira, Fredrick Munthali, Judith Elisa, Chimwemwe Maimba, Elsie Salima & Dr. Grace Kumchulesi

Foreword

On behalf of the Government of Malawi, the Ministry of Finance, Economic Planning and Development would like to cordially welcome all the delegates to the 2017 National Research Dissemination Conference. In general, there is increasing demand for evidence in policy making and implementation. To the researchers, this is a challenge as they have to produce the much needed evidence for decision making. On behalf of the Policy Makers, I would like to encourage the researchers to continue producing high-quality evidence that is relevant to the country. Government understands the importance of evidence for decision making, and that is why the Ministry of Finance, Economic Planning and Development through the Malawi Public Policy and Analysis Project partnered with the National Commission for Science and Technology in organizing this research conference. I would like to encourage other stakeholders to engage in similar partnerships and collaborations. Government is committed to promoting evidence-based policies in Malawi through research, dissemination, networking and coordination.

This year's theme 'Research and Innovation: a Catalyst for Sustainable Development', has come at the opportune time as the country starts implementing the third Malawi Growth and Development Strategy (MGDS III) which has domesticated the Sustainable Development Goals (SDGs). Recognizing that research and innovation is key to facilitating development, investing in innovative thinking will therefore help to fast track the development of our country. I am therefore confident that the outcome of this Conference will go a long way in promoting research and innovation in Malawi to enhance evidence-based public policies.

I would like to thank the Board, Management and Staff of NCST; the Steering and Technical Committee Members and Staff of MPPRAP; and Management and Staff of the Ministry of Finance, Economic Planning and Development for working together in the organization of this conference. Most importantly, the Government of Malawi is also grateful to the African Capacity Building Foundation (ACBF) for financially supporting the organization of this conference.

I wish you a successful and fruitful conference.

Ben Botolo
SECRETARY TO TREASURY

Welcome

On behalf of the NCST Board of Commissioners, Management and Staff, it is a great honour to extend a warm welcome and vote of appreciation to all the delegates, stakeholders and development partners from all sectors to the 2017 National Research Dissemination Conference.

The NCST through its mandate as provided for in the Science and Technology Act No. 16 of 2003; came up with different strategies to promote research and development in Malawi. One of the strategies is to ensure effective dissemination of research results. This has proven to be one of the effective ways of promoting research in Malawi as it gives an opportunity to researchers to showcase and transfer their research findings to a more diverse audience; as the conference attracts delegates from various sectors. Most importantly, it provides a platform for researchers, the industry and private sector players to interact, network, contribute and learn about recent advances and emerging issues in their various fields of interest and expertise. In addition, the conference advocates for science by enabling researchers, policy makers and the general public to become aware of research findings and instil curiosity and innovative thinking for development. The Ministry of Finance, Economic Planning and Development through the Malawi Public Policy Research and Analysis Project (MPPRAP), who are co-organizers of the conference, aims at promoting relevance and effectiveness of public policies in Malawi through research, dissemination, networking and coordination. This conference therefore links research with policy-making towards evidence-based policy formulation and sustainable development.

This year's theme ***"Research and Innovation: a Catalyst for Sustainable Development"***, has come at the nip of time as the country advances Sustainable Development Goals (SDGs), which build on the work of the Millennium Development Goals (MDGs). Recognising that research and innovation is the key to facilitating development in Malawi, investing in an innovative thinking population, is therefore a fast track to the development of a country, as has been evidenced in such countries as China, Brazil, India, Malaysia among others, that have subsequently transformed their economies largely due to heavy investments in Science and Technology. As an apex body on Science, Technology and Innovation in Malawi, the NCST collaborates with the government, the private sector and development partners to promote research as a tool to facilitate sustainable development for the social well-being of all Malawians. I am therefore confident that that the outcome of this will go a long way in promoting research and innovation in Malawi to enhance sustainable development.

I would like to sincerely thank the Chairperson of the Organizing Team, Mrs. Gift Kadzamira, Director of Documentation and Information Services, for the effort and competence in making this conference a success. Special recognition to Symon Mandala, Head of Technology Transfer at the NCST, for diligently and tirelessly working towards the success of this conference. Special thanks too to members of the Department of Economic Planning and Development (EP&D) and MPPRAP, Mrs. Elsie Salima and Dr. Grace Kumchulesi respectively, for their technical contributions in the organization of the conference. Thanks also to the Board, Management and Staff of NCST; the Steering and Technical Committee Members and Staff of MPPRAP; and Management and Staff of EP&D for their unwavering support.

I am therefore confident that the outcome of this conference will go a long way in promoting research and innovation in Malawi to enhance sustainable development. I wish you a successful and fruitful conference.

Anthony Muyepa-Phiri
DIRECTOR GENERAL

1.0 Preamble

The NCST in collaboration with the Ministry of Finance, Economic Planning and Department under the Malawi Public Policy Research and Analysis Project (MPPRAP) has organized the 2017 National Research Dissemination Conference; under the theme, "*Research and Innovation: a Catalyst for Sustainable Development"*.

The dissemination conference has been organized in a quest to fulfil one of the Commission's functions "*Encourage the establishment and promote the coordination of research institutions that undertake research and development activities which promote national socio economic development and other specialized research and development activities in a manner that enhances cooperation and collaboration among national and international science and technology personnel and institutions*". Further, the Commission is advancing the dissemination of research results and exhibition of technologies in order to inculcate a culture of *evidence based policy decision making*. The Commission holds the national dissemination conference every two years.

1.1 Conference Sub-themes

The Conference has the following sub-themes:

1.1.1 Agriculture, Irrigation and Food Security

This category, addresses advancements and contemporary knowledge in agriculture, irrigation and food security research and innovation.

1.1.2 Environment, Climate Change and Natural Resources

Issues to be addressed in this category include climate change adaptation and mitigation, waste management, Green-house gases emissions and environmentally sound technologies and innovations.

1.1.3 Education, Social Sciences and Humanities

This subtheme focuses on use of technologies in teaching and learning, teacher motivation, inclusive education, technical and vocation education, active and innovative learning, traditional leadership, cultural and social issues.

1.1.4 Health and Population

Major areas of focus include HIV and AIDS, nutrition, food science, food safety, hygiene and sanitation, sexual health and reproduction and health systems.

1.1.5 Energy, Industry and Engineering

This category covers alternative energy sources, renewable energies, construction technologies, industrial needs assessment, among others.

1.1.6 ICT and Knowledge Management

This category covers the role of ICT in education and health, cyber security, open access, telecentres and database management systems.

1.1.7 Technology, Innovation and Entrepreneurship

In this category, issues ranging from nanotechnology, value addition and processing as well as entrepreneurship are addressed.

2.0 Conference Objectives

The main objective of the conference is to provide a platform to present and discuss lessons learnt, best practices and solutions to the challenges impeding on socioeconomic development.

The specific objectives are to:

- Promote uptake of research results
- Provide a platform for researchers to showcase their research works
- Enhance cooperation, collaboration, networking and partnerships
- Facilitate evidence based policy decision making
- Enhance scientific advances into marketable innovations

3.0 Conference Organising Process

3.1 Call for Abstracts

A call for abstracts was placed in the print media, email circulation list and the NCST website. The call lasted for 30 days. A total of 263 abstracts were received.

3.2 Assessing Abstracts

3.2.1 Initial screening

The abstracts were screened to ascertain compliance to the submission requirements as outlined in the call for abstracts, as detailed below:

i. Title of Research/Study
ii. Authors first name followed by last name, institutional affiliation, email address and phone number.
iii. Objective(s) of the study-does the study have concise objectives?
iv. Method(s) used to achieve the objectives
v. Results – a clear summary of the results.
vi. Conclusions/recommendations
vii. Format for the abstracts
    - Times New Roman Font 12
    - Single spacing
    - Maximum 300 words in MS word
viii. Statement indicating the year the research/study was conducted.

3.2.2 Expert/ Peer Review

This stage involved expert review by independent reviewers which concentrated on technical aspects of the abstracts. The focus was mainly on the:

i. Introduction;
ii. Methodology;
iii. Results;
iv. Discussion;
v. Conclusion;
vi. Relevance of the study (Thematic area, body of knowledge);
vii. Quality of Science (Principles, theories);
viii. Logical Flow; and
ix. Significance of the study (applicability).

4.0 Expected outputs and outcomes

4.1 Expected outputs

The following are the expected outputs:

i. Proceedings of the 2017 Annual Research Dissemination Conference on "Research and Innovation: a catalyst for sustainable development"
ii. Published Papers in Peer Reviewed Journals

4.2 Expected outcomes

i. Improved uptake of research results.
ii. Improved linkages, collaboration, networking and partnerships among researchers and research and development institutions.
iii. Improvement of evidence based policy decision making process.

5.0 Conference Methodology

The Conference will last for two days and will primarily implement a vibrant participatory system to encourage networking and exchange of ideas. It will basically take three approaches;

5.1 Keynote Lectures

Selected topics will be presented by specialists in their particular fields. The presentations will be followed by brainstorming sessions where questions that have arisen in the course of presentation will be answered.

5.2 Facilitated Sessions

These presentations will be made by Presenters who submitted abstracts according to the conference subthemes. Due to the large number of presentations in these two days, the presentations will run in parallel sessions.

Programme for the National Research Dissemination Conference, 28th and 29th September, 2017, Sunbird Nkopola Lodge, Mangochi

Theme	**:**	**Research and Innovation: a Catalyst for Sustainable Development**
DAY ONE	**:**	**THURSDAY, 28/09/17**
Time	**:**	**Event**
8:00-8:45	:	Registration of Participants
8:45	:	Arrival of Guest of Honour
9:00	:	Welcome Remarks by **Mr. Anthony Muyepa-Phiri**, Director General, NCST; Remarks by **Professor Moses Kwapata**, Chairperson of the NCST Board of Commissioners; Remarks by the Executive Secretary, African Capacity Building Foundation (ACBF), **Professor Emmanuel Nnadozie** Remarks by the Secretary to Treasury, **Mr. Ben Botolo** Remarks by **Dr. Ken Ndala**, Secretary for Education, Science and Technology; Official Opening Remarks by **Honourable Bright Msaka SC**, Minister of Education, Science and Technology
10:00–10:30	**:**	**Group Photograph & Refreshments**
10:30–12:30	**:**	**Key Note Presentations (30mins)**
Chairperson	***:***	***Antony Muyepa-Phiri***
Rapporteurs	***:***	***S. Mandala and F. Munthali***
		Contribution of research and innovation to industrial and knowledge based development, by **Professor Paul Cunnigham**, IST Africa. Inculcating an Evidence Based Culture in Policy Decision Making, by **Mr. Peter Simbani**, Acting Chief Director, Department of Economic Planning and Development Research and Development: A tool for agricultural transformation, by **Dr. Albert Changaya**, Controller of Agriculture Extension and Technical Services
12:30-13:00	**:**	**General Discussion**
13:00–14:00	**:**	**Lunch Break**

PARALLEL SESSION 1: EDUCATION, SOCIAL SCIENCES AND HUMANITIES

Chairperson : ***Dr. Richard Kajombo***
Rapporteurs : ***Judith Elisa & Yohane Chimbalanga***

14:00-16:00 : Paper Presentations and Discussion (20 minutes)

Experiences of English Teachers when Teaching Learners with Hearing Impairment Reading Comprehension, by A. Hara.

Exploring Participatory Teaching and Learning Methods as a means for Implementing Education for Sustainability, by T. Mkandawire.

The Influence of Self-efficacy and Intrinsic Goal Orientation on Medical and Allied Health Students' Deep Learning Approach, by F. Ngwira.

Female Fandom: Identity, Sexism, and Football in Malawi, by J.E.J Mchakulu.

The potential and limits of handouts in shaping election outcomes: the case of Malawi, by B. Dulani

Pre-service Teachers' feedback on school-based teaching practice: Perspectives on readiness, support and satisfaction, by S.M Gwayi.

Self-determination Skills in Young Adults with a diagnosis of Autism Spectrum Disorders: Lessons for enhancing positive career outcomes for students with disabilities in vocational training programmes, by A. Itimu-Phiri.

16:00-16:20 : HEALTH BREAK

16:20–18:00 : Paper Presentations and Discussion Cont. (20 minutes)

Integrating Information Communication and Technology (ICT) in Distance Education at Domasi College of Education, by M. January

Students' Attitudes towards Science Subjects in Community Day Secondary Schools: Case of Three Schools in Blantyre, Malawi, by L.L. Msonthe.

Using the Theory of Transactional Distance to Assess Open and Distance Education: Empirical Findings from Mzuzu University, by P. Zozie.

Development of a locally appropriate instrument to measure children's readiness for School, by G. Y. Chamdimba.

Does persistent practice affect students' performance in mathematics word-problems? Case study of Mthenthera Community Day Secondary School, by B. Mlumbwira.

An Analysis of knowledge and skills Acquisition in Home Economics in Integrated Science and Technology Curriculum in Selected Teachers' Training Colleges in Malawi by H. Chanachi

18:00-18:15 : General Discussion

PARALLEL SESSION 2: ICT AND KNOWLEDGE MANAGEMENT

Chairperson : ***Dr. Stanley Mlatho***
Rapporteurs : ***Catherine Chaweza & Rominie Kaseghe***

14:00-16:00 : Paper Presentations and Discussion (20 minutes)

Adoption and Integration of Google Classroom in Teaching and Learning: a Case of a University College in Malawi, by N.K. Semphere.

Examining Secondary School Teachers' use of Information and Communication Technologies (ICT) in the Teaching of Agriculture: the case of Ndirande Zone, by J.C. Kankwamba.

Tracking the quality of YFHS using m-health tools-a case for Mangochi, by P. Harawa.

The Socio-Technical Nature of Secure Systems: Case of Malawi's IFMIS, by M.Phiri.

The State of ICT Security Education in Malawi, by M. Phiri.

The link between Telecentres and Rural Community in Malawi: the Case of Vikwa Community Telecentre, by D. Namusanya.

16:00-16:20 : HEALTH BREAK

16:20–18:00 : Paper Presentations and Discussion Cont. (20 minutes)

Teacher sources of information knowledge, attitudes and practices on climate change adaptation and mitigation strategies: A case study in Lilongwe central east division, by S.C. Nkhalamba

Understanding the key Factors in the implementation of the e-learning programme at the University of Malawi's Chancellor College, by N.M. Mpekansambo

Adoption of mobile technologies in Malawi academic libraries: the case of Mzuzu University Library and Learning Resources Centre, by D. Namusanya.

Radio Listening Clubs in Malawi and how they contribute to Expanding Ordinary People's capabilities, by P. Mhagama.

Security Services in group Communications over Mobile ad-hoc and wireless sensor networks using performance analysis of algorithms, by R. Ramasamy.

18:00-18:15 : General Discussion

PARALLEL SESSION 3: TECHNOLOGY, INNOVATION & ENTREPRENEURSHIP

Chairperson : ***Dr. Grace Kumchulesi***
Rapporteurs : ***Kondwani Gondwe and Mathias Mbendera***

14:00-16:00 : Paper Presentations and Discussion (20 minutes)

Design, Construction and Performance Evaluation of Automatic Poultry Egg Incubator, by J. Taulo.

Kasonga Micro-Hydroelectric Power Scheme, by L. Banda.

An examination of the impact of the bicycle taxis business on family relations, by C. Sonkhanani.

Selecting Organic Waste Treatment Technology in Limbe Market, by E. Tilley.

A Comparative Analysis of the Quality of Solar Tent (*Samva Nyengo*) and Open Sun Dried Usipa Fish (*Engraulicypris sardella*) Pisces; Cyprinidae, by J. Banda

Pit Latrine Fecal Sludge Resistance Using a Dynamic Cone Penetrometer in Low Income Areas in Mzuzu City, Malawi, by C. F. C. Chirwa.

Performance of Low cost cooling systems in Enhancing Shelf Life of Selected Vegetables in Malawi, by J. Nyaika.

Intergenerational Survival of Family Businesses: Factors Affecting Succession Success of Family Owned Businesses in Malawi, by S. Kaunda.

16:00-16:20 : HEALTH BREAK

16:20–18:00 : Paper Presentations and Discussion Cont. (20 minutes)

Perceptions regarding entrepreneurship as a successful career option: the case of Malawians in traditional organisational employment, by R.C. Bakuwa.

Chemical variation and insecticidal activity of Lippia javanica (Burm. f.) Spreng essential oil against Sitophilus zeamais Motschulsky, by J. Kamanula

Microbiological quality of traditional and improved kiln smoked catfish (Clarias gariepinus) in Lake Chilwa Basin, by M.C. Likongwe.

Using nanotechnology to fabricate polyethersulfone nanocomposite membranes for removal of emerging micropollutants from water, by Wanda.

New Features for Copy-Move Image Forgery Detection: A Specific Application in Digital Image Forensics, by M. Zimba.

Supply Response of Maize to Price and Non-Price Variables in Malawi by I. Mwale

Effect of homogenization stirring speed on mechanical and water barrier properties of gallic acid treated zein-oleic acid composite films by K. Masamba

18:00-18:15 : General Discussion

PARALLEL SESSION 4: HEALTH AND POPULATION

Chairperson : ***Dr. Alfred Ochanza Maluwa***
Rapporteurs : ***Mike Kachedwa and Frank Musa***

14:00-16:00 : Paper Presentations and Discussion (20 minutes)

Mineral composition and medicinal properties of Adansonia digitata L. root tubers in selected populations of Malawi, by M. Kamanula

Arm span is a reliable surrogate measure of stature in 6-59 month-old Malawian children attending routine growth monitoring and promotion I.Majankono

Aflatoxin contamination in whole peanut flour produced by small scale peanut flour processors in Malawi: Aflatoxin awareness and management practices, by C. A. Magombo

The life-world: the over-arching framework of experiencing HIV and AIDS information, by K. Wella

Impact of community-based WASH and food hygiene interventions on diarrhoeal disease incidence in children under 5, by T. Morse

Quantification of Healthcare Waste in Balaka, by T. Mchipha

16:00-16:20 : HEALTH BREAK

16:20–18:00 : Paper Presentations and Discussion Cont. (20 minutes)

Nonfulfillment of FANC visits among Pregnant Women at Nandumbo Village in Balaka, by C. Banda

Pupils' perceptions of their needs in HIV/AIDS education: the case of Zomba Urban secondary schools, by P. Makocho.

How do diets of infants and young children aged 6-23 Months whose care givers are in care groups differ from other infants? a Case of T/A Kalumo, Ntchisi, Malawi, by P. Chifika.

Assessment of Women's Awareness and Preferences for Birthing Positions and Midwives Practices in Chikhwawa District, by T. Nyirongo.

Evaluation of Community Led Total Sanitation Programme in Ntchisi District by J. Mtonga

18:00-18:15 : General Discussion

DAY TWO : FRIDAY, 29/09/17

PARALLEL SESSION 1: AGRICULTURE, IRRIGATION AND FOOD SECURITY

Chairperson : ***Dr Limbikani Matumba***
Rapporteurs : ***Lyson Kampira and Martina Chimzimu***

8:30–10:30 : Paper Presentations and Discussion (20 minutes)

Genetic Analysis of Seed Yield and Yield Components in Cowpea (*Vigna unguiculata* L., Walp) under Drought Stress, by S. E. Mwale.

Forecasting Lake Malawi water level fluctuations using stochastic models, by M. Mulumpwa.

Assessment of Informal Cross Border Fish Trade in the Southern African Region: A Case of Malawi and Zambia, by H. Mussa.

Economic Analysis of Small-scale Fish Farming in Bunda, Lilongwe, Malawi, by H. Mussa.

Selenium bio-fortification of Green Vegetables in an Oxisol, Alfisol and Vertisol: a stable isotopic labelling study, by I.S. Ligowe.

The Problems of Irrigation facilities for Agricultural Sector in Chiwawula Sub-region in Mangochi District, by Dr. D. Murugesan.

10:30–11:00 : HEALTH BREAK

11:00–13:00 : Paper Presentations and Discussion Cont. (20 minutes)

The Effectiveness of the Cascade Model in Promoting Improved Infant and Young Child Feeding Practices in Rural Malawi, by G. Chiutsi-Phiri.

Breeding Investigation for the Development of Storage Insect Pest Resistant F1 Maize Hybrids in Malawi, by M. Matewele.

Adoption of Organic Manure and Maize-Legume Intercropping in Malawi: Impacts of Economic and Weather Shock, by S.P. Katengeza.

Village Savings and Loan Associations do not have nutrition benefits among children from participating households in Traditional Authority Kyungu in Karonga district, by L. Wasambo.

Mandela cock Versus Windrow groundnut Dying Technique: A paired Comparison of Aflatoxin Contamination and Seed Germination, by Limbikani Matumba

13:00–14:00 : LUNCH

14:00–16:00 : **Paper Presentations and Discussion Cont. (20 Minutes)**

Effect of Soil Salinity on Germination and Early Growth of Selected Rice Varieties Grown in Malawi, by M. Maliro and E. Sambo.

Microbial quality assessment of open sun and solar tent dried Barbus paludinosus in Lake Chilwa Basin, by M. C. Likongwe.

Nutrient use efficiency and profitability of maize in central Malawi, by P. Nalivata.

Nutritive Values and Consumption Pattern of the Edible Wild Plant (Sphenostylis magnata) of Nalikuli (Lilongwe), by E. G. Mwase.

Performance of Drought Tolerant Maize Varieties under Rainfall Stress in Malawi, by S.P. Katengeza.

Improved Micropropagation of Banana Through Initial Darkness in Vitro, by A. Sefasi.

16:00-16:20 : **HEALTH BREAK**

16:20-18:00 : Paper Presentations and Discussion Cont. (20 Minutes)

Supply-side Crowding-out and Crowding-in Effects of Malawi's Farm Input Subsidy Program on Private-Sector Input Marketing: A quasi-experimental field study, by S. Kaiyatsa.

The Effect of Liquid Liming Agents as Soil PH correction tools for improved yields and quality of flue-cured tobacco in Malawi, by Y.P. Mtonga.

The Legal Protection of new plant varieties in Malawi: challenges and solutions for rural women farmers, by P.M. Chinguwo.

Investigation and quantification for metal contamination in hammer-milled maize flour for redesign and modification of hammer mills in Malawi, Zambia and Mozambique, by H.W. Kazembe-Phiri.

The irony of nutrition extension education: Agriculture Extension Development Officers from Lilongwe have poor nutrition knowledge, by D. Bambe.

18:00-18:15 : General Discussion

PARALEL SESSION 2: ENERGY, INDUSTRY AND ENGINEERING

Chairperson : ***Dr V. Kasulo***
Rapporteurs : ***H.Gausi & Thomas Kaluvi***

8:30–10:30 : **Paper Presentations and Discussion (20 minutes)**

Estimating Risk Factors for Severity of Motor vehicle accident in Malawi with Gologit, Ordered Multinomial Logit and Bayesian Ordered Multinomial Logit Models, by J. Ng'oma

Success inhibiting factors and mitigating measures of public road construction projects by small-and medium-scale contractors, by P. Kulemeka.

Bioenergy Potential and Future Prospect in Malawi, by J.Taulo

High utilization efficiency of $NiCO_2O_4$ supported on porous graphene as noble metal-free catalysts for oxygen reduction reaction, by A.C. Mtukula

Factors Influencing Adoption of Off-grid Community-based Solar Photovoltaics in Chikwawa District, Malawi, by C.D. Namakhwa

Assessing Utilisation and Acceptability of Bio-Ethanol Stoves in Nkhotakota, by R.W. Mkandawire

10:30–11:00 : HEALTH BREAK

11:00–13:00 : **Paper Presentations and Discussion Cont. (20 minutes)**

Challenges faced by female artisans in the Malawian construction industry, by R.L. Chilipunde

Understanding the Products and Services that the Industry in Malawi Needs: An Industrial Needs Assessment Study Approach, by T.C. Nindia

Methodology for Solar PV Needs Assessment in Chikwawa, Southern Malawi, by S.Masangwi.

Impact of Proposed Utility Scale Solar Photovoltaic Plants in Malawi, by M. Chikumbanje.

Dichotomous Choice Contingent Valuation for Improved Household Solid Waste Collection in South Lunzu, Blantyre City, by H. Ndau.

Potential to Improve Energy Efficiency in Water Works through Energy Audits:a Case Study of Mzuzu Water Supply, by S. Msongole

13:00–14:00 : LUNCH

14:00–16:00 : Paper Presentations and Discussion Cont. (20 Minutes)

Production of Binder-free Water Hyacinth Briquettes for Cooking, by T. Sanjika

Improving the efficiency of the solar cells by employing nanotechnology, by R. Chimombo

Survey design of Overhead Electrical Transmission lines: A Comparative Study of Global Positioning System (GPS), Total Station (TS), and Unmanned Aerial Vehicle (UAV), by R.S.B.G. Suya

Community transformation through installation of sustainable renewable energy technologies, by K. Tembo

16:00-16:20 : HEALTH BREAK

16:20-18:00 : Paper Presentations and Discussion Cont. (20 Minutes)

Design, Construction and Performance Evaluation of Automatic Poultry Egg Incubator, by J. Taulo

Urban Governance in Malawi: How does it fair in the Social Justice and Environmental Litmus Test? by D. Mamiwa

Academic Initiative for Renewables (AIR) Project – Capacity Building in Higher Education Institutions, by C. Tenthani

18:00-18:15 : General Discussion

PARALEL SESSION 3: HEALTH AND POPULATION

Chairperson : ***Dr. Thawani Sanjika***
Rapporteurs : ***Dziko Tembo, K. Nseula***

8:30–10:30 : **Paper Presentations and Discussion (20 minutes)**

Susceptibility testing of some common pathogenic bacteria and fungi to Pterocarpus Angolensis, by J.V. Chipinga

An Examination of the Management of Infertility in Thyolo and Blantyre Districts, by A. Nindi-Nyondo

Factors Influencing Early Sexual Debut among Adolescents in Mangochi District, Malawi, by Y. Onions

Assessment of Type of Snack Foods Consumed by Children Attending Nursery School in Mzuzu City, by A. Kamanga

Assessing Health System Responsiveness to Vulnerable and children with disabilities: Results from 'Aiming Higher in Malawi' project survey, by W. Chavula

10:30–11:00 : HEALTH BREAK

11:00–13:00 : Paper Presentations and Discussion Cont. (20 minutes)

Child Malnutrition in Malawi: A quantile Regression Approach, by G. Chijere Chirwa

Trends in child malnutrition inequalities in Malawi: a decomposition approach, by C.E. Banda

Knowledge and Practices about Cervical Cancer Screening Among Married Men in Traditional Authority Nkhumba, Phalombe District, by C.C.L Mthepheya

Factors that Hinder and Promote Parents' Involvement in Adolescent Sexual and Reproductive Health, by T. Munthali Chipeta

Neck Circumference is a Reliable Surrogate Indicator of Overweight and /or Obesity in Adult Malawian Men and Women, by A. Nakhaonga

Equities in skilled attendance at birth in Malawi: a decomposition analysis, by D.S. Chikoti

13:00–14:00 : LUNCH

14:00–16:00 : Paper Presentations and Discussion Cont. (20 Minutes)

Effect of Nutrition Education and Milk Processing on Nutritional Status of Under-five Children among Dairy Farming Households in Dedza District of Malawi, K. Mhango

Health Setting Approach – Is it the key to holistic Community Health and Development? by T. D. Morse.

Faculty Caring: Perspectives from Mzuzu University Nursing ad Midwifery Students, by M. Chipeta

Chemical variation and insecticidal activity of Lippia javanica (Burm. f.) Spreng essential oil against Sitophilus zeamais Motschulsky, by J.F. Kamanula

Promotion of Food safety, hygiene and sanitation in rural markets using Healthy Food Market Concept, A case of Dembo and Bereu markets of Chikwawa, by L. Kamwana

Knowledge, Attitude and Competencies of HSAs Towards Sanitation and Hygiene Disability Accessibility and Safety Audits: A Case of Rumphi District, by C.R. Kayoka

16:00-16:20 : HEALTH BREAK

16:20-18:00 : Paper Presentations and Discussion Cont. (20 Minutes)

Investigating Health Expenditures during Births in Malawi, by A.K Majamanda

Malaria Research in Malawi from 1984 to 2016: a literature review and bibliometric analysis, by C. Mwendera
Facilitating Factors and barriers to Malaria Research utilization for policy development in Malawi, by C. Mwendera

Challenges of Nurse Tutors' Classroom and Clinical Performance When Teaching, by N.D. Mbirimtengerenji

Prevalence and Intensity of Schistosomiasis in Communities around Water Reservoirs in Malawi, by A.H.N. Mtethiwa

Impacts of malaria on pregnant women lead to maternal death in Mangochi District, by M. Narayan

18:00-18:15 : General Discussion

PARALEL SESSION 4: ENVIRONMENT, CLIMATE CHANGE AND NATURAL RESOURCES

Chairperson	**:**	***Professor John Kalenga Saka***
Rapporteurs	**:**	***Yohanne Chimbalanga and Thandizo Mungwira***
8:30–10:30	**:**	**Paper Presentations and Discussion (20 minutes)**

The Effects of Climate Change on Lake Malawi Fisheries, by M. Chatsika

Above- and Belowground Biomass Models for Trees in the Miombo Woodlands of Malawi, by D.J. Kachamba

Spatial and Temporal Patterns of Physico-chemical Parameters and Plankton of Lake Malombe: Implications to Fish Productivity, by H.J. Chagoma

Environmental law in Malawi: barriers to enforcement and possible solutions, by G.D. Makanje

Characterisation of Solid Wastes in Lilongwe City, Malawi, by F. Munthali

Can citizen science play a role in building resilience to hazards in urban WASH systems? The case of Karonga Town, Northern Malawi by E. Wanda

10:30–11:00 : HEALTH BREAK

11:00–13:00 : Paper Presentations and Discussion Cont. (20 minutes)

Assessment of Heavy Metals in Water, Sediments and Fish from Lake Chilwa, Zomba, Malawi, by L. Listide.

Assessment of noise levels in heavy and light industries in Blantyre City, Malawi, by J.S.P Mlatho

Capacity needs in catchment management among technical personnel and community members in Mchinji district, Malawi, by W. Phalira.

Coverage of Climate Change in Malawian Newspapers, by S. Kimu.

Economic valuation of water resources at Chia lagoon in Nkhotakota District, Malawi, by R. Makwinja.

Examining Applicability of the Terzaghi Filter Pack-Aquifer Formation Relationship Theory in Sustainable Groundwater Development in Malawi, by T.M. Kachulu.

13:00-14:00 : LUNCH BREAK

14:00-16:00 : Paper Presentations and Discussion Cont. (20 minutes)

Malawi's GHG emissions inventory for the industrial sector: a gap analysis of the cement industry, by K.J. Gondwe

Municipal Solid Waste Management, Pollution, Human Health and Climate Change: A Critical Review of the city of Blantyre, by K.J Gondwe.

Incidence of *Lernaea cyprinacea* (Anchorworm) on Lake Malawi *Bagrus meridionalis* (Kampango), by S. M'balaka

Models for efficient BOD and COD Characterisation of Faecal Sludge from Unplanned Settlements in Cities of Malawi, by K. Kalulu

Influence of rooting hormone, stem length, stem diameter and propagation time on root development of *Pterocarpus angolensis* DC stem cuttings, by A. Kanzunguze

Decentralised Integrated Solid Waste Management for Peri-urban Areas, by T. Kapichi.

16:00-16:20 : HEALTH BREAK

16:20-18:00 : Paper Presentations and Discussion Cont. (20 Minutes)

Invasive species management in Malawi: a study of four alien-invasive plants in Nyika National Park, by A. Kanzunguze

Value Chain Analysis of Baobab Products in Malawi, by N. Amosi

Potential Effect of Selectively Harvesting Miombo Forests of Malawi in Mitigating Living Biomass and Carbon Loss: The Case of Chindenga Forest, Liwonde, Malawi, by L. Mwabumba

Consumer choice and willingness to pay for improved cookstoves in Malawi: a Case of Chiradzulu District, by J. Grevulo

Treatment efficiency of Kauma wastewater treatment works in Lilongwe, Malawi for pollution control and wastewater reuse, by P. Mdolo

Utilization of Municipal Waste and Biosolids as Sources of Phosphorus for Land Restoration Projects, by P. Mdolo

18:00-18:15 : General Discussion

PARALLEL SESSION 5: EDUCATION, SOCIAL SCIENCES AND HUMANITIES

Chairperson : ***Mr. Alick Manda***
Rapporteurs : ***Chimwemwe Maimba and Martina Chimzimu***

14:00-16:00 : **Paper Presentations and Discussion (20 minutes)**

Factors affecting the participation of Girls in Technical Colleges in Malawi: Case of Don Bosco Institute, by R.N Lemani.

The Paradox of Traditional Leadership in Democratic Malawi, by H. Kayuni

Promoting active and innovative learning in Universities in Kenya through Open Distance and E-Learning: Students' Perspective from a Private University, by D.A. Opollo

Enhancing quality of academic programs in Universities in Kenya: The importance of stakeholders' feedback in quality enrichment, by D.A. Opollo.

ICT AND KNOWLEDGE MANAGEMENT

Presentations and Discussion Cont. (20 minutes)

Evaluating the Effectiveness of Malawi Traffic Information System in the Context of Public Service Delivery, by D.F. Malanga.

Scaling-up of ICT-based water metering technologies: lessons from a pilot project in the city of Blantyre, by G. Namizinga.

16:00-16:20 : HEALTH BREAK

16:20-18:00 : Presentations and Discussion Cont. (20 minutes)

The use of Koha Integrated Library System at Mzuzu University Library and Learning Resources Centre, by F. Ngwira

Making Access to information on HIV and AIDS and Sexual Reproductive Health Cool for Young People: The Role of Short Messaging Services and Social Media, by D. Chikatentha

HEALTH AND POPULATION

Assessment of Microbial Contamination of Groundwater from Protected and Unprotected Shallow wells in Mzuzu City, by T.G. Tandwe.

Exploring Effects of Flooding on Mental Health of Victims in Mzuzu City, by G. Mwafulirwa

The use of maternity waiting home at Chiradzulu District Hospital, Southern Malawi, by B.R. Kadzuwa.

The Malawi fortification logo is not well-known among consumers in Zomba and does not help in making food choices by D. Chimwala

18:00-18:15 : General Discussion

ARRANGEMENT OF ABSTRACTS

1. Agriculture, Irrigation and Food Security
2. Education, Social Sciences and Humanities
3. Energy, Industry and Engineering
4. Environment, Climate Change and Natural Resources
5. Health and Population
6. ICT and Knowledge Management
7. Technology, Innovation and Entrepreneurship

AGRICULTURE, IRRIGATION AND FOOD SECURITY

Genetic Analysis of Seed Yield and Yield Components in Cowpea (Vigna unguiculata L.,Walp) under Drought Stress

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Abstract

Cowpea is an important source of food and income for small scale farmers in Uganda. Production is, however, affected by both biotic and abiotic stresses. Drought stress has recently emerged as a serious concern due to the effects of climate change. This study was therefore undertaken in 2015/2016 growing season to determine the mode of gene action conditioning the inheritance of drought tolerance in seed yield and its components in Parents and F2 crosses. Five drought tolerant genotypes were crossed with four drought sensitive genotypes in a North Carolina II mating design. The F2 families together with their parents were evaluated for their levels of drought tolerance in a randomized complete block design (RCBD) with 5 replications.

The study revealed that drought tolerance is conditioned by both additive and non-additive gene effects with the predominance of non-additive gene effects for seed yield, 100 seed weight and number of pods per plant. Delayed leaf senescence was however, controlled by additive gene effects, implying that progenies performance could be predicted from parents General Combining Ability (GCA) effects. The cultivars SECOW 5T, IT93K-452-1 and IT98K-205-8 were good combiners for drought tolerance and could be used as parents for breeding for drought tolerance. The following F2 families were promising cross combinations that should be advanced for later generation selection as they had positive Specific Combining Ability (SCA) effects in a desired direction: SECOW 3B x IT98K-205-8, SECOW 5T x IT98K-205-8, SECOW 4W x IT98K205-8 and SECOW 1T x IT98K-205-8

Forecasting Lake Malawi Water Level Fluctuations Using Stochastic Models

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Abstract

The study considered Seasonal Autoregressive Integrated Moving Average (SARIMA) processes to select an appropriate stochastic model to forecast monthly data from Lake Malawi water levels for a period of 1986 through 2015. The appropriate model was chosen based on SARIMA (p, d, q) $(P, D, Q)^s$. The Autocorrelation function, Partial autocorrelation, Akaike Information Criteria, Bayesian Information Criterion, Box–Ljung statistics, correlogram and distribution of residual errors were estimated.

The SARIMA (1, 1, 0) $(1, 1, 1)_{12}$ was selected to forecast the monthly data of the lake's water levels from August, 2015 to December, 2021. The plotted time series showed that the lake's water levels were decreasing since 2010 to 2015 but not as much as was the case in 1995 through 1997. The forecast of the lake's water levels until 2021 showed a mean of 474.47 m ranging from 473.93 to 475.02 m with a confidence interval of 80% and 90% against registered mean of 473.398 m in 1997 and 475.475 m in 1989 which was the lowest and highest water levels in the lake respectively since 1986. The forecast also showed that the water levels will drop by 0.57 m as compared to the mean water levels recorded in the previous years. These results suggest that the Lake Malawi water level may not likely go lower than that recorded in 1997. However, there is a need to step-up efforts to make both aquatic and terrestrial ecosystems resilient to climate change.

Key words: Forecasting, Lake Malawi, Water Level Fluctuation, Climate change

Assessment of Informal Cross Border Fish Trade in the Southern African Region: A Case of Malawi and Zambia

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Abstract

Intra-regional fish trade has potential in addressing the region's food and nutrition insecurity, as well as poverty reduction by enabling movement of fish from countries of surplus to those with deficit. However, informal fish trade, just like all informal economic activities, has been overlooked and neglected in many national and regional policies, leading to obscurity of such an important part of the fisheries sector. This study examined the situation in the cross boarder informal fish trade in order to deepen our understanding about the traders, the factors influencing the trader's decision to use informal trade channels, the structure of the products being traded, the challenges which the traders face as well as propose policy direction to enhance the cross-border fish trade in the Southern African region.

The study revealed that informal fish trade was dominated by female traders. In both Malawi and Zambia, an estimated 45,285.52 metric tonnes of fish valued at 82.14 million dollars and 102,263.9 metric tons of fish valued at 33.3 million dollars were informally traded. The key species involved in informal cross-border trade in Malawi and Zambia were the small pelagics, Usipa (*Engraulicypris sardella*) from Lake Malawi and Dagaa (*Rastrineobola argentea*) from Lake Tanganyika respectively. From the study it emerged that fish traders are put off by the cross-border regulations. Therefore, it is important for countries in the SADC region to regularize and formalize cross-border trade in small pelagic fish species since these fish species plays a great role in the livelihoods and food and nutrition security of many people in the region, especially the rural and urban poor. It is also important for governments to support processors and traders to improve the quality of fish being traded; and decentralize issuing of the import/export certificates and other cross-border support documents.

Key words: Informal trade, fish, small pelagic species, Malawi, Zambia.

The study was conducted in 2016 across the borders of Malawi and Zambia and is part of the "Improving Food Security and Reducing Poverty through intra-regional Fish Trade in sub-Saharan Africa (Fish Trade Program)", jointly implemented by WorldFish, two African Union institutions (AU-IBAR and NEPAD Agency). The program is funded by the European Union (EU), following the Malabo Declaration.

Economic Analysis of Small-Scale Fish Farming in Bunda, Lilongwe, Malawi

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Abstract

The study to determine economic returns of small-scale fish farming in Malawi was carried out in Bunda area, Lilongwe. Thirty two small-scale fish farmers were purposively sampled and interviewed using a structured questionnaire. Data collected were analyzed using descriptive statistics, budgetary analysis and multiple linear regression. Descriptive analysis revealed that both the males (68.8%) and the females (31.3%) are involved in fish farming. The average age of farmers was 43.87 years and the majority of fish farmers were aged between 41 and 50 years (34.4%). Cost and returns analysis per harvest (production cycle) showed the gross margin of MK7, 378.12. Regression analysis showed that costs of fingerlings, costs of labour, pond size, and costs of manure and fertilizer were significant factors affecting respondent's total revenue.

The major problems faced by fish farmers were high cost of input, predators, inadequate extension visit and drying of ponds. Drying out of ponds was found to be the most serious problems of all the problems faced as it forced farmers to harvest their fish before reaching maturity (table size). The study concluded that small-scale fish farming is a profitable enterprise, especially when there is access to high quality inputs, proper management, absence of predators, and when farmers have access to extension services. It was therefore recommended that there is need to equip fish farmers and all small-scale farmers with knowledge to use water harvesting technologies which to address climate change risks which resulted in drying of fish ponds during the production cycle.

Key words: Economic analysis, small-scale, fish farming, revenue, Malawi

The study was conducted in 2015 in Bunda area, Lilongwe, Malawi.

Selenium bio-fortification of Green Vegetables in an Oxisol, Alfisol and Vertisol: a Stable Isotopic Labelling Study.

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Abstract

Selenium bio-fortification of crops is a proven technology for improving dietary nutrition. This study used isotopically labelled selenate (>99% enriched ^{77}Se) to assess the longevity of Se availability to two green vegetables (*Brassica napus* and *Amaranthus caudatus*) grown in three contrasting Malawi soils, a Vertisol, Alfisol and Oxisol from Ngabu in Chikwawa, Chitedze Research Station and Bembeke in Dedza respectively. Plants were grown under glasshouse conditions, from August to December 2016, (4 replication; 6 kg soil per pot) following application of ^{77}Se-selenate at rates of 0, 10 and 20 g ha^{-1}. The plants were harvested five times and plant leaves analysed by inductively coupled plasma mass spectrometry (ICP-MS) for selenium isotopes. The isotopic data were processed to quantify the contribution to plant Se concentration (Se_{plant}) from the fertilizer (Se_{fert}) or the soil (Se_{soil}). The trend in the proportion of plant Se from the fertilizer (Se_{fert}/Se_{plant}) declined sharply with sequential cuts so that there was little uptake of the original Se-enriched fertilizer by the 4th cut (12 weeks after application). Comparing the original application of ^{77}Se (10 and 20 g ha^{-1}) with the cumulative Se_{fert} uptake by the crops, the declining Se availability was due to progressive *fixation* of residual Se in the soil rather than exhaustion (by uptake) of the Se applied. There were also marked differences between the three soils. The bio-availability of the ^{77}Se-enriched fertilizer followed the sequence: Vertisol > Alfisol > Oxisol. However, the two crops followed the same trend in declining Se_{fert} uptake. Thus, fixation of selenate in the soils studied was sufficiently rapid that Se bio-fortification of green vegetables subject to several harvests would require multiple applications during the growing season. This contrasts markedly with cereals where a single application at the start of the growing season provides viable grain Se enrichment at harvest.

"The Problems of Irrigation Facilities for Agricultural Sector in Chiwawula Sub-Region in Mangochi District"

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Abstract

This research paper entitled "The Problems of Irrigation facilities for Agricultural Sector in Chiwawula Sub-region in Mangochi District". Most of the people they have own fertilized agricultural land and also cultivate some agricultural products. But there is no sufficient growth in agricultural field, due to lack of irrigation facilities and supportive policy to sustainable development in Agriculture.

Research Methodology: The universe of the study is the Chiwawula sub-region consists of eight villages in Mangochi District of Malawi.
Objectives of the Study

- To describe the Socio- economic background of the farmers in these villages
- To analyze the nature and type of cultivation in their agricultural field.
- To find out the problems faced by farmers in-adequate Irrigation and lack of scientific method adopt in agriculture
- To suggest the implementation of proper Irrigation and Scientific method in Agriculture for Green Revolution Sampling

The researcher adopted the purposive sampling method as a non- probability methods from the universe. 40 respondents (5 farmers from each village) were selected for present study .

Data collection: The primary data were collected from the farmers. The secondary data were collected from the library books, Journals, newspapers, magazines, and websites.

Tools of Data Collection: Observation methods were used for data collection. The researcher interact with the respondents by own observation.
Duration of the Study
The data collection work done from 1st to 29th June, 2017.

Results and Discussion: Majority of the farmers are ignoring the Irrigation and Modern machineries that can get the maximum yield, Moreover, most of them are very poor as a result of helplessness, lack of supportive policy, lack of access to inputs, lack of finance and in-competent market to their Agricultural-products.

Conclusion: This study also conclude and recommend that our Government collaborate with NGO's', Agricultural research institutions, higher educational institutions should be necessary action to implement the green revolution with proper irrigation facilities and input of mechanization in Agricultural sector, as well as initiate to getting the fund from international funding agencies and organizations.

Effect of Lipid Levels on Reproductive Performance of *Oreochromis karongae* (Trewavas 1941)

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Abstract

Oreochromis karongae, though it has good growth performance, has a major constraint of low fecundity. As such, a study on the influence of dietary lipid level on reproductive performance of O. *karongae* was conducted at Bunda Fish Farm. Fish were reared in 12 hapas for 86 days at a ratio of 2:1(female and male) with four treatments replicated three times and fed four diets formulated to contain 8.28%, 10.17%, 12.09% and 14.05% levels of lipid. Sampling was done every two weeks and different reproductive parameters like absolute and relative fecundity, individual egg weight and diameter were determined.

At the end of the experiment, O. *karongae* fed 10.17% and 12.09 % lipid had the highest absolute fecundity (237.5±6.50 and 271.3±26.19, respectively) as compared to fish fed on 8.28% and 14.05% lipid levels (90.3±46.3 and 143.7±30.8, respectively). However, there was no significant difference between fish fed on 14.05% and fish fed the other lipid levels for absolute fecundity. Higher number of spawns were observed in fish fed on diets containing crude lipid of 10.17 %. Thus, we can assume that diets of 10.17 % lipid performed better and also is not costly as those of 12.09 % or 14.05 % lipid. It was also found that the size of eggs depended on the number of eggs spawned by the female fish, as the number of eggs increased, the weight of eggs and mean egg diameter decreased. There were no significant differences ($p>0.05$) among treatments in terms of relative fecundity.
The above findings unveiled that diets containing at least crude lipid of 10 % should be fed to broodstock for optimum reproductive performance of O. *karongae*.

Keywords: *Oreochromis karongae*, lipid, nutrition, absolute fecundity, relative fecundity.

Note: This research was done at LUANAR in 2015 and has been published in Aquaculture Research in 2016.

The Effectiveness of the Cascade Model in Promoting Improved Infant and Young Child Feeding Practices in Rural Malawi

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Abstract

Introduction: Insufficient knowledge, skills and resources are main determinants of inadequate complementary feeding of children aged 6 to 23 months in Malawi. In addition to these, cultural beliefs and practices influence utilization of resources available within the household to make the best foods for the young children. The study was conducted to evaluate the effectiveness of a cascade model in the dissemination of the improved IYCF messages.

Methodology: This study was conducted in Kasungu and Mzimba districts using mixed methods convergent parallel design using pre and post training tests, training observations, focus group discussions, in-depth interviews and document review. The master trainers, community nutrition facilitators (CNFs) and caregivers with children aged 6-18 months were the study subject.

Results: Knowledge scores increased significantly after training among master trainers from 34 to 37 ($p<0.05$), CNFs from 14 to 24 ($p<0.001$) and caregivers from 23 to 38 ($p<0.001$). Caregivers retained the knowledge six months after the nutrition education. Following the knowledge scores along the training cascade, there was no association between Knowledge scores neither of master trainer and CNFs nor between CNFs and caregivers. The caregivers' results were corroborated by FGDs in which caregivers reported having gained complementary food preparation skill while grandmothers and spouses observed improved hygiene and preparation of diversified porridge for children among caregivers after nutrition education.

Conclusion: The training cascade was successful in promoting the improved IYCF practices among caregivers using locally available resources. This implies that community-based nutrition education using cascade training has potential to successfully promote basic improved IYCF practices among a lot of people within a short time if properly planned, supervised, having well scheduled in-service trainings and supportive community. In addition to these, proper timing of nutrition education is required to ensure adequate time for caregivers to focus on the nutrition education.

Key words: Training cascade, dietary diversification, Nutrition education, complementary feeding and IYCF

The Research was conducted from 2013 to 2014.

Breeding Investigation for the Development of Storage Insect Pest Resistant F1 Maize Hybrids in Malawi

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Abstract

Maize (*Zea mays* L.) is the main staple food crop in Malawi grown by 97% of small holder farmers. The potential maize yields are reduced by postharvest losses of grain in storage due to the larger grain borer (*Prostephanus truncatus* Horn) and maize weevil (*Sitophilus zeamais* Motschulsky). Limited research is conducted to improve larger grain borer and maize weevil resistance in productive varieties and exploit their genetic potential for insect resistance breeding programs. Studies were conducted at Chitedze Agricultural Research Station from 2012 to 2014, with the objective of developing storage insect pest resistant F1 hybrids. Five sets of breeding materials (180 crosses) were generated through crossing using North Carolina Design II scheme and tested under rain-fed, and irrigation, and late drought. Resistance evaluations were done under controlled environment in the laboratory.

Designed crosses to combine insect resistance and productivity resulted in the development of 4-67% maize weevil (mw) resistant hybrids and 4-9% larger grain borer (lgb) resistant hybrids across sets. Stacking of mw and lgb resistance produced 67% mw resistant hybrids, 14% lgb resistant hybrids and 14% maize hybrids with resistance to both lgb and mw.

Maize hybrids such as MWA06A, and MWMW15106 were resistant to mw and had net yields of 10 tons/ha, and 9.07 tons/ha respectively. Maize hybrid LGLG087218 had better resistance to lgb and net yield of 6.17 tons/ha. Maize hybrids, lgMW087940 and MWlg06264 were resistant to both mw and lgb and had net yields of 11.05 tons/ha and 8.16 tons/ha, respectively. Larger grain borer and maize weevil resistance genes can be incorporated into productive cultivars. Stacking of maize weevil and larger grain borer resistance in single maize hybrids would provide an effective way of breeding for dual insect pest resistance. Therefore, the study has demonstrated that development of insect resistant hybrids is possible in Malawi.

Adoption of Organic Manure and Maize-Legume Intercropping in Malawi: Impacts of Economic and Weather Shock

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Abstract

Population growth continues exerting pressure on predominant maize-based farming systems in Malawi to produce more food from very small land holdings. Achieving sustainable food security remains a critical challenge and the problem is worsened by declining crop productivity, loss of soil fertility, market failures and poor infrastructure development. To meet the growing demand for food, maize-based farming systems require complimentary investments in sustainable conservation agriculture with efficient use of natural resources. Organic manure and maize-legume intercropping are some of the complimentary conservation practices that can prevent soil fertility loss while enhancing crop productivity.

This paper investigates the impact of economic and weather shocks on adoption of organic manure and maize-legume intercropping over time. Data comes from household surveys conducted between 2006 and 2015 in central and southern Malawi. We employ nonparametric and parametric methods for data analysis.

Results show an increase in adoption from 30% in 2006 to 53% in 2015 for organic manure and from 33% to 76% for maize-legume intercropping. Both nonparametric and parametric methods show that the likelihood of organic manure adoption is increased by maize grain prices, fertilizer prices, fertilizer use intensity and previous exposure to dry spells but there is an inverse relationship with poor market access. For maize-legume intercropping, the probability of higher adoption is associated with maize and pigeon peas prices, exposure to dry spells, high population density and female-headed households.

These results reveal incentive potential of markets and output prices on adoption of soil fertility enhancing technologies, complementarity relationship between organic manure and inorganic fertilizer and response of farmers to dry spells and population pressure by adopting climate-resilient and crop productivity enhancing technologies. This implies that efforts to enhance adoption of conservation agriculture technologies require complimentary investments in marketing forces if the desire of sustainable food security is to be realised.

Village Savings and Loan Associations do not have Nutrition Benefits among Children from Participating Households in Traditional Authority Kyungu in Karonga District

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Abstract

Background: Village Savings and Loan Associations (VSLAs) are small groups of people who pool their savings together in order to have a source of lending that is expected to combat poverty and food insecurity. We embarked on this 2016 study to test the hypothesis that parental participation in VSLAs improves children's nutritional status and infant and young children feeding (IYCF) practices, namely minimum meal frequency, MMF; minimum dietary diversity, MDD; and, minimum acceptable diet, MAD.

Methodology: Proportionate stratified sampling was used to obtain 70 VSLA and 38 non-VSLA members in Traditional Authority Kyungu in Karonga district. A universal questionnaire for assessing IYCF practices was administered to VSLA and non-VSLA respondents. Children's weights and heights were measured using standard protocols. Data were entered and analysed in IBM SPSS version 21.0.

Results: There were no significant differences ($p>0.05$) in MMF, MDD, MAD and nutritional status among children who belonged to VSLA and non-VSLA households.

Discussion: Conventional wisdom suggests that increased access to loan facilities results in improved livelihoods. While this may be true, results of the present study show that participation in VSLAs is unlikely going to infer nutritional benefits among infants and young children. This may be a result of financial burdens that VSLA members usually have.

Conclusion: In a rural area in Karonga district, parental participation in VSLAs was not associated with improved children's nutritional status and IYCF practices.

Key words: Village Savings and Loans Association, Dietary Practices, Nutritional Status

Mandela Cock Versus Windrow Groundnut Dying Technique: A Paired Comparison of Aflatoxin Contamination and Seed Germination

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Abstract

Prompt moisture content reduction in harvested groundnuts is critical for safe storage. In most parts of sub-Saharan Africa, moisture content reduction is practically achieved by natural solar drying. In particular, the groundnuts are traditionally cured in the field using inverted windrow drying methodology. However, recently, Mandela cock technique, a ventilated stack of groundnut plants with a chimney at the center has been introduced in the southern Africa region and is believed to reduce the risk of aflatoxin contamination and maintain seed viability.

A study involving 29 farmers across 3 districts in Malawi was carried out in 2016 to systematically compare the performance of the two drying techniques with respect to aflatoxin control and seed quality. Paired t-test results indicate that Mandela cock groundnut drying technique significantly ($P<0.10$) increased the risk of aflatoxin contamination and lowered seed percentage germination compared to the traditional inverted windrow drying. Considering that the Mandela cock method was introduced in the region without conducting efficacy trials the present findings clearly demonstrate the need for strict government regulation and technology validation if farmers are to benefit.

Key words: Mandela cock, inverted windrow, drying groundnuts, aflatoxin, seed germination

Effect of Soil Salinity on Germination and Early Growth of Selected Rice Varieties Grown in Malawi

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Abstract

Soil salinity is one of the abiotic factors contributing to low agricultural productivity in some areas of the world. Some rice-growing areas in Malawi have an emerging soil salinity problem as a result of poor cultural practices or have experienced salinity as a result of inherent bedrock. Crop varieties that are tolerant to salinity are needed to sustain productivity.

This research was aimed at studying the degree of tolerance of rice varieties to increasing soil salinity. Five rice varieties: Kilombero (local variety), Faya 14M69 (local variety), Mtupatupa (TCG 10), Mpatsa (IR82077-BB-71-1-1) and Lifuwu (FRX178), were grown in a sand-soil mixture (1:5), with pH of 7.6, in pots in a greenhouse at average minimum/maximum temperatures of 26/38oC in the summer of 2016. The pots were saturated with 0, 50, 100, 150 and 200 mM NaCl solutions. Germination percentages and Growth attributes were measured on four occasions and the experiment was terminated after 35 days from sowing.

The results showed that during seedling growth, the shoot height, leaf area development and total dry weight of the five rice varieties decreased as the salt concentration increased. Based on shoot height, total dry weight and leaf area development, Faya 14M69 and Lifuwu were categorized as salt tolerant, with Kilombero being moderately tolerant, while Mpatsa and Mtupatupa were found to be sensitive to salinity. However, seed germination of all the five varieties was not found to be sensitive to salinity. It is concluded that selection for salt tolerance in rice grown in Malawi may be possible.

Microbial Quality Assessment of Open Sun and Solar Tent Dried *Barbus paludinosus* in Lake Chilwa Basin

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Abstract

This study assessed the effects of two processing methods open sun drying and solar tent drying on microbial quality of *Barbus paludinosus*, (straight fin barb locally known as Matemba), a species of ray-finned fish in the family Cyprinidae that supports a significant fishery sector in Malawi.

Barbus paludinosus (Matemba) were dried using open sun drying and solar tent driers. Samples were collected in newly bought polythene bags, well labelled and collected in cooler boxes transported ready for laboratory analysis. One gram (1g) representative sample was obtained aseptically from the muscle of the fresh and dried the straight fin barb (Matemba) samples. The samples were grounded and serial dilutions (10-1 to 10-4) of the homogenized samples were made using sterile distilled water.

Fish samples were analysed for total plate count (TPC), Total fungal count (TFC), *E. coli* counts and for pathogenic organisms (*Salmonella*) following the methods prescribed by (AOAC, 2000). Each analysis was carried out in triplicates.

There were significant differences ($p = 0.05$), with respect to total viable bacterial counts between open sun dried and solar tent dried B. *paludinosus* (1.6 x 106CFU/g, 1.4 x 106CFU/g, respectively). Open sun dried B. *paludinosus* harboured significantly higher total viable counts as well as a higher population of *Escherichia coli* compared to solar tent dried *Barbus paludinosus*. However, open sun dried B. *paludinosus* harboured undetectable levels of *Salmonella typhi*, a microbe of public health importance. *Escherishia coli* was found to be more abundant on solar tent dried B. *Paludinosus* than on open sun dried B. *paludinosus* ($p = 0.001$). Overall, bacterial populations were not above acceptable norms (108cfu/g) for both processing methods implying that the two methods can be deployable without public health concerns.

The study for which this abstract is submitted was conducted in the year 2016.

Nutrient Use Efficiency and Profitability of Maize in Central Malawi

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Abstract

On-station and on-farm field trials were conducted at Chitala in Salima district and at Bunda Campus in Lilongwe district to determine maize yield response, nutrient use efficiency and the economically optimum N, P and K rates for maize production in central Malawi. Sixteen treatments consisting of N, P and K rates and a diagnostic treatment were laid in RCBD. The data were subjected to ANOVA and fertilizer optimization tool for the calculation of the economically optimum rates (EOR). Grain yields, agronomic use efficiency of N, P and K and value cost ratios (VCR) significantly differed with treatment in both districts. There was a 300% yield increase at both sites when the rate of 120 kg N plus 15 kg P/ha was applied compared to the control. The VCR values were all higher than the minimum required value of 2, with largest profits in applied N or P obtained for maize at both sites when the rate of 30 kg/ha N or 15 kg/ha of P alone was applied. The VCR was above 4 even at 90 kg/ha N and 22.5 kg/ha P, indicating that fertilizer application is highly profitable at both sites. The values of EOR were similar to the fertilizer recommended rates for N. However, EOR for P (30; 24) were higher than the currently recommended rates of 3 to18 in Salima and Lilongwe. The EORs for K (2) were three times lower than the recommended rates for Salima (6 kg/ha K) and Lilongwe (8 kg/ha K) for maize production.

The results demonstrated the practicality of increasing profit margins with minimal investments for the financially constrained smallholder farmers based on choice of the best fertilizer types and combinations.

Nutritive Values and Consumption Pattern of the Edible Wild Plant (*Sphenostylis magnata*) of Nalikuli (Lilongwe)

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Abstract

Malnutrition in children is common in some parts of Malawi especially in rural areas. Major cause of malnutrition is inadequate intake of food rich in nutrients and vitamins in the diet due to poverty. However, foods locally available in the natural environment can provide a cheap and rich alternative source of nutrients, micronutrients, vitamins and minerals.

The study was conducted at Nalikuli in Lilongwe in the year 2016, to investigate the nutritive values, conservation status and consumption pattern of the edible wild plant known as *sphenostylis magnata*. Sample tubers of fresh *Sphenostylis magnata* were collected and analyzed in triplicates at Chancellor College Chemistry Laboratory in Malawi using AAS, UV-VIS spectrophotometer, Soxhlet method and titration for its nutritive values in terms of vitamin C, magnesium, calcium, iron, phosphorus, crude fats, crude protein and iron. Crude protein and fats were measured in % and Phosphorous was measured in g/kg. While Mg, Fe, K, Ca and Vitamin C content were measured in mg/100g. Investigations on the consumption pattern by local people were done using questionnaires on 300 respondents through random sampling method.

The results were as follows: Mg = 260 ± 0.05, Fe = 6.5 ± 0.013, P = 94.5± 0.013, K = 253± 0.68, Ca = 45.18± 0.05, Crude protein = 19.38± 0.15, Crude fats = 5.1± 0.21 and vitamin C = 17.18± 0.05.
Results of the survey revealed that 90% of the respondents had knowledge on its consumptive use. It is harvested frequently for consumption which has led to its overuse and subsequent scarcity now. The plant is also used for production of yoghurt by local people.
The results also showed that wild edible plant is a rich source of these nutrients and vitamins. Advantage with these wild fruits is that they can be accessed within reach and hence reduce searching for expensive commercial food stuffs. The importance of this study is based on the fact that loss of wild edible plants has caused many children lose a cheap source of minerals, vitamins or micronutrients and hence become more prone to malnutrition.

Keywords: Local foods, malnutrition, nutritive value, wild plants, conservation status

Performance of Drought Tolerant Maize Varieties under Rainfall Stress in Malawi

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Abstract

Introduction
Maize is a single most important food crop in Malawi whose availability equates to food security. Production is heavily dependent on rain-fed and therefore greatly affected by the country's erratic rains. The rainfall uncertainty coupled with frequent dry spells reduces maize productivity and consequently increases food insecurity. Drought tolerant maize (DTM) varieties is one potential technology that has been developed to help smallholder farmers cope with drought. It is estimated that DTM can produce up to 30% of their potential yield after six weeks of water stress, before and during grain filling phase. This paper therefore provides empirical evidence on the performance of drought tolerant maize under rainfall stress.

Methods
The paper uses four-round panel data spanning nine years from 2006 to 2015 from two districts in central region and four in southern region. Data analysis uses the Mundlak-Chamberlain's correlated random effects (CRE) Tobit models with a control function approach (CFA).

Results and Discussion
Results show that adoption of DTM varieties increases the probability of higher maize yield by at least 24-55% compared to other improved hybrid varieties, while local maize reduces maize productivity by 22-33% under rainfall stress. These results suggest superior yield advantage of DTM varieties when faced with erratic rains. The results are consistent with on-station and on-farm trials who report that DTM varieties are capable of withstanding dry spells during maize flowering phase than other maize varieties.

Conclusion
The results in this paper could be evidence that the poor harvests that have characterized most smallholder farmers in Malawi is largely technological deficiency and not necessarily rainfall scarcity. Thus, in the absence of irrigation alternatives, proper development, packaging, promotion and availability of good technologies such as DTM can offer smallholder farmers an option to hedge against poor yields under rainfall stress.

Improved Micropropagation of Banana through Initial Darkness in Vitro

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Abstract

Banana (*Musa* spp.) productivity in Malawi is currently constrained by Banana Bunchy top virus disease (BBTV). Although the application genetic engineering of banana is currently underway in Malawi, indexing remains a readily accessible management practice that is not subject to biosafety requirements. Faced with high costs for importing BBTV-free planting materials, Malawi is currently focusing on building its capacity to produce BBTV-free plants through tissue culture. However there is huge demand for disease-free planting materials. On the other hand, tissue culture protocols for local varieties are not well-developed.

The objective of the current research, which was conducted in 2017, was to develop a protocol for rapid multiplication of local cultivars and reduction of phenolisation in tissue culture. The experimental design was completely randomized with 3 x 2 factorial arrangement. There were two varieties (Williams and Mulanje); two types of explants (Shoot tip and meristem block); and two initial dark conditions (15 and 30 days). There were three replicates. Each experimental unit consisted of ten explants. Statistical analysis consisted ANOVA with significance level of 5 %. Means were compared by Tukey test at 5 % of probability. Contamination was a challenge (54.3%). Williams performed better (66.04%) than Mulanje (52.21%) in terms of survival. It has been demonstrated that there was no significant difference in phenolisation between 15 days (8.6%) and 30 days (7.76%) for both cultivars. Meristem block produced significantly (5%) best results in terms of number of buds proliferated (50% more than apical meristem) for both cultivars.

This research has proved that initial darkness significantly improves proliferation of new shoots and reduces phenolisation in the investigated cultivars. The investigation has high likelihood of succeeding with other local cultivars, namely Palmer, Sweshi, kambani and Zambia, which are of interest to farmers in Malawi.

Key words: banana, banana bunchy top virus, proliferation, survival, *in vitro* multiplication.

Supply-side Crowding-out and Crowding-in Effects of Malawi's Farm Input Subsidy Program on Private-Sector Input Marketing : A Quasi-experimental Field Study

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Abstract

During the 2015/16 season, the Government of Malawi allowed some larger-scale input distributors to sell Farm Input Subsidy Program (FISP) fertilizer in 9 out of 28 districts at their retail outlets on a pilot basis, while smaller-scale independent agro-dealers were excluded from participating in the pilot. Conversely, Smallholder Farmers' Fertilizer Revolving Fund of Malawi and Agricultural Development and Marketing Corporation were responsible for selling subsidized fertilizers in the remaining 19 districts.

The objective of the present study is to analyze the extent to which the reforms to Malawi's FISP enacted during the 2015/16 season increases or decreases commercial sales by private input suppliers. To estimate the crowding-in/crowding-out impacts of the policy change, we use three waves of nationally representative panel data from private input retailers in Malawi collected in three consecutive agricultural seasons of 2013/14, 2014/15, and 2015/16. We apply a quasi-experimental, difference-in-difference (DD) estimator to test how the FISP fertilizer pilot during 2015/16 affected the volume of commercial fertilizer sales for large-scale distributors and smaller-scale independent agro-dealers who were also excluded from participating in the program.

Results from our DD estimator indicate that large-scale distributors who sold FISP fertilizer through the pilot program in 2015/16 experienced a 48 percent increase in the volume of total fertilizer sales, on average. Conversely, independent agro-dealers who were excluded from participating in the FISP pilot program experienced a 53 percent decline in the quantity of commercial fertilizer sales on average. Thus, the FISP reform appears to have mainly benefitted larger-scale fertilizer distributors at the expense of a large number of small agro-dealers most of whom conduct their businesses in remote areas. As such, there is a need to provide support to independent agro-dealers to allow them to remain competitive, and build their capacity over time.

The Effect of Liquid Liming Agents as Soil PH Correction Tools for Improved Yields and Quality of Flue-Cured Tobacco in Malawi

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Abstract

Malawi soils are highly weathered and acidic resulting in fixation of Phosphorus (P), Potassium (K) and Nitrogen (K) into insoluble forms with iron (Fe) and aluminium (Al) which are inaccessible by plants. Soil pH correction through liming to neutralize acidity to amenable levels for plant growth is important cultural practice for improved productivity. But currently, the standard cumbersome method of ploughing and immediately manually applying of dry-calcitic-lime at two tons/ha as a blanket recommendation nine months before transplanting poses implementation challenges amongst resource challenged small-holder farmers who channel all their energies to current crop rather than future one. With unavailability of tractors in such small-holdings, liming is almost non-existent. The adoption rate of liming is 2% this affects productivity per unit area. As mitigation measure targeting small-holder farmers, two liquid-liming agents, MAG-LIME-FLO and CAL-LIME-FLO, with two controls: the standard dry-calcitic practice and plot with no lime, were investigated for their efficiency in correcting pH, improving nutrient availability, on increasing yields and quality in a trial laid out in randomized complete block with six replications. Data collection was on pH at transplanting, 6, 10, 14 weeks after transplanting and assessed for yield and quality.

The results showed that liquid-limes started correcting pH as early as six weeks after transplanting with MAG-LIME-FLO and CAL-LIME-FLO increasing soil pH by 15% at six weeks and by 25% five months later. Liquid-limes increased P availability by 70%, K by 56%, Ca by 79% and Mg by 77%. Liquid-limes had 94% yield advantage over non-limed plots and significantly outperformed the dry-calcitic by 50%. Handling costs showed that liquid-limes had reduced application and transportation costs of 70% over dry-calcitic-lime. These findings are of significant benefit to Malawi small-holder farmers who are yet to embrace pH correction initiatives through liming as an integral part of good agricultural practices.

The Legal Protection of New Plant Varies in Malawi: Challenges and Solutions for Rural Women Farmers.

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Abstract

Introduction
The emerging and developing area in Intellectual Property discourse and developing countries is the area of New Plant Varieties due to its impact on food security and socio-economic developing of the countries. This is more imperative as it impact on family livelihoods especially on women in the rural areas.

Methodology
The paper ulitised qualitative research methodology comprising of primary data collection from key informants in-depth interviews with five plant breeders and nine women farmers as well as three focus group discussions of twelve participants each group discussion and secondary data based on the doctrinal approach.

Results
The 45 farmers who were interviewed never knew the existence of any law that protect new plant varieties in Malawi. On the other hand, of the 5 plant breeders only 1 was conversant with the Plant Breeder Rights Bill but all of them knew the existence of Seed Act and the need for approval of new plant varieties from government. The plant breeders indicated that they do not use Patent law because they are not conversant with it.

Discussion
a *sui generis* law, such as The Plant breeder's Rights Act, would bring more players in the seed industry as they would know that their intellectual property in the new plant variety would be protected since the Seed Act is not adequate.

Conclusion
The formal law is a good means of protecting new plant varieties in Malawi for the benefit of rural women farmers.

The research was conducted from January to March, 2016

Investigation and Quantification for Metal-Contamination in Hammer-Milled Maize Flour for Re-design and Modification of Hammer Mills in Malawi, Zambia and Mozambique.

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Abstract

In an effort to produce safe hammer-milled maize flour for human consumption in Malawi, Mozambique and Zambia, metal contamination in grain flour samples was assessed in local hammer mills in Malawi and Mozambique. The investigation was aimed at assessing and quantifying the levels of metal contamination in the flour compared to hand pounding method for flour production. This approach was employed to establish adequate basis for reducing metal contamination in the flour by modifying the current hammer mill designs using metal detection and trapping machine components. In this study, there were three treatments: hand pounding using pestle and mortar as a control. Thereafter, the other two treatments samples were also prepared by foundry and artisanal hammer milling as main treatments. For the hammer-milling, two experimental hammer mills (foundry and artisanal) at two study sites in each district of Malawi (Lilongwe and Salima) and Nampula Province in Mozambique were identified. Mozambique only implemented foundry hammer-milling at IIAM in Nampula City. In each site LB7 hammer mill size was used. For the control treatment, Open pollinated variety (OPV) 523 maize variety was used. The collected flour samples were analyzed by Atomic Absorption Spectrophotometry (AAS), for Aluminum (Al), Zinc (Zn), Arsenic (Ar), Cadmium (Cd), Copper (Cu), Lead (Pb), Manganese (Mn) and Iron (Fe). The same samples are also being analyzed by PLASMA technique in Mozambique. Weight loss / wear of the hammer mill beaters was also recorded as well as magnetic metal detection and trapping were conducted. So far, the results from Malawi (Lilongwe) confirmed that significant metal content, in hammer milled flour, is existent.

The findings showed higher metal contamination of >28.60±0.80, 54.85±0.60 ppm with AAS analysis in the flour samples and achieving metal wearing of beaters at 60.48 and 75.02 ppm in sixty six days of Foundry and Artisanal hammer milling, respectively. On the other hand, AAS analysis for hand pound samples achieved the lowest and comparable metal content to maximum set limits set by WFP (2011), of < 0.10 ppm. Magnetic metal detection and trapping, also achieved higher metal contents in hammer-milled flour samples than those for control treatment. As the experiment is in progress in Salima and Mozambique, data collected is also be analyzed and translated similarly.

This trend of findings confirms significant metal contamination in flour samples and thus agrees quite well with the hypothesis that flour samples prepared by hammer milling are more metal-contaminated than hand pounding. In conclusion, this trend of results seems to confirm that there is adequate basis to urgently modify the current hammer mills by incorporating metal detection and trapping machine components as a practical and an effective measure to address the current problem in the flour.

Key words: Hammer-milled maize flour, hand pound flour, metal contamination, metal detection, modified hammer mill.

The Irony of Nutrition Extension Education: Agriculture Extension Development Officers from Lilongwe have Poor Nutrition Knowledge

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Abstract

Introduction: Among other duties, Agriculture Extension Development Officers (AEDOs) are mandated to disseminate nutrition messages to households and communities and are therefore expected to be nutrition literate. Whether or not this is the case is presently not known. We therefore embarked on a study to assess the level of nutrition knowledge among AEDOs in Lilongwe.

Methodology: This was a 2016 descriptive cross sectional conducted of 38 AEDOs from Mitundu and Chitsime Extension planning areas (EPAs) in Lilongwe. A semi-structured questionnaire was used to collect data on basic nutrition information based on Key Messages that are used in the Scaling up Nutrition (SUN) 1000 Special Days Movement. Global guidelines for assessing nutrition-related knowledge, attitudes and practices were used to determine knowledge levels of participant. SPSS version 16 was used to enter and analyse the data.

Results: Most (n=36, 94.7%)AEDOs had 'poor overall knowledge' on basic nutrition knowledge; 2 'needed support', and none was considered 'knowledgeable'. The majority (n=34, 89%) had average knowledge on infant and young child feeding and very little knowledge on micronutrient such as folate, iodine and iron.

Discussion: It is ironical that AEDOs, who are custodians of nutrition education in communities largely failed basic nutrition knowledge test. This puts to question their ability to communicate correct information to households and communities for behaviour change that would result in reduction of various forms of malnutrition.

Conclusion: There is likely to be low proficiency in basic nutrition knowledge among AEDOs, which would affect the effectiveness of nutrition education interventions.

Key words: Nutrition education, knowledge, Agriculture Extension Development Officer

EDUCATION, SOCIAL SCIENCES AND HUMANITIES

Experience of English Teachers when Teaching Learners with Hearing Impairment Reading Comprehension

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Abstract

Information in the literature indicates that children who have hearing impairment (HI) often struggle with reading comprehension. HI students also struggle with the acquisition of crucial literacy skills and/or the attainment of reading abilities. It is therefore a challenge for hearing impaired learners to learn effectively in both primary and secondary schools. Information in the literature also points out that teachers encounter several challenges when teaching hearing impaired students. However, most of the studies in these areas have been carried out in African countries such as Tanzania and Kenya. In addition, the studies have focused on challenges faced when teaching in general without specifically looking at an individual subject. This study is therefore unique because its main purpose was to examine the experiences of English teachers when teaching learners with hearing impairment reading comprehension.

In order to collect detailed information, interviews and focus group discussions were conducted with a total of eleven informants from three secondary schools in the northern region of Malawi (Nkhorongo Community Day Secondary School, Luwinga and Mzimba Secondary Schools).

The results reveal that most hearing impaired students manage to predict the content of a written text from a title and answer comprehension questions. However, the results indicate that hearing impaired students have problems in explaining key terms and central ideas. Other challenges identified in this study include lack of teaching and learning materials suitable for hearing impaired students, lack of hearing aids, inadequate staff and large classes that prevent teachers to give a one-on-one assistance to students who require help. Among other things, the study recommends the need for teachers to be trained so that they are competent to teach hearing impaired students. The study also stresses the importance for schools to be supplied with the necessary teaching and learning materials to improve the poor learning environment of hearing impaired students.

Data for this study was collected from 3rd January, 2017 to 7th April, 2017.

Exploring Participatory Teaching and Learning Methods as a Means for Implementing Education for Sustainability

(Empowering learners to be sustainability agents through linking knowledge to action)

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Abstract

Introduction

The research was carried out as a case study in Kasungu district in 2014. The dissertation was submitted to London South Bank University as a course requirement for Master of Science in Education for Sustainability. The research investigated the efficacy of participatory teaching and learning methods (PT/LM) integrated with linking lesson content to community contexts in empowering learners to be sustainability agents in communities where they live. The research had three major outcomes, which were adoption of learner centred pedagogy, positive attitude change and innovation of club activities.

Methodology

The methodology feature that shaped the research design was qualitative because of eliciting and explaining views about learner centred pedagogy. It was underpinned by the epistemology of critical theory paradigm, which necessitated the choice of case study for inquiry. The methods used to generate data were document analysis, questionnaire, non-participant observation, interviews and focus group discussion.

Results

The findings showed that teachers adopted some PT/LM and linked lesson content to community contexts. Both teachers and learners demonstrated increased awareness of Education for Sustainability (EFS) issues by explaining links between lesson content and community issues of concern, which was an indication of the influence of PT/LM on learners as well as teachers.

Discussion

The investigation focused on establishing the influence of PT/LM on learners towards possible actions on issues of concern at school and in community. The issues include inappropriate farming practices, deforestation, environmental degradation, waste disposal, poor sanitation, pollution, inappropriate water and electricity use, which are a result of human activity emanating from behaviour and lifestyles. The research was carried out as an intervention based on the empowering effect of PT/LM, that they enable the learner to explore a situation, identify a problem, describe, analyse, interpret, appreciate and make a decision to solve it. The approach was mentoring teachers of Life Skills and English on how to effectively use PT/LM. The two subjects were selected on the basis that the outcome of the influence of PT/LM on learners was observed through club activities. The clubs were Mama yee and Debate respectively.

Conclusion

The findings showed that PT/LM can be used as a means for implementing EFS.

The Influence of Self-efficacy and Intrinsic Goal Orientation on Medical and Allied Health Students' Deep Learning Approach

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Abstract

Introduction: Medical institutions have an exceptional responsibility to train health providers fit for the practice; more independent of their teachers in extending and updating their knowledge base. Research on academic self-regulation suggests that students' self-efficacy, intrinsic goal orientation and deep approach to learning improve students' academic performance. The primary goal of the study was to investigate the role intrinsic goal orientation plays on students' deep and meta-cognitive learning strategies.

Methodology: A sample of 205 first year students (121 males and 84 females) from College of Medicine in Malawi responded to a questionnaire assessing their intrinsic goal orientation and learning strategies use. Data were analyzed using IBM SPSS Statistics, version 20.

Results: Linear regression results indicate that intrinsic goal orientation positively predicted both deep ($\beta = 0.53$) and meta-cognitive ($\beta = 0.55$) learning strategies. Safe-efficacy positively predicted both deep ($\beta = 0.43$) and meta-cognitive ($\beta = 0.51$) learning strategies. Male students had higher levels of intrinsic goal orientation than their female counterparts ($p < 0.05$), and there were no gender differences between male and female students on both deep and meta-cognitive learning strategies and self-efficacy.

Conclusion: The results suggest that intrinsic goal orientation and self-efficacy has an important impact on medical and allied health students' deep learning approach. Possible implications of the results and recommendations for future research are discussed.

Key words: intrinsic goal orientation, self-efficacy, deep cognitive learning strategies, meta-cognitive learning strategies, self-regulated learning
Note: Data for this study was collected in 2015, during the college's second semester

Female Fandom: Identity, Sexism, and Football in Malawi

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Abstract

Introduction: In this article I consider women's relationship to football culture, showing how women sometimes downplay their gender identities to reinforce their fan identities. Domination of men's football spaces by men makes stadiums hostile environments for women who are often physically and verbally abused. This paper provides a nuanced analysis of female fans' responses to the masculine nature of the football stadium. This research in Malawi brings to the fore the voices of female fans and how they construct the stadium experience.

Method: To accomplish this I interviewed 38 female fans at Super League football matches and analysed their responses to abusive or insulting behavior by male fans. The paper highlights how women react, negotiate and respond to misogynistic and vulgar songs and chants, and the threat of violence from male fans. The qualitative data was analysed using the grounded theory approach.

Results: Women used three strategies to respond to sexism and homophobia. First, they expressed disgust at abuse, sometimes redefining fandom to exclude abusers. Second, they downplayed sexism. Their third strategy was to embrace gender stereotypes, arguing that femininity was inconsistent with "authentic" fandom and that abuse was a fundamental part of football.

Discussion and Conclusion: The findings are analysed in light of the hegemonic masculinity and dominant femininity theories. In the end, the strategies used by women to respond to sexism in the football stadia was in line with the established theories that women will most likely join in the sexist and abusive singing, remaining oblivious, sitting in quieter parts of the stadium and responding to abusers.

This research was conducted between January 2016 and April 2017

Pre-service Teachers' Feedback on School-based Teaching Practice: Perspectives on Readiness, Support and Satisfaction

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Abstract

An effective teacher preparation program is essential for improving the quality of education, especially in developing countries where most of the teachers employed are either underqualified or indeed unqualified. Student teachers' views or feedback on all aspects of their training experiences are essential for effective monitoring, evaluation and ongoing improvement of the quality of teacher preparation program. Therefore, the purpose of the study was to explore pre-service teachers' views on their school-based clinical teaching practice experiences with the view of informing the pre-service teacher preparation program as well as future teaching practicum arrangements.

The study adopted a descriptive cross-sectional survey design. The sample consisted of 119 third year pre-service teachers who had undergone teaching practice in 2016. A questionnaire was used to gather both quantitative and qualitative data. Qualitative and quantitative data were analysed using content analysis by seeking patterns and themes in relation to each research objective, and descriptive statistics, respectively.

Key findings revealed that a majority of student teachers (88.6%) felt very well prepared and confident about themselves for clinical teaching practice, and they got the least assistance from their cooperating teachers. Student teachers also expressed general agreement that they were adequately supported and guided during teaching practice. While they expressed overall satisfaction of the teaching practicum experience, they observed that the clinical assessment was subjective. These findings affirm the efficacy of the pre-service teacher preparation programme while at the same time putting to question the realities on the ground regarding the expectations about both the role of mentor teachers in secondary schools and supervisors. Participants' suggestions for improving similar school-based experiences included the need for adequate practical preparation in formulating schemes and lesson plans as well as the need for supervisors to observe and objectively assess students in their areas of specialities.

This research was conducted in 2016

Self-determination Skills in Young Adults with a Diagnosis of Autism Spectrum Disorders: Lessons for Enhancing Positive Career Outcomes for Students with Disabilities in Vocational Training Programmes

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Abstract

This study examined supportive factors that promote self-determination skills of young adults diagnosed with autism spectrum disorders (ASD). Five young adults between the ages of 18 and 22 with a diagnosis of ASD were the focus of the study. The young adults participated in a university-based school-to-work internship program for a period of one year.

A basic qualitative research design was used to examine the experiences of the five students over a period of one year. Field observations, interviews, and archival program documents were used as data sources for the study. Internship supervisors and mentors, and parents/guardians of the young adults and the students were interviewed. Grounded Theory techniques were utilized during data collection and analysis.

Results of the study showed evidence of positive changes in specific aspects of self-determination. Four major themes covered the data in exhaustive ways that describe and explain changes in self-determination and factors that influence it. Self-determination was supported by environmental contexts and efforts that aimed to enhance student capacity. Student readiness and internship related factors undermined positive changes in self-determination. Unique to this study, changes in routines and setting undermined the students' capacity to demonstrate autonomy or behavior and emotional regulation. The fourth theme described a comparison of indicators in self-determination. Lessons on how to enhance self-determination and positive career outcomes for students with disabilities in vocational programmes are drawn.

Using the Theory of Transactional Distance to Assess Open and Distance Education: Empirical Findings from Mzuzu University

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Abstract

Introduction: Slowly but surely, open and distance learning (ODL) programmes are being regarded as one of the most practical ways that universities across the world are increasingly adopting in order to increase access to university education. Likewise, Mzuzu University (MZUNI) has been running ODL programmes for some years.

Methodology: In this study, we used the Transactional Distance Theory (Moore, 1997) to assess the quality of ODL education at MZUNI. We self-administered a questionnaire to 350 ODL students and 9 heads of department in the Faculty of Education whose programmes are offered through ODL.

Results: We found that instructions are mostly delivered to students through print-based instructional materials which somewhat conform to the Transactional Distance Theory. We further found that key benefits include increased access to quality higher education, affordable tuition fees, and flexibility in payment of fees. Delayed feedback of assignments and release of end of semester examination results, and absence of information for some courses of study are the key challenges.

Discussion: Our case study has demonstrated the potential of ODL programmes towards achieving universal access to higher education in Malawi, not just to the working group but to other many Malawians who cannot access it through campus-based learning. This is due to flexibility of the programme as students are allowed to study while working, and more importantly, tuition is fairly affordable, in addition to being paid through instalments.

Conclusion: In a nut shell, the study finds that over the years, MZUNI has admitted quite a number of Malawians. Despite successes registered and benefits associated with the introduction of ODL programmes at MZUNI, the programmes are not short of challenges. In light of the findings of the study, the researchers urge MZUNI to release end of semester examinations on time to avoid inconveniencing learners, offer reasonable incentives to lecturers and more importantly, set up satellite learning centres in the three geographical regions of Malawi.

Keywords: Higher education, Malawi, Mzuzu University, open and distance learning, students

The year the study was conducted 2016

Development of Locally Appropriate Instrument to Measure Children's Readiness for School

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Abstract

There is an achievement gap occurring in standard one of primary education, between children who attend pre-schools and those that do not. Many children are not prepared for the minimal standards needed to succeed in primary school and, as a result, the gap widens throughout schooling. Children's readiness for school is an important attribute for future success among all children. The purpose of this study was to develop a culturally appropriate instrument that will be used to measure children's readiness for school. Specifically, the focus was the use of the Malawi Early Learning Development Standards to generate items in the six developmental domains.

The study consisted of 12 CBCCs, 25 caregivers and 303 children enrolled in the CBCCs and who were 5 years at the time of assessment. On appropriateness of the instrument, the study examined the reliability and validity of the whole instrument and items in the instrument. The study also focused on clustering items and reducing the number of items by using factor analysis method.

High values (>0.7) of ***a*** and ***r*** were obtained. The values provided strong evidence of validity and reliability tests. Items have been reduced from 88 to 56, of which the 56 items are able to explain about 60% of what the 88 items do.

The instrument provides an opportunity for thorough assessment of children holistically than chorological age mostly used in Malawi. The instrument is an easy to use and interpret tool, which will assist caregivers whom most are illiterate, to intervene on developmental areas children are lacking behind.

The instrument will improve transition of children from pre-schools to primary education and broadly improve quality of primary education by reducing dropout and repetition rates which are highly attributed to many factors one being low levels of children readiness for school.

The study was conducted in 2015.

Does Persistent Practice Affect Students' Performance in Mathematics Word-Problems? Case Study of Mthenthera Community Day Secondary School

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Abstract

Malawi faces industrial and community challenges that require expertise of scientists to provide alternative solutions. Such solutions usually require someone's ability to translate real world problems into mathematical models. Hence, the need of understanding mathematical word problems at both secondary and tertially levels is therefore of great importance. However, the performance of students in mathematics word problems at all levels of education in Malawi is generally poor. Previous studies have identified lack of teaching and learning resources, teacher competence, learner attitude, learner anxiety, and language problems as some of the factors affecting students' performance in mathematics word problems. However, there has been little research on what these students should do in in order to improve their performance in this area. This study therefore aimed at evaluating the effectiveness of continuous practice on the performance of students in mathematics word-problems.

The study employed experimental study method whereby the participants were randomly allocated into experimental and control groups, respectively using simple random sampling technique. Data was collected using Mathematics Pre-test, Mathematics Post-test, and Questionnaires. Data was analyzed descriptively and using Student t-test, and Mann-Whitney U-test to test if there was a significant difference in the levels of performance between the Experimental and Control groups before and after exposure to persistent practice.

The results (Z= -2.29875; T= -0.312) revealed that continuous practice is very effective for students to improve their performance in mathematics word problems. Unlike in arithmetic problems, study findings revealed that most students (51%) rarely practice mathematics word problems during their study habits. In addition, some students do not possess a personal study time table and therefore do not even practice solving mathematics word-problems on their own. However, it was recommended that further studies be conducted in other schools in order to get a broader view.

Note: This study was carried out as academic study as partial fulfilment for award of undergraduate degree at Domasi College of Education from January to June 2017.

Factors Affecting the Participation of Girls in Technical Colleges in Malawi: Case of Don Bosco Institute

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Abstract

Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) in Malawi promotes equitable technical, entrepreneurial and vocational training programmes to all learners by among other things ensuring that conditions are attractive to girls' participation in TEVET programmes. Despite several efforts by the Malawi Government and other developmental stakeholders, the participation of women in automobile mechanics remains low. The aim of the study was to find out factors that contribute to low participation of girls in technical and vocational education in Malawi especially in Automobile Mechanics course.

The study used qualitative research methodology with case study design. Data was collected using in-depth interviews (IDI) which was conducted to instructors in Automobile Mechanics. Semi-structured questionnaires were administered to collect data from students in Automobile Mechanics and Automobile mechanics prescribed text book were also reviewed with non-probability sampling technique. It was guided by the "Holland's career choice Theory". The study revealed that the girls' participation and female instructors in automobile mechanics at the institution is low with only 13 girl students out of 131 auto-mechanics students representing 10% and 1 female instructor out of 4 instructors, respectively.

The following factors were identified that hindered girls' participation in Automobile Mechanics; negative peer pressure, stereotyping perception against automobile mechanics that women cannot participate in the course, lack of motivation from the institution as there are no incentives for girls pursing automobile mechanics, lack of career guidance and counseling as well as lack of female role models contributed to low girls' participation in automobile mechanics. Some textbooks were promoting males than females, for effective teaching and learning to take place the teaching and learning materials have to be gender responsive. The study therefore recommended for public sensitization campaigns to change stakeholders' perception, intensify career guidance to girls and use of role models starting from secondary schools.

The study was done in 2015/2016

Integrating Information Communication and Technology (ICT) in Distance Education at Domasi College of Education

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Abstract

Domasi College of Education Introduced the Distance Education programme to offset the teacher shortage in Malawi. As a way of improving learner support in Distance Education, the College, with funding from African Development Fund (ADF), embarked on a project to integrate information communication and technology (ICT) in its Distance Programme. It had established ten internet centres for use by the teacher-learners and staff. Considering that this was the first time ICT would be used in Distance Programme in the country, there were a number of issues to be addressed so as to ensure its success. In this regard a study was conducted, with its primary focus on the prospects and challenges, to find out how the College intended to use the internet sustainably in the Distance Education.

The study, which targeted 200 distance learners, 8 lecturers 3 managers and 4 field supervisors was derived from a survey genre using both quantitative and qualitative methods. Data were collected through interviews and questionnaires. Among its prospects, the study found out that the teacher-learners would be exposed to other resources apart from the modules and lecturers' handout notes. This would in turn benefit the College in reducing communication costs between lecturers and their teacher-learners. In terms of the foreseen challenges, the study found out that there is low computer literacy level among most of the targeted teacher-learners. Apart from that the College will find it difficult to fund the programme once the project is over. In order to address those envisaged challenges, the study recommends a joint venture approach whereby other institutions which are also involved in distance learning in Malawi should work together with Domasi College. In addition, there is also need for intervention from the Malawi Government to support the programme.

In August 2013

Students' Attitudes Towards Science Subjects in Community Day Secondary Schools: Case of Three Schools in Blantyre, Malawi

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Abstract

The investigation of students' attitudes towards studying science has been an essential feature within the science education research community for the past years. However the study of Students' Attitudes Towards Science Subjects (SATSS) in Malawi appears sparse. Most community day secondary schools (CDSSs) register high failure rates in science subjects during national examinations and the trend could be attributed to students' attitudes towards science among other factors since without positive attitudes, students have little chance of learning proficiently.

The study used a 130-item questionnaire ($\alpha = 0.893$) to measure students' attitudes towards science subjects in CDSSs in Malawi. The data were obtained from 273 CDSS students in Blantyre, Malawi. A sample of 160 boys and 113 girls sampled based on stratified randoming using Taro Yamane's formula was used to collect the data. Results show that over 54.9% of the students ($n = 273$) in CDSSs have a positive attitude towards science subjects. Results of the study also showed that gender had a significant effect on students' attitudes towards science subjects. Girls [Mean = 2.53, and SD = 0.983] had significantly higher attitudes towards science subjects than boys [Mean = 2.28 and SD = 0.883] on total attitude scale and on all sub-scales of the questionnaire. This is perhaps because of girl child education campaign in CDSSs that is encouraging girls to like science and aspire to undertake scientific careers.

The following were the underlying factors influencing SATSS: Self-efficacy (SE), Science Learning Value (SLV), Stimulating Learning Environment (SLE), Teacher Factors (TF), and Active Learning Strategies (ALS). However, Self-efficacy, Science Learning Value, and Stimulating Learning Environment were noted as predominant factors influencing SATSS since they had higher percentage of the total variance explained than the rest of the factors. This is because the SLV has the power to determine students' motivation and readiness to learn whereas the SLE have a direct impact on the learner and the learning process. Finally, findings reveal a significant positive relationship between SATSS and performance/academic achievement ($r = 0.720$ and $p = 0.001$). This means that students with high attitude levels towards science subjects registered high levels of achievement in science. The findings have wide implications on learning of science.

Key terms: SATSS, attitude, gender, Self-efficacy, Teacher factors, stimulating learning environments, active learning strategies, science learning value, academic achievement.

The Potential and Limits of Hand-outs in Shaping Election Outcomes: The Case of Malawi

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"Giving handouts is part of our political career. You can do your research on how many politicians have survived without giving handouts…without handouts, your people in the constituency can take you as a useless parliamentarian. Whenever I am at home, I spend almost K100,000 in handouts every day,"
Patricia Kaliyati, Director of Women in the DPP, quoted in the Nation Newspaper, January 12, 2014

Abstract

Incumbency and election handouts have traditionally been considered to be one of the most important and decisive factors in influencing election outcomes in Africa generally and Malawi in particular. In the words of Patricia Kaliyati, handouts are considered to be a cornerstone of electoral politics in Malawi, determining the likelihood of success or failure of candidates. Yet, recent studies of elections and other elated political campaigns have shown that handouts are not always a reliable strategy for securing preferred political outcomes.

Drawing on survey data conducted either side of the Malawi 2014 elections, this paper re-examines the role of handouts during elections and assesses their impact in shaping election results. Although most Malawian politicians consider handouts as an indispensable ingredient of their election campaigns, our findings show that they do not always work as a stand-alone campaign strategy. We find no direct relationship between handouts and election results. In a context where an increasing number of citizens are becoming aware that those seeking elected office have no means of finding out how they voted, an increasing number of voters are looking at handouts as an opportunity to claw back from politicians but subsequently renege on their promise to vote for their patrons. The widespread practice of handouts meanwhile means that voters consider handouts as freebies and maximize their share by receiving from multiple candidates, including those from competing political parties.

The Paradox of Traditional Leadership in Democratic Malawi

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Abstract

Introduction
Ever since colonial rule, political authorities in Malawi have failed to extricate themselves from the influence of traditional leaders. The democratic movements of the 1990s renewed pledges to abolish the institution of traditional leadership and replace them with democratically elected structures. Such pledges however yet again came to naught. Therein lies the paradox which this paper examines. Specifically, we seek in this paper to unravel this paradox of traditional leadership in democratic Malawi.

Methodology
The paper draws its findings from a national quantitative survey conducted in October-November 2016.

Results and discussion
The paper explains why traditional leaders remain active players in the political arena, what roles they play, their perceived legitimacy, vis-à-vis elected political leaders. The findings show that traditional authorities remain more popular than democratically elected leaders in several areas of social-economic initiatives in communities.

Conclusion
We close by offering some tentative observations on what the existence of traditional leadership alongside democratically elected institutions means for the future of the country's fledgling democracy.

Promoting Active and Innovative learning in Universities in Kenya through Open Distance and E-Learning: Students' Perspective from a Private University

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Abstract

Challenges facing the education sector are classified into economic, technological, social, and cultural. Due to massification in higher education and a pursuit to obtain degrees instead of knowledge, the quality of education has declined. This is evidenced by employers' dissatisfaction with the Universities' abilities to train a competent workforce. Increased student enrolment brings more adult learners. This calls for innovative strategies in Universities in delivering quality and practical education. Information and Communication Technology (ICT) provides the impetus for change from the traditional concepts of administering education to more contemporary measures. The importance of ICT cannot be over emphasized in order for Universities to achieve the goal of providing flexible learning environments such as ODEL platforms. Innovation and ICT go hand in hand and must be incorporated in the learning process to equip students with requisite skills and gain a competitive edge in the global market.

This paper evaluated students' satisfaction with the ODEL teaching and learning methodologies used in a private University The paper addressed the gaps, opportunities, and recommended best practices globally to enhance effective and efficient delivery of quality ODEL education. The study employed descriptive design using structured questionnaires. The target population was 750 students enrolled in 6 programs. The sample was 400 collected over 4 trimesters from January 2016 to April 2017.

The findings indicated that 77% of students were dissatisfied with ODEL due to limited access to the Internet, outdated modules, lack of tutorial sessions in regional centers, and direct interaction with lecturers. Findings will assist faculty in adoption of innovative methods of teaching via ODEL. Additionally, University Management should invest in effective and efficient ODEL platforms such as Moodle and Blackboard to enhance learning amongst students and lecturers. Accreditation bodies will review the process of evaluating and accrediting programs that promote active and innovative learning.

Enhancing Quality of Academic Programs in Universities in Kenya: The Importance of Stakeholders' Feedback in Quality Enrichment

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Abstract

Stakeholders play vital roles in improving the quality of University education. There is need for participatory and collaborative efforts of stakeholders such as students, faculty, alumni, and employers to improve the quality of curriculum content, teaching, and assessment through practical attachment experiences as well as acquisition of a global view on matters. These collaborations can be achieved through establishing links with stakeholders such as private sector, accreditation bodies, and the government. This will increase Universities' utility of industry technologies and expertise to strengthen curriculum design by linking theory and practice. There have been concerns of declining academic standards against the background of massification in higher education that focuses on numbers as opposed to knowledge and quality education. Stakeholders have lost confidence in Universities' ability to meet the needs of dynamic workplaces. Budget restrictions and declining funding for students has resulted in pressure to increase efficiency in expenditure.

This study addressed the importance of stakeholders' feedback in enhancing quality of academic programs in Universities in Kenya. Descriptive design was used to assess the employers' views of recent University graduates, Alumni, faculty and current students from 2014 to 2016 of their programs of study. The study was conducted in April 2017. The target population was a total of 1600 current students, faculty, alumni and employers. The sample size was 910 and stratified random sampling used. Data collection was via structured questionnaires. Seventy percent of alumni and 92% of employers indicated need for collaboration in curriculum development to strengthen academic programs to match industry trends. Faculty (62%) indicated that students lack critical and application skills. Fifty two percent of current students indicated dissatisfaction with academic content being outdated, duplicated and not authentic. Feedback will enhance tool development for valid and reliable data collection, implementation of findings, and strengthen quality of University academic programs.

ENERGY, INDUSTRY AND ENGINEERING

Estimating Risk Factors for Severity of Motor Vehicle Accident in Malawi with Gologit, Ordered Multinomial Logit and Bayesian Ordered Multinomial Logit Models

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Abstract

Background: Malawi is among the low- income countries in which citizens are dying from preventable and treatable causes such as road traffic accidents. Efforts to reduce severe road accidents have been done. However, more safety studies that use sophisticated statistical data analysis techniques and whose aim is to identify risk factors associated with severity of road accidents are recommended.

Methods: We used the 1995 to 2007 motor vehicle accident secondary data from the National Road Safety Council of Malawi to demonstrate analysis of accidents data using generalised ordered, multinomial logit and Bayesian multinomial logit models. A better model was achieved through assessment of R2, through test of significance and through comparison of variable estimates. Risk factors were drawn from significant variables.

Results: *Surroundings* and *accident type* were the only variables which were significant in OMNL (*P < 0.05*, *CI* that exclude a *1;* (*-1.2212, -0.8779*), (*-0.5263, -0.2066*)) and in BOMNL (*P < 0.05*, and 2.5% quartiles that exclude a *1 (-1.2370, -0.8791*) and *(-0.5399, -0.2002*)). The greatest effect of the two variables was to decrease the likelihood that the accident will be severe.

Conclusion: BOMNL produced improved estimates. Drunk driving and risk taking behaviours are the risk factors suspected to increase severity.

Keywords: Generalised ordered; Multinomial logit; Bayesian multinomial logit; Motor vehicles; Accident severity; Accident risk factors.

Success Inhibiting Factors and Mitigating Measures of Public Road Construction Projects by Small-and-Medium-Scale Contractors

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Abstract

The contribution of small- and medium-scale contractors (SMCs) to the construction industry in general, and to the economic and social development of the individuals involved cannot be overemphasized. However, the majority of SMCs face a myriad of constraints that impacts on their delivery of successful construction projects and eventually their survival. Challenges faced by SMCs are similar the world over but their gravity differs from country to country due to various factors. Therefore, the overall aim of the study was to explore crucial success inhibiting factors affecting delivery of construction projects by SMCs in Malawi and mitigation measures against their impact on project success indicators.

An empirical research conducted by means of a questionnaire survey administered to players in the construction industry yielded 310 valid responses. The data were analysed by means of statistical methods of mean score value analysis and Analysis of Variances with crucial success inhibiting factors identified through Pareto's principle. In order to underpin the questionnaire survey, 12 semi-structured interviews were conducted with indigenous contractors. The interviews facilitated an investigation of mitigation measures for some of the established crucial inhibiting factors of SMCs in Malawi analysed by means of content analysis.

The crucial success inhibiting factors were dominated by economic issues and human resource capacity shortfalls in project management and technical know-how, including: 'Inflation of prices', 'Fluctuation of currency/exchange rate', 'Lack of proper training in Project management', 'Poorly prepared tenders/estimates', 'High lending interest regimes for SMEs offered by financial institutions', 'Unavailability of credit lines from suppliers', 'Lack of technical know-how', 'Uncertainty in prices of materials', 'Rapid changes in the economy', and 'Lack of experience of Project Management'.

The general view of contractors was that government had a duty to devise policies and mitigation measures that would facilitate the SMCs' development and successful participation in the construction industry.

Period of study:

• **Phase One**: Questionnaire survey was conducted in May and June 2013.

• **Phase Two:** Semi-structured interviews were concluded in March 2016.

Bioenergy Potential and Future Prospect in Malawi

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Abstract

Introduction : In order to enhance energy security while reducing environmental impact, the Malawi government has established policy to develop domestic energy resources to increase energy stability and to sufficiently meet the future demand. Bioenergy is one of the renewable energy sources that can readily replace fossil fuels, while helping to reduce greenhouse gas emissions and promoting sustainable rural development. This paper analyses the feasibility of future scenarios based on moderate and high use of biofuels in the transportation and electricity generation sectors with the aim of determining their possible impact on the Malawian energy system.

Methodology: The energy simulation model, the Long-range Energy Alternatives Planning (LEAP) system, has been used to simulate how energy might develop over a 35-year period (2015-2050). The study has three main scenarios, based on the year 2015 data, Comprises Business-As-Usual (BAU), Moderate Diffusion (MD) and High Growth (HG) scenarios.

Results: Results from the modeling study indicate that the use of ethanol, biodiesel and electricity obtained from primary biomass may account for 12% of the total energy consumed in the high scenario for all selected sectors. Carbon dioxide (CO2) emission reduction-including the emissions saved from the reduction in the non-sustainable use of fuelwood in the rural residential sector-is equivalent to 67.25 million tons of CO2 and would account for 14% of the CO2 emitted by electricity supply and transportation sectors when the base and high scenario are compared by 2050.

Discussions and Conclusions: This study focuses on the feasibility of future scenarios of bioenergy supply and demand in the Malawi during the period, from 2015 to 2050, by using LEAP model with three scenarios: the BAU, the moderate diffusion and high growth scenario. Results from this study indicate that it is essential for the current energy system to evolve towards an ever- greater use of bioenergy as a substitute for fossil fuels in order to achieve environmental sustainability. The findings suggest that the use of bioenergy would allow Malawi to foster sustainable development strategies, particularly in the rural sector.

High Utilization Efficiency of $NiCo_2O_4$ Supported on Porous Graphene as Noble Metal-free Catalysts for Oxygen Reduction Reaction.

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Abstract

Due to the π-π interaction of graphene (GR) layers, GR sheets tend to aggregate irreversibly to graphite during the application process. In addition, nanoparticles supported on GR layers are easily sandwiched or secluded inside the stacked layers and therefore not efficient exposure for catalysis.

To address the irreversible aggregation of GR and increase the utilization efficiency of supported nanoparticles, in this work, porous GR (PGR) was prepared using SiO_2 as a template and used as support for the $NiCo_2O_4$.

The porous structure provided larger surface area and more opportunity for the exposure of supported $NiCo_2O_4$. Due to the porous structure of PGR, the $NiCo_2O_4$ supported on PGR were not hidden by aggregated GR layers and were highly exposed to target molecules. Compared with $NiCo_2O_4$/GR, the electrocatalytic activity of $NiCo_2O_4$ supported on PGR is effectively increased accompanied with the high utilization efficiency of $NiCo_2O_4$ supported on PGR.

By combination of the catalytic properties of highly exposed $NiCo_2O_4$ and structural properties of PGR, the $NiCo_2O_4$/PGR is highly active, cheap and selective noble-metal free catalysts for oxygen reduction reaction (ORR) in alkaline solution. In addition, the ORR activity of $NiCo_2O_4$/PGR is increased accompanied with the decrease of pore size of PGR. $NiCo_2O_4$/PGR is potential efficient and inexpensive noble metal-free ORR catalysts with good long term stability in alkaline solution.

Note: This work was published in Journal of Alloys and Compounds in 2016.

Factors Influencing Adoption of Off-grid Community-based Solar Photovoltaics in Chikwawa District, Malawi

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Abstract

As there are limited opportunities for grid expansion in developing countries whose populations are growing and demand for energy increasing, rural electrification is slowly being achieved through use of off-grid technologies. Community solar photovoltaics (CSPVs) are being seen as the means through which off-grid electrification can be diffused to rural areas. The purpose of this study was to determine and analyse factors that influence adoption of CSPVs in Chikwawa, Malawi.

A quota sample of 309 respondents was drawn from 5 communities where CSPVs had been installed to collect quantitative data using a Likert-type questionnaire on the five attributes that influence adoption in Roger's Diffusion of Innovation Model: relative advantage, trialability, compatibility, observability and complexity. Qualitative data from in-depth interviews and desk research provided insights into the CSPV market and project policies.

The study found that adoption of CSPVs in Chikwawa was facilitated by relative advantages derived from using the CSPV, compatibility with their occupations and social norms and observability effects. It is concluded that a rural CSPV adoption strategy that uses Roger's Model is modulated by gender and occupational differences of the target market in perceiving the attributes that influence relative advantage, observation and compatibility.

It is therefore recommended that CSPV adoption strategies should include rural market segmentation in gender and occupational lines.

This research was concluded on 31 January, 2017.

Assessing Utilisation and Acceptability of Bio-Ethanol Stoves in Nkhotakota

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Abstract

Introduction

Malawi is one of the least developed countries in the world where over 73.6 percent of the population live below US$1.90 a day and 83.3% of the population live in rural areas. Ninety-eight percent of the rural households depend on firewood and other biomass for cooking and heating leading to deforestation that by 2005 reached 0.93 percent or loss of 32,900 hectares per year.

To contribute to addressing deforestation the Industrial Research Centre of MUST assessed the acceptability of using bioethanol as alternative fuel in Nkhotakota.

Methodology

Thirty-six households were randomly selected from three sites, each site providing twelve participants. Each household was assigned an ethanol stove and two litres of ethanol. In addition, 228 litres of ethanol were provided for the participants to buy at MK600.00 per litre.

The participants were required to record cooking date, the type of food, cooking session starting time and cooking session ending time; the amount of fuel used was also to be recorded.

Results

Nsima is the most frequently prepared foodstuff while beans are the foodstuff that takes the longest to cook. On average a rural household requires about 18±2 litres per month and the technology utilisation rate was 7%.

Discussion

The low level of utilisation implies that the technology was yet to be fully accepted within the nine months that the study took place. The poor utilisation can be attributed to the high cost of ethanol when compared to fuelwood, the stove design and the selection of participants.

Conclusion

A lot of effort needs to be made in order to successfully transfer alternative cooking technologies to rural Malawi. Issues to do with cost and technology convenience need to be closely monitored. In conclusion, this technology was to be successfully transferred.

Challenges Faced by Female Artisans in Malawian Construction Industry

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Abstract

Women in the construction industry are seen as the wrong gender. It requires not only manual dexterity but physical strength. The industry is employing less than 10% of the females in its workforce with even lower participation in crafts and trades. It continues to be dominated by males despite the government efforts to legislatively increase the percentage of women in the industry. The nature, organizational structure and culture of the industry present several barriers and challenges to women.

The methodology used was both purposive and random sampling. Extensive literature review was used to collect data through structured interviews and a questionnaires survey on 40 artisans working in 10 different construction firms. The top five challenges faced include; in sufficient maternity leave to recover from, and during maternity; problems in balancing work and family; women prefer office work; women are naturally more emotional and have motherly home instinct that they need to be taught construction duties and, finally, sexual harassment at work place. The obstacles included: gender bias; gender inequality; gender stereotyping; ill-fitting personal protective clothing and equipment that are not sized to fit women; temporary sanitary facilities that are usually unisex, often without privacy and not well maintained to satisfy women needs for privacy.

The study concluded that women artisans encounter many barriers and challenges when working on construction sites for example sexual harassment, ill-fitting protective clothing which are not sized to fit women, sanitary facilities which are unisex, pain and injuries of which though women's works hard on construction site, they still lag behind men without progression. It recommends that; construction stakeholders should intervene by strictly enforcing gender affirmative action, career guidance for women to genuinely participate in vocational training and should be employed on every construction sites. Contractors should be checked from time to time and action should be taken against all those who harass female employees.

Understanding the Products and Services that the Industry in Malawi Needs: An Industrial Needs Assessment Study Approach.

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Abstract

Results are presented for a study that was conducted to identify the research, training and technology needs as well as outreach and extension gaps of the industry with a focus on some selected key sectors. The study was conducted to guide University's Industrial Research Centre on operations that address the pressing needs of the country towards economic growth. Three areas of focus based on the country's Development Strategies were: (i) Agriculture and agro-processing; (ii) Energy; and (iii) Industrial Development. Organizations and companies that are producing one or more products in the three focus areas were surveyed in November, 2016. Data was collected using a stratified sampling procedure within various subgroups in the targeted sectors.

Key informants from various levels within the targeted entities were purposively identified in Lilongwe, Blantyre, Zomba, Mulanje, Chiradzulu and Thyolo. Some participants outside these areas participated through Google online survey. The appropriate sample size for the study was 96 organizations and companies. However, the study targeted 160 organizations to minimize possible non-response bias. A total of 98 organizations actually participated in the study. Secondary data on prevailing challenges and issues in the targeted sectors was also sourced from Malawi Confederation of Chambers of Commerce and Industry and the National Statistical Office to supplement the data.

The study results show a number of pertinent issues and challenges, which include; research, training, and technology needs, and outreach and extension gaps that exist within these three key sectors. Interventions have been designed to resolve the challenges to foster industrial growth and development for the socio-economic development of Malawi.

Keywords: Industry, Needs assessment, Energy, Agro-processing, Development, Malawi.

Methodology for Solar PV Needs Assessment in Chikwawa, Southern Malawi

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Abstract

Introduction: WASHTED was subcontracted by the Malawi Renewable Energy Acceleration Programme (MREAP) to, among other activities, deliver a strategic energy project (SEP) in Chikwawa utilising solar photovoltaic technology. As part of this work stream, a needs assessment was conducted to determine sites and communities that would be included within the SEP.

Objective: To determine sites and communities that would be included in the pilot project to set up photovoltaic installations in selected health facilities and schools in Chikwawa District.

Methodology: The needs assessment targeted health facilities and schools that were recommended by the Chikwawa District Health and District Education Offices respectively as the most in need of lighting facilities in the district. Senior health personnel (i.e. clinical officers, medical assistants, nurses and/or senior health surveillance assistants (SHSAs)) and headmasters (or senior school masters) working in the health facilities and schools respectively were involved in the Key Informant Interviews while community leaders and committees were involved in focus group discussions.

Findings: Overall, the needs assessment work establishes a methodology that enabled WASHTED to select health facilities and schools in the communities that had: potential to sustain energy projects , capacity to form and sustain energy committees, potential to assist maternal activities at the health facilities, ability to provide capacity for the PV systems when installed, availability of cellular networks for purposes of remote monitoring exercises, no likelihood that national grid will be established in the area in the next five years and availability of self-help energy activities.

Conclusion: The methodology has shown that it could help facilitate strategic planning within the rural communities and help to ensure that investment in renewable energy is focused at the most viable sites. In addition, the methodology has shown that it can assist in identifying sites with the highest need of help and in the remotest areas of the district that are mostly ignored by development stakeholders.

Keywords: Needs Assessment, Renewable Energy Technology, methodology

Impact of Proposed Utility Scale Solar Photovoltaic Plants in Malawi

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University of Strathclyde, Glasgow, United Kingdom (2017)

Abstract

Background: Security of electricity supply is achieved by having a diverse mix of adequate generation resources. However, Malawi seems lacking in both mix and adequacy with high dependency on hydro-power. In an effort to increase power generation capacity and mix in the short-term, there are plans to develop 70MW of utility-scale PV plants on four different sites. This study looks to quantify the impact that this variable, uncertain and low-marginal cost generation source will have on the Malawi electricity supply system.

Objective: The main objective of this study is to quantify the impacts that these plants will have on the following aspects:

a. Local constraints at point of connection

b. Stability of the power system

c. Operation and control of the power system

d. Losses in the power system

e. Other sources of generation in the power system

f. Power generation resource planning

Methods : The following methods are applied in this study:

a. Literature review on the impacts of integrating large scale PV plants into power systems

b. Collection of load, generation, operational and network data from ESCOM and other sources.

c. Data validation and benchmarking

d. Simulations and analyses using PowerFactory DigSILENT and other applications

e. Discussion and interpretation of results

Results and Conclusions: Conclusions of the study are drawn from the results of the simulations and analyses. Among others, the results help to demonstrate impacts of the proposed utility-scale PV on:

a. Thermal limits at points of connection

b. Voltage limits and control at points of connection

c. Steady state and transient stability of the power system

d. Power losses in the system

e. Management of other generation resources

f. Generation planning methodologies

Dichotomous Choice Contingent Valuation for Improved Household Solid Waste Collection in South Lunzu, Blantyre City.

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Abstract

Insufficient staff, inappropriate collection vehicles, limited operating budgets as well as growing, hard to reach populations mean that solid waste management remains limited in most developing countries; Malawi is no exception.

The main goal of this research was to estimate the willingness to pay (WTP) for two hypothetical solid waste collection services. Additionally, we tested the impact of the question positioning relative to environmental perceptions, on respondents' WTP.

Questionnaires were administered to 1256 households. Socio-demographic information, environmental perceptions and WTP values for two different scenarios were collected. The first scenario involved a 5 minute walk to disposal, the second scenario involved a 30 minute walk. Additionally, the order of the question was randomized within the questionnaire.

Willingness to pay of K1937 was found for the 5 minute walk scenario when the question was placed first and 2000 when placed after revealing respondent's perceptions on environment. In the 30 minute walk scenario WTP was K218 when placed first and K402 when placed after revealing respondent's perceptions on environment. Additionally, respondent demographics were found to be significant predictors of WTP.

The estimated values indicate that there is both a willingness to pay for solid waste service and that there are at least two options that would be acceptable to the community; a pilot scale implementation would be required to validate the hypothetical values, especially given the dependency on problem framing. Community financing should be considered as a sustainable approach to solid waste management in underserved areas.

Potential to Improve Energy Efficiency in Water Works through Energy Audits: A Case Study of Mzuzu Water Supply

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Abstract

Energy is prime mover of all economic sectors. However, there are many countries, including Malawi, that are in energy deficit. Efficient use of available energy is one of cost effective way of reducing demand and hence improve energy availability. Although energy efficiency principles and practices are well known, most industrial energy users in developing countries do not use energy efficient practices in their operations. The sector of interest in this study is the water sector where pumping systems are rated as the highest energy users in water supply.

The study investigated energy efficiency practices at Mzuzu Water Supply using a comprehensive energy audit. The energy audit involved four critical step: structured interviews involving management and staff were conducted to assess commitment, perception and knowledge; detailed technical assessment of the pumping system was done (flow charts, motor ratings, power factor, pumping outputs, electricity bills, condition of equipment); collected data was prepared for modelling purpose using Monitoring and Targeting Tool; and finally Mzuzu Water System was modelled using Pumping System Assessment Tool.

The results of the study showed that management commitment, energy policy and budget were rated as the most critical factors in the implementation of energy efficiency measures. Using the model, pumping sub-systems that had highest potential for energy savings were identified. For sustainability, energy audits should not be implemented in isolation and as once-off activity but rather they should be in the job descriptions and be embedded in continuous improvement management practices of the organisation such as Plan-Do-Check-Act and Total Quality Management.

Key words: Energy efficiency, water supply, energy audit, Mzuzu Water Supply.

N.B: The research was done as part of my master's thesis at the Polytechnic during 2016/17.

Production of Binder-free Water Hyacinth Briquettes for Cooking

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Abstract

Inaccessibility of binder materials is one of the major challenges impeding widespread production of biomass briquettes in rural areas and hence their low adoption as an alternative energy source to firewood and charcoal. Production of biomass briquettes of good strength and combustion characteristics at low compression pressures usually requires the addition of binder materials such as waste office paper, newspapers and starch to the feedstock. This study was aimed at developing a methodology for producing briquettes from water hyacinth at low compression pressures without the addition of a binder material.

The study mainly involved five steps; (i) mixing ground and chopped water hyacinth with binder material (white office paper) at four levels of water hyacinth to binder proportions, viz. 100:0, 90:10, 80:20 and 70:30, (ii) soaking the mixtures in water for three days to decompose, (iii) briquettes production using a 6-cylinder screw briquetting machine, (iv) measuring the strength and combustion characteristics of the briquettes, and (iv) statistical comparison of the briquettes' strength and combustion characteristics at 5% level of significance.

Results from the study indicate no significant differences in compressed densities, relaxation ratios and calorific values between the briquettes. Further, the results indicate that briquettes made without a binder material have significantly higher shatter resistance and low ignition time. Furthermore, it was found out that briquettes made without a binder material have significantly poor water penetration resistance and high burning rate. It can be concluded from the study that good quality briquettes can be produced from water hyacinth at low compression pressures without the addition of a binder material. It is envisaged that good quality briquettes can equally be made from other biomass materials at low compression pressures without the addition of a binder material if optimal preparation methodologies and water soaking times are established.

This study was carried out in 2016 with funding from the Shire River Basin Management Program.

Improving the Efficiency of the Solar Cells by Employing Nanotechnology

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Abstract

One of the major problems challenging Malawi is the interruptive power supply that in turn limits the industrial, economic, and social development of the country. These problems extend to insufficient power generation capacity, lack of investment in new power generation units and poor power quality and reliability. One of ways of dealing with aforementioned problems is a firm focus on other alternative sources of energy like solar energy; as it presents considerable potential contribution to filling the gap of energy needs in Malawi. Currently, there is a world-wide commercial production of solar cells. With solar power gradually becoming a popular alternative energy source to hydroelectricity in Malawi, there is a need to improve its efficiency and nanotechnology plays a major role.

Nanotechnology is an emerging science which has shown remarkable potential for efficient, cost effective, and environmentally acceptable solutions for improving the energy supply from solar power. In the country, no research has been done to assess the use of nanomaterials in the solar power industry. An example of a nanomaterial that can be used in the solar cells is the carbon quantum dot which is easy to manufacture/fabricate provided all necessary equipment are available. Carbon quantum dots are a class of nanomaterials that can be used as the photovoltaic material in solar cells to replace bulk materials such as silicon, copper indium gallium selenide (CIGS) or cadmium telluride (CdTe) which are very expensive. The carbon quantum dots improves the efficiency of solar cells by harvesting multiple portions of the solar spectrum hence giving off high voltage of light. By comparing the efficiency of solar cells between those with and without carbon quantum dots, the expected result is that the solar cells having quantum dots should give a higher energy output than the solar cells without them.

Survey Design of Overhead Electrical Transmission Lines: A Comparative Study of Global Positioning System (GPS), Total Station (TS), and Unmanned Aerial Vehicle (UAV).

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Abstract

Before an Overhead Electrical Transmission (OET) line is constructed, a design survey to map the transmission corridor is necessary. OET line projects in Malawi employ both conventional geomatics methods and satellite-based positioning. Geomatics engineers utilise traditional geomatics measurement techniques in routing the line. However, performance of UAV in Malawi still remains unknown in preliminary line routing. Thus, this paper compares the use of GPS, the UAV and the TS in routing of OET line for Gogode 33 kV reticulation in Kasungu District, undertaken in 2015.

Leica GPS1200 + series unit was used in fixing a 10.002 km transmission line in which Angle Points (APs) locations were determined first. Then all the structures between APs were traversed by staking out from the pre-determined positions by COGO instrument calculator. The Leica Total Station with an inherent Laser Plummet was used to check the alignment of the pegs. The Parrot Bepop Drone Version 1 - UAV was utilised in 2017 on the same project at an altitude of 30-meters.

Three H-In-Line, Seven H-Pole Angle Section, Three Vertical Section; Angle Vertical Intermediate; H-Pole Section with LELs including the stays and Intermediate Structures were independently checked to be in their actual positions.

There were no documented differences in sighting with the GPS and the Total Station. Besides, it has been shown that Bepop Drone may be used to identify structure locations by assisting in estimating structure intervals where the GPS and Total Station surveying are integrated in alignment observations.

Keywords: Transmission Line, Unmanned Aerial Vehicle, Structure, Angle Points, Geomatics Engineer

Community Transformation Through Installation of Sustainable Renewable Energy Technologies

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Abstract

Introduction: The inadequate generation capacity from ESCOM hydropower and the geographic isolation of many of the Malawian communities present serious challenges for the equitable distribution of grid power to rural and remote areas. A major concern for these communities is the lack of access to electricity enjoyed by their city counterparts, particularly given the enormous educational, economic and social benefits to be derived from access to power.

Methodology: Projects funded by the Scottish Government International Development Fund, namely Malawi Renewable Energy Acceleration Programme (MREAP) and Sustainable Off Grid Electrification for Rural Villages (SOGERV) aim to provide rural communities with sustainable renewable energy (RE) technologies. Strategic community RE technologies have been deployed throughout Malawi to determine their sustainability. The deployment of strategic community RE technologies included due diligence in technical design, market assessments, needs assessments, procurement analysis of suppliers and contractors, and district engagement for implementation of the projects. A rigorous M&E system, coupled with an intelligent remote monitoring technology, has been deployed to gather key learning from these projects, resulting in a series of learning papers on the sustainability of a community energy approach.

Results and Conclusions: Results demonstrate that the approach to community renewable energy systems deployed in these projects significantly improve the long term sustainability outlook. Investment in the technical, social, economic and organisational aspects of the project design is critical for a sustainable project. Previous efforts in community energy have focussed on ownership and operation models where all responsibility lies either with the community, public entities, or a commercial entity. In the projects presented here, a holistic business model for community electrification has been developed that includes community, local government, and private enterprise contributions, roles and responsibilities. Early results indicate this model has the potential to scale up as a sustainable deployment model for off-grid electrification.

Keywords: Community Energy, Rural Electrification, Sustainable Renewable Energy Technology

Design, Construction and Performance Evaluation of Automatic Poultry Egg Incubator

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Abstract

Introduction

Artificial incubation is rapidly becoming the predominant method for incubation of poultry eggs worldwide. It is favoured in order to increase the production of chicks and protein intake, particularly in the developing countries. Electrical incubators are the best where the supply of electricity is readily available and cheap. However, the absence of local equipment like an incubator suitable for small scale poultry production is one of the challenges facing the poultry industry. The purpose of this study was to design, fabricate and test the performance of an automatic poultry egg incubator for the purpose of meeting the protein needs of the Malawian population using locally available materials.

Methodology

A total of 3362 eggs [trial 1 (n = 683, BA); trial 2 (n = 1404, HL); trial 3 ([n=398, BA); and trial 4 (n=598, HL and n =279, HL)] were used for hatchability tests. The eggs were divided into two treatments: treatment 1 (60% RH; temperature =38°C; n=1275) and treatment 2 (65% RH; temperature = 39°C; n = 2087). Each treatment group of eggs was incubated in an individual incubator, according to its experimental temperature and relative humidity during incubation. The incubating chamber was maintained throughout the incubating period within a temperature range of 35°C to 38° C and relative humidity range of 48 % to 68%.

Results and Discussions

The results of this study showed that the percentage fertility and hatchability of eggs were 80% and 66%, respectively. Chicken eggs incubated at a lower temperature (38°C) and lower humidity (60%) presented the highest level of hatchability (73%) compared to higher temperature (39°C) and relative humidity (65%). These results suggest that the locally-manufactured electric egg incubator may be used for artificial incubation, aimed at enhancing production of day-old chickens.

Conclusions

This work focused on the design, construction and performance evaluation of an automatic egg incubator using locally available materials. The results from the tests showed that the prototype incubator functioned according to the designed operating temperature, humidity, and frequency of turning the eggs during the performance test. The study has also shown that a stable power supply is needed for the optimal hatching performance of the incubator.

Urban Governance in Malawi: How does it fair in the Social Justice and Environmental Litmus Test?

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Abstract

Urban governance has an impact on the life of the urban residents and other people therein. This impact goes even beyond to determine the urban environment in which people live, travel and work. This research study was mainly primary, and it aimed at investigating how urban governance in Malawi is performing in the context of social justice and the environment. Primary data was randomly collected in the four cities of Blantyre, Zomba, Lilongwe and Mzuzu using interview questionnaires. Observation also formed part of data collection. Respondents were city residents and those who work, travel through, and visit these cities. Both qualitative and quantitative data was collected and analysed. Qualitative data from the survey was analysed by establishing patterns and themes from responses, while quantitative data was analysed using Excel and SPSS to generate frequencies, tables and charts that visualize the study results.

Generally, using social justice lens and environmental perspective, the study found out that urban areas in Malawi are characterized by problems that range from subserviced and unserviced settlements, poverty, unrepaired facilities, lack of citizen participation and consultation in decision making, and so forth. Practically, the Malawian urban management scenario accommodates the exposition and perpetuation of some social injustices on the urbanites. Urban areas in Malawi are characterised in one way or the other, by some elements of deprivation, and the urban environment lacks standard aesthetic outlook. In response to the problems identified, the study suggested solutions like enhancement of urban community engagement in needs identification and decision making; ensuring that all levels of the government system understand their roles and responsibilities; fostering effective intergovernmental relationships and sound public - private partnership; encouraging innovative urban management that contributes to successful outcomes for the community; public awareness campaigns on citizenship roles in cities; and enforcement of quality assurance.

Key words: Urban governance, social justice, environment, deprivation, participation

Year Study Conducted: November, 2015

Academic Initiative for Renewables (AIR) Project – Capacity Building in Higher Education Institutions

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Abstract

The Academic Initiative for Renewables (AIR) Project is a DAAD funded (Universities Business Partnerships) programme. The project takes a holistic view on higher education while focusing on the topic of Renewable Energy Technologies (RET). Through an improved and more practice-oriented academic education in RET in the six target countries; Botswana, Malawi, Mozambique, South Africa, Zambia and Zimbabwe, the specific demands of the local labour markets shall be met and a notable contribution to the economic development of these countries will be derived. The deliverables of the project include capacity building which involves student exchanges, aims at equipping students in the participating Universities with insights of how RET programs are run in different countries and development of a common Bachelors and Masters Programs whose content was determined through a questionnaire administered in all the six countries.

Results show that most of the respondents to the open ended questionnaire (that allowed for choice of preferred educational requirements) opted for solar PV (88.2%), Grid Electricity (80%), Solar Thermal (70.6%) and Biomass (67%). This shows that the respondents appreciate the fact that in this part of Africa these renewables are the preferred options. A generic program will therefore be developed to respond to these needs in the four year duration of the project, the process and outcomes will be discussed here.

Note: The project started in 2016 and is on going

Keywords: capacity building, higher education, renewable energy,

ENVIRONMENT, CLIMATE CHANGE AND NATURAL RESOURCES

The Effects of Climate Change on Lake Malawi Fisheries

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Abstract

The Lake Malawi's fisheries are seen as a primary asset within the lake's catchment. Worldwide, climate change poses a threat on fish stocks. The effects are on physiology and behavior which in turn alter growth, development, reproductive capacity, mortality, and distribution. These effects have consequences for the future fisheries catches. To determine the impacts of climate change on fishes of Lake Malawi, a study was conducted to assess how environmental factors like temperature and precipitation have changed over time and how these changes have affected fish catches.

Time series data for fish catches and effort, and air temperature and precipitation were collected from the southeast arm (SEA) of Lake Malawi for a period of 30 years (1980 – 2010). Since annual variability in water temperature and precipitation can affect fish catches, a multiple regression analysis of fish catches of three commercially important fish species, *Oreochromis species* (chambo), *Engraulicypris sardella* (Usipa) and *Bagrus meridionalis* (Kampango) as a response variable on the environmental parameters, was done.

Our results indicated that there were no significant changes in temperature over time while a significant decrease was observed for rainfall over time. Though there was some increase in temperature over time, the increase did not go beyond the optimal ranges required by the fish for growth and reproduction. Catches of *Oreochromis* and *Bagrus species* (higher trophic level species) declined over time while catches of *Engraulicypris sardella* (lower trophic level species) increased over time. Though there is an increase in lower trophic level species, the overall fish catches went down in Lake Malawi which can be attributed to decrease in rainfall. These results are important because they will guide fisheries managers to determine which levels of harvest should be considered in the context of the changing climate.

Above-and Belowground Biomass Models for Trees in the Miombo Woodlands of Malawi

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Abstract

In this study we present general (multiple tree species from several sites) above- and belowground biomass models for trees in the miombo woodlands of Malawi. Such models are currently lacking in the country. The modelling was based on 74 trees comprising 33 different species with diameters at breast height (dbh) and total tree height (ht) ranging from 5.3 to 2 cm and from 3.0 to 25.0 m, respectively. Trees were collected from four silvicultural zones covering a wide range of conditions. We tested different models including dbh, ht and wood specific gravity (ρ) as independent variables. We evaluated model performance using pseudo-R2, root mean square error (RMSE), a covariance matrix for the parameter estimates, mean prediction error (MPE) and relative mean prediction error (MPE%). Computation of MPE% was based on leave-one-out cross-validation. Values of pseudo-R2 and MPE% ranged 0.82–0.97 and 0.9% –2.8%, respectively. Model performance indicated that the models can be used over a wide range of geographical and ecological conditions in Malawi.

Keywords: root to shoot ratio; root sampling; tropical dry forest; error estimation; carbon

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Spatial and Temporal Patterns of Physico-chemical Parameters and Plankton of Lake Malombe: Implications to Fish Productivity.

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Yamikani Balaka and

Orton V. Msiska

Abstract

Lake Malombe is located between Lake Malawi and the Shire River systems; it is part of the Lake Malawi complex. A comprehensive sampling of the Lake indicates that it has unique chemical characteristics with high pH of 8.60-10.19, conductivity of 258-290 uS/m, Total Dissolved Solids of 131-140 ppm and Dissolved Oxygen of 5.67-6.59.The maximum depth during the survey was 3.7 meters in May 2017. A full biogeochemistry has been determined showing that it is influenced by Lake Malawi and inflows from the catchment area. These conditions confer on the lake the classification as mesotrophic. Several zooplankton were identified including *Tropodiptomus cunningtoni, Mesocyclops aeqaequatorialis, Thermocyclops neglectus, Bosmina longirostris, Diaphanosoma* spp, nauplii and Rotifers (*Keratella*), indicating that it is a rich source of fish food. Mean phytoplankton biomass estimated as chlorophyll 'a' fluctuated between 2.10µg/L and 4.54µg/L with maximum phytoplankton biomass observed at station **E**. Secchi disk depth readings with a range of 1.1-2.5m reflects the mean chlorophyll a values and showed the same trend as productivity. Observed average phytoplankton biomass of 3.35µg/L is an indication that the Lake is highly productive in terms of primary production and can support secondary production and other life forms. Therefore, restocking is feasible, however, transfer of energy from one trophic level to another will depend on targeted fish stocking to achieve fishing-in-balance as practiced in the marine fish stocks of Namibia.

Key words: Physico-chemical parameters, Lake Malombe, Zooplankton, Trophic levels, Phytoplankton, Fishing-in-Balance.

Environmental Law in Malawi: Barriers to Enforcement and Possible Solutions

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Abstract

Legislation remains an indispensable tool for effective protection and management of the environment. Availability of laws notwithstanding, desired results do not happen automatically. Effective enforcement is critical to the success of any law. In this regard, the 1994 National Environmental Action Plan highlighted that one big challenge to effective environmental management in Malawi was the uncoordinated legislative framework which had several gaps, inconsistencies, duplications and conflicts thereby making enforcement difficult.

In an attempt to solve this problem, the Environmental Management Bill, 2016 provides for a coordinated and comprehensive legal framework for environmental protection and management. Bearing in mind that this is the supreme law on environmental matters in Malawi and that it is on the verge of becoming operational (passed in parliament but awaiting assent) this paper examines this law side by side with other principal environmental statutes in a bid to expose barriers to enforcement and suggest solutions accordingly.

Characterisation of Solid Wastes in Lilongwe City, Malawi

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Abstract

Introduction: Determination of waste generation and composition is crucial for planning and implementation of waste reduction, reuse and recycling programmes. A waste characterisation study was conducted in Lilongwe City to determine sources, generation rate and composition.

Methodology: This study used the Direct Waste Analysis approach. A total of 57 samples were collected and weighed as waste delivery vehicles entered the disposal site. Hand-sorting characterisation of waste samples was also employed to estimate the composition of solid wastes corresponding to specific waste sources.

Results: The main sources of wastes are households (77.1%), commercial entities (20.1%) and the remainder are industries, markets, institutions (schools and health facilities) and public places. Organics (food and garden waste) are the major component of wastes generated (67.7%), followed by soil, ash, stones and debris (9.2%); plastics (8.5%) and paper and cardboard (8.1%) and 6.4% are the other wastes such as textiles, metal and glass,). Waste generation rate for the city was estimated at 0.493 kg/capita/day.

Discussion: The high proportion of organic waste is a typical characteristic of municipal solid waste in low income countries. Organic waste can be composted; converted to biogas; and used for animal feed amongst others.

Conclusion: This study established that waste generated in the City is mainly organics which can be put to economic use by composting or conversion to biogas - an opportunity for urban agriculture and waste-to-energy sectors; respectively.

The study was carried out in 2016.

Keywords: characterisation, solid waste, Lilongwe, composting, biogas

Application of Malawi Agricultural Sector Model in Estimating Soil Organic Carbon Abatements Under Smallholder Farmers in Malawi

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Abstract

The common but differentiated responsibility of article 10 of the Kyoto protocol calls for all to participate in the reduction of greenhouse gases. Currently there are no formal policy support mechanisms to support smallholder farmers' participation in mitigation targets. Using an integrated bioeconomic modeling approach, this study analyses the effect of subsidies and taxeson technology adoption, soil organic carbon abatement (SOC) and farm revenues among smallholder farmers in Malawi. Subsidies were selectively applied to the more environmentally friendly technologies (MEFTs) while taxes were also selectively applied to the less environmentally friendly technologies (LEFTs). The model was designed to optimise SOC abatement under two scenarios. Firstly, where the model had a restriction to guarantee a minimum food production and secondly, where the model did not have a restriction to guarantee a minimum food production.

The results showed that subsides, unlike taxes, resulted into higher adoption of the more environmentally friendly technologies (MEFTs) and consequently improved SOC abatement under the actual cultivated areas. However, the total SOC abatement which was estimated as a sum of abatement under the cultivated areas and the respective fallow areas was higher under taxes than subsidies support. Total SOC abatement resulting from subsidies of $50/ha under the more environmentally friendly technologies was 21.9% of the technical potential, while total SOC abatement resulting from taxes of $50/ha under the less environmentally friendly technologies (LEFTs) was 39.5% of the technical potential. While taxes were more effective in SOC abatement, they had negative impact on farm revenues. Subsidising MEFTs at $50/ha increased farm revenues by 8.4% while taxes of 50$/ha on LEFTs decreased income by 5.1%.

These results may guide both country policy planning and global negotiations on how to support and optimise soil based mitigation under smallholder farmers.

Keywords: small-holder farmers, SOC abatement, technology adoption, farm revenues.

Assessment of Heavy Metals in Water, Sediments and Fish from Lake Chilwa, Zomba, Malawi

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Abstract

An assessment of heavy metals in water, sediments and fish was done in Lake Chilwa (2015 to 2016), Zomba, Malawi. Five sampling points namely Bonga, Chaone, Thunde, Mchenga and Kachulu were selected. Samples were analyzed for pH, EC, TDS, temperature, nitrates, phosphates, lead (Pb), cadmium (Cd), manganese (Mn), copper (Cu), zinc (Zn) and iron (Fe) using American Public Health Association (APHA) prescribed standard methods during dry season and rainy season. Generally, physico-chemical parameters were higher in the dry season than the rainy season which was attributed to low water volumes. The results further revealed that Pb was undetectable in water, sediments and fish. However Mn and Cu were detected in fish and sediment samples ($Mn_{sediments}$: 2.25 – 10.66 mg kg-1 dry weight (dw); Mn_{fish}: 0.015 – 1.18 mg kg-1 dw; $Cu_{sediments}$: n.d – 1.63 mg kg-1 dw; Cu_{fish}: 0.41 – 0.92 mg kg-1 dw). The concentrations of heavy metals in fish samples were below the maximum limits for edible fish recommended by FAO / WHO: Cd (0.1 mg kg-1), Cu (3 mg kg-1), Fe (43 mg kg-1), Pb (0.2 mg kg-1), Mn (2 – 9 mg kg-1) and Zn (60 mg kg-1). Generally, the levels of heavy metals were ranked in the order sediments > fish > water. The study further revealed significant differences in metal concentration between dry season and rainy season. Mn, Cu and Zn in sediments were significantly higher ($p < 0.05$) in the dry season than rainy season. Conversely Fe in sediments was significantly higher ($p < 0.05$) in the rainy season than the dry season. Results of this study indicate that the main sources of heavy metals in Lake Chilwa are the use of fertilizers, burning of fossil fuels and disposal of metal products. Therefore, there is a need for an integrated approach towards controlling pollution activities in the area.

Assessment of Noise Levels in Heavy and Light Industries in Blantyre City, Malawi.

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Abstract

The aim of the study was to determine the noise levels in various companies of Blantyre City, Malawi and to determine if these companies complied with the National Standards and the Occupational Safety, Health and Welfare Act of Malawi on noise pollution control program.

In this study, the noise levels, ambient temperature and humidity were measured in various sections of the different industries in the city. A questionnaire was used to check if the industries applied any control measures to prevent induced hearing loss.

The results show that noise levels are above the recommended limit levels of 85 dBA set by Malawi Standards and Laws in most of the sections of the production lines in many industries. The study has shown that only 21 % of the industries complied with the national regulations. Furthermore, it was also observed that lack of noise data, awareness, commitment, and enforcement by the regulatory authorities are contributing factors to the failure to implement induced noise hearing loss control programmes.

In conclusion, we recommend that the noise levels in some sections of the industries in Blantyre city are high that in these sections, very few industries are implementing programs to reduce or prevent induced hearing loss. It is therefore recommended that regular inspections are need to be carried out in the city to ensure that industries are complying with Malawi standards and laws on permissible noise levels.

Capacity Needs in Catchment Management Among Technical Personnel and Community Members in Mchinji District, Malawi

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Abstract

A study was conducted from November 2016 to January, 2017 to assess the needs and gaps in catchment management among technical personnel and community members in Mchinji District, Malawi. The assessment aimed at identifying training needs of district technical personnel and community members to effectively develop and execute Integrated Catchment Management (ICM) interventions in support of the MASAF 4 Productive Community Driven Public Works Projects administered through the Local Development Fund with financial support from the World Bank.

The data collection approach was mostly participatory, involving systematic review, Key Informant Interviews, mapping and community meetings, which was then analysed thematically. A Knowledge, Attitudes and Practices survey was conducted among selected district and sub district technical personnel whereas information gathering and work planning meetings were held with community members in 14 villages of Kamphoro Catchment, Sub-Traditional Authority Kapunula.

The results revealed limited knowledge and skills characterised by disjointed and uncoordinated management practices among district technical personnel and extension workers despite the existence of catchment management guidelines in local government and water resources management institutions. At the community level, the knowledge and skills gaps were characterised by proliferation of poor cultivation methods, rampant deforestation and the pursuit of environment-damaging livelihood sources – all attributable to limited tuition and exposure to "systems thinking", which is a core attribute of ICM and sustainable development. Breaking the cycle of catchment degradation and instituting a culture of sustainability among Malawians demands exposure of technical personnel and local communities to systems knowledge and skills through tuition and experience-sharing forums within and outside the country.

Key words: Capacity Needs, Integrated Catchment Management, Mchinji, Public Works Programme

Coverage of Climate Change in Malawian Newspapers

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Abstract

An increase in frequency and intensity of weather-related disasters in Malawi in the past decade has led to reporting of climate change issues in the media. This study conducted from 11th to 30th January 2017, examines Malawian newspapers' coverage of climate change during the time of floods and drought from 1 October 2014 to 30 April 2016. Despite being an elitist medium in the country, newspapers have a strong influence among policy makers. Using BNL and NPL newspaper articles, the study intended to identify frequency of climate change coverage and whether the articles indicated the causes of climate change, link between climate change and weather-related disasters and whether climate change was presented as a prominent social problem. Content analysis was conducted on articles identified through systematic random sampling except on frequency, where convenience sampling was used.

Basing on norms of journalism, this study found that there were more climate change reports during the time of floods than that of drought. Furthermore, climate change reports were also not only silent on causes of climate change and the relationship between climate change and weather-related disasters, but were also less prominent. Adopting public arenas model, this study argues that the media are not entirely to blame for such coverage since all climate change mitigation and adaptation stakeholders are supposed to collaborate to raise its prominence, with all the cause-effect relationships, as an urgent social problem that warrant prominent newspaper coverage.

Key words: climate change, journalistic norm, Malawi, public arenas model, weather-related disasters

Economic Valuation of Water Resources at Chia Lagoon in Nkhotakota District, Malawi

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Abstract

The study was conducted at Chia lagoon in Nkhotakota, Malawi. Chia is the largest lagoon in Malawi with a total watershed area of 989 km2 and a body water surface area of 17 km2. The study used stratified random sampling technique to obtain a sample size of 101 from approximately 7857 total households. Primary data was obtained through administering a well-structured questionnaire. Secondary data was obtained from relevant literature and government departments. Gross Output Value (GOV) was used to estimate total annual economic wealth of the lagoon. Contingent valuation method was applied to estimate household willingness to pay for water resources at the lagoon. Gini coefficient estimated income distribution among the households from various economic activities. Logit model was applied to identify key factors affecting household's willingness to pay for water resources at the lagoon.

The economic valuation results showed that water resources at Chia lagoon provide an annual monetary value of MK2.7 billion (US$3,7 million). The contingent valuation results showed that households around the lagoon are willing to pay an annual aggregate value ranging from MK65.7 million (US$89569.8) to MK7.7 billion (US$10.5 million) and on average MK0.74 billion (US$1,011,824.46).

The study further displayed linkage between households' income from various economic activities and the willingness to pay evidenced by the Gini coefficient which was above 0.5 in income generated from agricultural activities and less than 0.5 in off farm activities. Logit model statistically demonstrated that demographic (AGH, LL), social-economic (LMSI, LOS, DBLP, HALI) and institution (WRCCESNI, AEFS, WRPHH, AEXTS) factors significantly affected household's willingness to pay at $\alpha = 0.01$ and $\alpha = 0.05$. Within the local government decentralization policy framework, the study recommends the establishment of community based water resources conservation committees to operate under the mandate of District Council to economically manage the resources.

Key words: Chia lagoon, Economic valuation, Malawi, Water resources

Examining Applicability of the Terzaghi Filter Pack-Aquifer Formation Relationship Theory in Sustainable Groundwater Development in Malawi

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Abstract

Boreholes are the main source of water supply to rural Malawians. In Malawi, boreholes have a non-functionality rate of about 30%. Non-functionality due to incongruent properties of filter pack and aquifer formation, according to the theory developed by Terzaghi in 1921 which states

$$(d_{15}\text{filter})/(d_{85}\text{formation}) < 4 < (d_{15}\text{filter})/(d_{15}\text{formation})$$

has not been explored. Filter pack must be compatible with the borehole's aquifer formation material. This study aimed at examining the extent to which the Terzaghi Filter Pack-Aquifer (P-A) Relationship Theory is applied in sustainable groundwater development in Malawi. Aquifer formation samples from 53 boreholes were collected across Malawi. Filter pack samples were collected from all filter pack approved sites in Mangochi and Karonga. Grading and analyses to BS 1377 Part 2: 1990 were done. Terzaghi Migration (T_m), Terzaghi Permeability, (T_p) factors and filter pack Uniformity Coefficient, CuF, were deduced. Tm and Tp were checked against Terzaghi theory. Cu_F was checked against The Code of Practice (CoP) for Borehole Drilling in Malawi which limits $CuF \leq 2$ and $D_{50F} \leq 1$. Observations to establish the current practices on borehole drilling, design and construction were also conducted to relate theory and practice.

There was 100% compliance on T_p and 87% on T_m. Nineteen percent of the samples had P-A ratios ranging between 4 and 10. $Cu_F > 2, D_{50F} > 1$. Malawi's filter pack, in its current natural state, is not compatible with the aquifer formation properties. These two are not wholly consistent with either the Terzaghi criteria or Malawi's CoP for borehole drilling. No system exists in practice for filter pack selection. This might explain the 30% borehole non-functionality rate. This study recommends a review of Malawi's Code of Practice on borehole drilling and the development of a standard for filter pack design in line with Terzaghi theory on the same.

Key Words: Aquifer Formation; Boreholes; Filter Pack; Non-functionality; Terzaghi Theory;

Note: The research for which this abstract is submitted was conducted in 2015 in partial fulfillment of the requirements for a Degree of Master of Science (Sustainable Engineering Management)

Malawi's GHG Emissions Inventory for the Industrial Sector: a Gap Analysis of the Cement Industry.

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Abstract

Malawi Government submitted its Intended Nationally Determined Contributions (INDCs) as part of the Paris Agreement in 2015. The Agreement came in force in 2016 and aims at achieving greenhouse gas (GHG) emissions reduction to avoid global warming beyond 1.5oC. It is, therefore, necessary that countries setup robust systems to record and monitor their emissions in line with the global tracking framework.

This paper analysed gaps in GHG reporting in general with a focus on cement industry, a significant GHG emitting sector at global and local scale. The general and industry specific gaps were identified through interviews of key informants and from published literature, and reports. The collected data was analysed and evaluated against a criteria which used 2006 IPCC methodology as a benchmark. Strategies for the identified gaps were developed based on lessons from international best practices but aligned to local circumstances. GHG emission approaches were ranked from Tier 0 (Reference) to Tier 3. Tier 3 is the most detailed. Malawi reports used either Tier 0 or Tier 1 approaches.

The identified gaps were: there were no data; data source could not be traced; there were no local emission factors; no physical and chemical analysis emitting materials; institutions were unwilling to share data; data confidentiality could not be assured; and there was limited expertise in GHG inventory work. Furthermore, the cement industry has no machine performance and materials analysis data per batch produced. Although the government is trying to improve the status quo, the complexity of tasks is deterring progress. Therefore, the government could concentrate on improving data management system and delegate technical tasks of developing local emission factors to research and academic institutions.

Key word: Cement industry, emission factors, GHG, Malawi, Paris Agreement, UNFCCC.

N.B: This paper is based on part of corresponding author's PhD research in progress which commenced in July 2016.

Incidence of *Lernaea cyprinacea* (Anchorworm) on Lake Malawi *Bagrus meridionalis* (Kampango)

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Abstract

Bagrus meridionalis, a high value fish and locally called *Kampango* is the only member of *Bagridae* family in Lake Malawi. Because of its wide range distribution, B. *meridionalis* is a target species for both artisanal and commercial fisheries. *Lernaea cyprinacea* (anchorworm), small ectoparasitic aquatic crustaceans are very common on freshwater fishes and recently on B. *meridionalis*. They get their name from the shape of the head which resembles a ship's anchor. Infestation by L. *cyprinacea* increases the susceptibility of the fish to other diseases. Male L. *cyprinacea* have a short life span and die after mating hence, it is female L. *cyprinacea* that is parasitic. The female worms burrow their heads into the bodies of fish.

The study that took place from January to December 2015 at Monkey Bay Fisheries Research Station revealed that their prevalence was distributed throughout the year with some peaks during cold and rainy season. More than half (53%) of the sampled fish population were infected A significant difference ($P<0.05$) on the preferred places of attack on the fish was noted and the most common part were the gills (77%), followed by an area around pectoral fin (13%) then around ventral fin (10%) and other places with a negligible contribution. Prevalence level was noted to increase with an increase in size of the host. There was no significant effect ($P<0.001$) of the attacks on the B. *meridionalis's* health as there was a strong correlation between length and weight of the infected fish.

The study has reported the incidence of the L. *cyprinacea* on Lake Malawi B. *meridionalis* hence, a great need for further studies on the same arises.

Models for Efficient BOD and COD Characterisation of Faecal Sludge from Unplanned Settlements in Cities of Malawi

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Abstract

Research on faecal sludge characterisation has demonstrated higher variability in faecal sludge characteristics when compared to wastewater whose characteristics inform faecal sludge treatment practices in many developing countries. There is a growing emphasis on the need to generate accurate data on faecal sludge characteristics which in turn informs treatment options that match the variability. Lack of such data in developing countries has been attributed to resource constraints.

This study explored the use of predictive models to efficiently characterise biochemical oxygen demand (BOD) and chemical oxygen demand (COD) of faecal sludge from unplanned settlements in Blantyre, Lilongwe, Zomba and Mzuzu Cities of Malawi. Faecal sludge samples were collected from 20 pit latrines from each of the four cities. In each latrine sampling was done at four depths (0 mm, 500 mm, 1000 mm and 1500 mm from the sludge surface). Standard methods of laboratory analyses were used to characterise sludge for pH, electrical conductivity (EC), BOD, COD, total solids (TS) and total volatile solids (TVS). Models were developed using multiple linear regression with BOD and COD as dependent variables and pH, EC, TS and TVS as predictor variables. Akaike Information Criterion was used to select parsimonious models for BOD and COD. The selected models for BOD and COD had Radj2-values of 0.867 and 0.906 respectively making the models reliable for prediction at $p < .05$.

Keywords: Akaike Information Criterion, Malawi, faecal sludge characterisation, multiple linear regression, unplanned settlements.

Influence of Rooting Hormone, Stem Length Diameter and Propagation Time on Root Development of *Pterocarpus angolensis* DC Stem Cuttings

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Abstract

Pterocarpus angolensis is one of the endangered species in Southern Africa that continues to experience heavy exploitation even in Malawi. In this study, P. *angolensis* stem cuttings (n=240) of lengths 20cm and 40cm, and diameters 3cm, 4cm and 5cm were tested for their ability to root when treated with a rooting hormone before and after (October) bud break. Two experiments were set up in Completely Randomized Designs, with 2x3 and 2x2x3 factorial treatment structures. Analysis of Variance was carried out to assess rooting percentage, number of roots per cutting, mean root length and number of shoots per cutting. Correlations were run to determine the relationship between root development and traits of the stem cuttings. An overall rooting percentage of 27.1% was obtained from the study.

The analyses revealed that propagation time, application of rooting hormone, and stem length were not significant in influencing rooting percentage, number of roots per cutting, and mean root length per cutting. Significant differences in root development (P=0.014) were only observed in mean root length as a result of stem diameter, where stem cuttings with the largest diameter produced the longest roots (6.5cm) than the medium (3.3cm) and small (2.5cm) stem cuttings respectively. In contrast, shoot development was significantly enhanced by all the treatment variables in both experiments (P<0.025). Correlation analysis revealed that number of shoots, stem length and stem diameter were all weak predictors of root traits for P. *angolensis* cuttings, with correlation coefficients between -0.074 to 0.185. The study concluded that it is feasible to propagate P. *angolensis* using truncheons without the aid of hormones. Further studies are required in the management of plantlets before transplanting and during planting. In addition, tree to tree variation in rooting should be investigated.

Mechanical Control of Bracken Fern Invasion in Nyika National Park: Effect of Slashing on *Pteridium aquilinum* Rhizome Development

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Abstract

Pteridium aquilinum is a renown invasive plant that spreads by spores and relies on its complex network of rhizomes for survival. Mechanical methods have been appraised as the most logical options for controlling the species in grasslands and fallows across the world. This study was conducted to determine the effectiveness of slashing as a control measure for P. *aquilinum* spread on the grassland plateau in Nyika National Park, Malawi. P. *aquilinum* rhizomes were used as a proxy measure of P. *aquilinum* survival. Rhizome samples (n=20) were collected from soil volumes of 0.6m3 (1m length x 1m width x 0.6m depth) in slashed plots and un-slashed plots during two rainy seasons (2015 and 2016). Student's T-tests were run to analyse the differences in rhizome parameters (rhizome depth, biomass, density and health status) between slashed and un-slashed plots in the space of two years.

Results revealed that continuous slashing significantly reduced rhizome depth ($p=0.027$) in the space of two years, where rhizomes in the slashed site occurred closer to the surface (23.4cm) than in sites not slashed (47.4cm). Rhizome biomass and rhizome density did not differ significantly at the elapse of two years. In the first year however, rhizome biomass and rhizome density were significantly higher ($p<0.01$) in un-slashed plots (7.7kg; 12.9kg/m3) than slashed plots (6.1kg; 10.1kg/m3). At the elapse of 2 years, rhizomes in the un-slashed plots were characterized as rigid and tough with a cream white colour in the longitudinal section, whereas those from the slashed plots where characterized as fragile with a dark reddish-brown colour in the longitudinal section.

It was concluded that continuous slashing is indeed a viable option for controlling P. *aquilinum* invasion in Nyika National Park. Notwithstanding, further investigations into chemical control and other cost-effective options are recommended.

Invasive Species Management in Malawi: A Study of Four Alien-Invasive Plants in Nyika National Park.

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Abstract

Invasive species are an increasingly serious global threat to the integrity of protected areas and unique landscapes across the world. Early detection of plant invasions remains necessary in order to enhance management and mitigation of plant invasion phenomenon and the associated impacts. To improve invasive plant management in Malawi's largest protected area, Nyika National Park, a survey was conducted aimed at determining the abundance and spatial distribution of Black Wattle (*Acacia mearnsii*), Mexican Pine (*Pinus patula*), Himalayan Raspberry (*Rubus ellipticus*) and three species of Gum (*Eucalyptus maidenii*, *Eucalyptus bridgesiana* and *Eucalyptus saligna*). Data on species presence and abundance was collected from belt transects (n=31) in a 100 square kilometre area on the central plateau. Spatial statistics were carried out using the statist function in Quantum GIS 2.14 to analyse species distribution. T-test was carried out to compare abundance and frequency of the alien-invasive plants.

The survey revealed that *Acacia mearnsii* and the different species of *Eucalyptus* were localized in the areas where they were first introduced, whereas *P. patula* and *R. ellipticus* were spread out on the central plateau. There were no significant differences in the abundance of *R. ellipticus* and *P. patula* ($P<0.05$), although more spot observations were made for *P. patula* (68) than *R. ellipticus* (48). *R. ellipticus* occurred as dense, extensive (up to 50 meters) thickets on the margins of forest patches and pine stands, whereas P. patula was common at the source of streams.

The study concluded that *R. ellipticus* and *P. patula* require prompt management attention in contrast to the rest of the other localized species. Further studies are required into the ecology of *R. ellipticus* on the Nyika plateau, with particular emphasis on its introduction on the plateau, its relationship with pines and the associated dispersal pathways.

Value Chain Analysis of Baobab Products in Malawi

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Abstract

Adansonia digitata (baobab) has the potential to be a billion dollar industry for the African continent and could employ over 2.5 million households, if fully commercialized. The European Union (EU) authorized the placing on the market of baobab product as a novel food ingredient. Despite the socio-economic importance of baobab trade actors, revenue collected, institutions and institutional arrangements are not known. In 2017 study was carried out in Karonga, Salima, Mangochi, Chikwawa and Neno districts. Purposive sampling and snow balling technique were used in selection of districts and actors respectively. Individual interviews, focus group discussions and key informant interviews were carried out. Six main actors of baobab trade were identified; harvesters, wholesalers, processors, retailers, consumers and exporters. Revenues accrued per actor per year ranged from 17USD (harvesters), 4000USD (wholesalers), 13886USD (processors), 833USD (retailers) and 2106USD (exporters). There are no by laws of baobab harvesting and marketing at local level and inadequate forest law enforcement of NTFPs at national level. Baobab products are consumed at home and sold by different actors along the chain. These actors play a role in the successful commercialization of the product and have a different incentive and abilities to influence the chain. Lack of by-laws is affecting the quality of baobab products on the market as the fruits harvested are immature. There is need for policy makers to enforce laws of baobab trade to have products which can enter both local and international markets.

Potential Effect of Selectively Harvesting Miombo Forests of Malawi in Mitigating Living Biomass and Carbon Loss:

The Case of Chindenga Forest, Liwonde, Malawi.

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Abstract

Carbon reduction strategies in "forests remaining as forests" are currently limited to forest plantations and harvesting "avoidance" activities. However, emerging modalities such as selective harvesting are gaining increased recognition. This study was conducted to determine the potential of selective harvesting in mitigating biomass and carbon loss in forest co-management block in Liwonde forest reserve, Malawi.

The results showed that there were no significant ($P>0.05$) differences on forest living biomass and carbon stock between harvested and non-harvested areas after four years of harvest. The total living biomass and carbon stock for non-harvested area were 140.34 tha-1and 70.17tCha^{-1}, respectively; while for harvested area were 122.12 tha^{-1} and 61.06 tCha^{-1}, respectively. The rate of carbon sequestration in the non-harvested area was 0.72 tCha^{-1}yr^{-1}, while for the harvested area was 5.40tCha^{-1}yr^{-1}. The carbon stock estimation prediction models established indicate that beyond 6 years after harvest, the carbon stock would be equal in both harvested and non-harvested areas. The uncertainties for the estimated living biomass and carbon stock were within those recommended for REDD+ mechanism (<15%). Therefore, selective harvesting has the potential to mitigate biomass and carbon loss. Hence, it is possible to register carbon projects in Malawi through selective harvesting with Chindenga forest co-management block in Liwonde forest reserve as one of the sites.

The fieldwork and data collection for this research was conducted in 2015.

Consumer Choice and Willingness to Pay for Improved Cook Stoves in Malawi: A Case of Chiradzulu District

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Abstract

Introduction: The Government of Malawi is championing the promotion of Improved Cookstoves (ICS) with a target to distribute 2 million stoves by 2020. Despite promotion efforts, the adoption of ICS has been low and slow. The study was therefore designed to assess the consumer choice and willingness to pay for ICS in Chiradzulu District. The understanding of consumers` choice and their willingness to pay for the ICS is crucial in order to design appropriate strategies to enhance their wider adoption.

Methodology: Data used in this research were collected from 404 households using a contingent valuation questionnaire in 2016. Models used in the data analysis include; multinomial Logit, Single bounded and probit.

Results and Discussion: The study found that distance to firewood source from home, monthly household income, firewood collection frequency per week, number of adult females, primary cook education level, type of firewood source, household head age, under-five children ratio and value of household assets were significant factors influencing the choice of ICS. The mean willingness to pay for Chitetezo Mbaula, TLC Rocket Stove and Portable Rocket Stove were estimated as MK1586 ($2.22), MK2838 ($3.98) and MK12032 ($16.87), respectively. WTP for Chitetezo Mbaula was significantly influenced by number of firewood collection helpers in the household, sex of the household head, total time spent collecting firewood and number of adult female members in the households. While firewood source distance from home and age of the primary cooks significantly influenced TLC Rocket Stove`s WTP. Furthermore, WTP for Portable Rocket Stove was significantly influenced by firewood source distance from home and total time spent collecting firewood.

Conclusion: These findings have important implications for designing strategies for up-scaling ICS to support government program of reaching two million households by 2020.

Treatment Efficiency of Kauma Wastewater Treatment Works in Lilongwe, Malawi for Pollution Control and Waste Water Reuse

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Abstract

Discharge of poor quality wastewater effluent in surface water can cause aquatic ecosystem disturbance. In developing countries, local communities depend on surface water for domestic water supply and small-scale irrigation. Discharge of poor quality wastewater negatively impacts on their livelihoods. Properly treated wastewater can be a valuable resource for irrigation. Climate change has impacted negatively on water resources by reducing the quality and quantity of fresh water and thereby increasing pressure on such resources. Irrigation with treated wastewater would reduce this pressure. To protect aquatic ecosystems and the people who depend on them, the Malawi Bureau of Standards (MBS) has developed tolerance limits for domestic wastewater effluent discharge into inland surface waters.

This paper evaluates the effluent quality and performance efficiency of a waste stabilization pond system at Kauma in Malawi. Grab samples were collected in 2014 at the influent and effluent of the ponds, and analysed for Biochemical Oxygen Demand (BOD5), Total Suspended Solids (TSS) and Chemical Oxygen Demand (COD) using standard methods. Influent wastewater was of low strength while the effluent wastewater had BOD5, COD and TSS concentration of 16 mg/L, 87 mg/L and 58 mg/L, respectively. Concentrations of COD and TSS were higher than standards. Anaerobic and facultative ponds achieved a BOD5 removal efficiency below the design requirement. The COD removal efficiency was higher in the anaerobic pond than in the facultative ponds. The concentration of TSS increased in all ponds. The ponds are inefficient in the biological treatment of wastewater. Consequently, the effluent poses pollution threat to receiving Lilongwe river and could cause soil imbalance if used for irrigation.

It is recommended that the influent wastewater is seeded in order to enhance biological treatment. Broken and blocked sewers should be repaired to minimize disruptive inflows and infiltrations.

Key words: Biochemical Oxygen Demand, Chemical Oxygen Demand, Effluent quality, Total Suspended Solids, Wastewater

Utilization of Municipal Waste and Biosolids as Sources of Phosphorus for Land Restoration Projects

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Abstract

Waste disposal is a major environmental challenge facing municipalities. Waste contains considerable amounts of nutrients and organics required for plant growth. It is important to quantify the amount of waste generated and the quantity of nutrients that can be recovered. Further, the cost of applying the waste on land should be evaluated to make wise investment decisions. In Iceland, waste generated is disposed without resource recovery. Therefore, the objectives of the study were to 1) quantify waste generated in the Reykjavík, 2) determine the quantity of phosphorus in waste generated 3) evaluate the cost of utilizing the waste in restoration. Data for 2015 was collected from waste operators in Reykjavík. Phosphorus contained in waste was calculated based on their dry matte and their typical phosphorus content. The amount of waste generated, average distance to nearest restoration sites and recommended application rates formed the basis for calculating the cost of utilizing waste. Cost of spreading waste in the field was based on figures used by Soil Conservation Service of Iceland. We found that phosphorus in wastewater treatment was 68% while municipal waste generated 32%. Overall, this phosphorus was 400% higher than that used for land restoration. This phosphorus was, however, either landfilled or discharged into the ocean in waste. If this phosphorus was recovered, it would meet the phosphorus requirement for land restoration. The cost of utilizing the waste in restoration was 140,000 ISK/ha ($1,200/ha). This cost could be higher than using inorganic fertilizers. However, land application of waste is economical, reduces eutrophication, and most importantly conserves non-renewable phosphorus reserves. The study recommends that phosphorus recovery systems should be installed in wastewater treatment to improve phosphorus recovery. Legislation should be put in place to encourage waste utilization in land restoration.

Key word: Biosolids, compost, land restoration, municipal waste, phosphorus

Municipal Solid Waste Management, Pollution, Human Health and Climate Change: A Critical Review of the City of Blantyre.

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Abstract

Malawi signed the Paris Agreement is September 2015 in solidarity with other nations to reduce greenhouse gas (GHG) emissions and contribute towards the prevention of rise in global temperature above 1.5 degrees Celsius. Malawi's efforts are guided by the Intended Nationally Determined Contributions (INDCs) that was submitted. One of the GHG emitting sectors is waste. This research reviewed solid waste management practices in the city of Blantyre, assessed the impacts and proposed paradigm shift towards sustainable waste management. The study used critical review of literature, analysis of secondary data and interviewed key informants.

The results showed the following challenges: indiscriminate dumping of waste, under collection of wastes, mixed waste streams including toxic wastes, open burning of wastes, under maintained waste trucks, lack of purpose built landfills, undervaluation of wastes, lack of political will, limited institutional capacities, outdated curricular as well as unclear institutional and regulatory mandates. The city population, especially in the traditional and low income housing areas, is perpetually exposed to waterborne diseases and stench especially during the wet season. Leachates from dumpsites containing heavy metals and other toxic chemicals contaminate ground water systems and shallow wells. Furthermore, open burning of wastes emits greenhouse and particulate and gaseous toxins (e.g. furans and dioxins).

In conclusion, the delegated responsibilities to local government must be accompanied with financial, human and infrastructural resources to facilitate the implementation and enforcement of the Regulations. Therefore, there is need for raising awareness, training and community support, careful location and zoning of dump sites, improvement in the waste management practices at all levels, action plans and by-laws that are in harmony with national standards, policies and regulations. This approach would result in reduced air, water and soil pollution; improved health of communities; reduced GHG emissions and resource (energy and raw materials) recovery.

Key words: Blantyre, solid waste management, climate change, GHG, pollution, human health.

N.B: This paper is based on research work undertaken as part of the corresponding author's PhD thesis.

Decentralised Integrated Solid Waste Management

For Peri-Urban Areas

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Abstract

Rapid increase in Municipal Solid Waste (MSW) generated in Peri-Urban areas of Malawi has been exacerbated among other factors by inadequate operational funds to collect and ferry the refuse to designated dump sites as most of the waste stream in collected in its raw form as well as lack of community participation as waste management is viewed as the responsibility of the city authorities. The accumulation of solid waste in public places is very noticeable in many towns and cities hence presents major concerns about people's health and pollution of the environment at large. It is against this background that this research was conducted to assess the efficiency of a decentralized integrated approach to MSW management.

The study was conducted within the city of Zomba. A recovery centre was constructed comprising locally made incinerator; five beds for composting biodegradable waste; paper recycling system and a green area for growing vegetables.10 households were sampled randomly and waste collection took place twice a week. The waste was manually segregated then weighed. The energy from incineration was harnesses and used during the recycling process to come up with decorations and other artistic products. The waste that was not of direct use was weighed and its volume determined before being disposed it of in the MSW Banker.

The study showed that 76.8% of the total volume of the waste was reduced, and 69.3% of the weight total weight was reduced. This is a significant decrease that is economically and environmentally sound. There is therefore need for a policy shift in the approach to waste management where communities should be involved, as well as start looking at waste as a resource. However proper waste management training to communities is paramount to minimize effects of pollution.

Key words: Peri-urban, Municipal Solid Waste, composting, incineration, recycling, recovery centre.

March, 2017

HEALTH AND POPULATION

Evaluation of Community Led Total Sanitation Programme in Ntchisi District

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Abstract

Introduction

The objective of Community-Led Total Sanitation (CLTS) is to reduce the incidence of disease related to poor sanitation by empowering communities to take collective action to achieve Open Defecation Free (ODF) status. Level 1-ODF is attained when every household uses a private latrine though not necessarily their own while Level 2-ODF indicates that every household and institution (markets, health centres, etc.) has a latrine and hand washing facility.

Ntchisi district has been implementing CLTS since 2012 when World Vision started in Traditional Authority (T/A) Chikho while Africare started in T/A Malenga in 2014. The impact of these interventions is not yet known.

Methodology

This research compares the presence of WASH infrastructure, the use of WASH infrastructure and health expenditure between triggered and non-triggered villages in Traditional authority Malenga in Ntchisi. A sample size of 266 households (133 from each of the triggered and non-triggered villages) were randomly selected to complete a comprehensive questionnaire.

Specifically, the presence and use of latrines (smell, presence of faeces, worn-off path to latrines); the quality of latrines (door, roof), the presence of adequate handwashing stations (soap and water), hand hygiene behaviour (presence of dirt on hands), and the use of hand washing facilities (presence of water and wet soil under the HWF) were measured. Additionally, self-reported health status and health expenditures by household members were collected along with reports on community health by health clinic staff.

Results

Preliminary results will highlight how the intervention has affected the coverage, quality and use of sanitation infrastructure to determine if and at what level ODF status has been achieved.

Susceptibility Testing of Some Common Pathogenic Bacteria and Fungi to *Pterocarpus Angolensis.*

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Abstract

The medicinal plants used to treat different ailments in Malawi, contain important phytochemicals which have bactericidal and anti-fungal properties. In this study, different organs of *Pterocarpus angolensis*, a medicinal plant which is locally used to treat skin diseases, were qualitatively screened for the presence of phytochemical constituents and quantitatively assayed for the antimicrobial activity to ascertain their pharmaceutical potential.

The study revealed that *P. angolensis* contained tannins, flavonoids, saponins and terpenoids. The aqueous, dichloromethane and methanolic extracts of the leaves, stem-bark, fruits and roots of the plant were tested against *Escherichia coli, Staphylococcus aureus, Streptococcus agalactiae* and *Candida krusei* by the macro tube dilution method. All the extracts exhibited some activity against the test organisms. However, the activity of the extracts depended on concentration and microbial species. The minimum inhibition concentration (MIC) values of the extracts ranged from 0.166 g/ml to 0.01046 g/ml with the dichloromethane and methanolic extracts exhibiting more activity than the aqueous extracts. The minimum bactericidal concentration and minimum fungicidal concentration (MBC and MFC, respectively) values of the extracts ranged from 0.166 g/ml to 0.0417 g/ml.

The results obtained indicate that *Pterocarpus angolensis* has both antibacterial and antifungal properties and could be used for the treatment of ring work and other ailments. Use of the isolated and purified compounds from P. angolensis could increase the susceptibility of the tested pathogenic microorganisms in this study.

An Examination of the Management of Infertility in

Thyolo and Blantyre Districts

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Abstract

Introduction: The provision of infertility services is given a very low priority in many developing countries as it is mainly regarded as none life threatening and usually associated with high cost of treatment. In Malawi, infertility is one of the priority sexual and reproductive health (SRH) issues according to the national SRH and Rights policy (2009). However, little is documented on the availability and quality of infertility services in the country. This study therefore sets out to assess the type of infertility services provided at all levels of health service delivery by assessing health care providers (HCP) knowledge, practice, barriers to provision of services and client's satisfaction.

Methodology: This study was conducted between December 2015 and December 2016. It employed a cross section research design using a mixed method approach. Quantitative data was collected from 73 HCP through interviews and observation while qualitative data was collected through in-depth interviews with 27 clients receiving infertility services. Quantitative findings were analysed using SPSS version 16; qualitative data was analysed manually using thematic content analysis.

Results: Study results revealed a generalised lack of knowledge and good practice of infertility management among all HCP assessed. HCP cited lack of knowledge and skills (45.2%, n=33) as the main barrier to provision of infertility services. Clients cited long duration of receiving infertility services and failure to integrate male clients in the service as reasons for their dissatisfaction.

Discussion and conclusion: A gap exists between policy and infertility management practice. To improve infertility service provision, there is need for Ministry of Health and policy makers to develop standard guidelines for training and provision of infertility services. Furthermore, there is need for integration of infertility services in already existing RH services in all levels of service provision.

Factors Influencing Early Sexual Debut Among Adolescents in Mangochi District, Malawi

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Abstract

Introduction: Early sexual debut is a major public health problem because of its association with poor sexual and reproductive health outcomes like unwanted pregnancies, abortions, sexually transmitted and HIV infections which contributes to poor performance of most health indicators. Identifying adolescents' risky sexual behaviour including early sexual debut is important for the protection of all at risk of HIV and other sexually transmitted diseases.

Methodology: A descriptive cross-sectional study, recruited 384 adolescents using convenience sampling methods. Collected data were analyzed using SPSS software version 22.

Results: The median age at sexual debut is 14 years. Early sexual debut was strongly associated with information from initiation ceremonies, early menarche, early marriage, myths and misconceptions and orphan hood. An association between early sexual debut and having multiple sexual partners was also found $X^2=8.348$, DF =3 & p=0.039.

Discussion: Although the median age at sexual debut is 14 years, some adolescents had experienced sexual intercourse at 12 years. Early initiation of sexual intercourse increases the period that one is sexually active during adolescence and young adulthood hence accumulating the number of sexual partners and predisposing them to risk of pregnancy and sexually transmitted infections including HIV.

Participation in a puberty rite increased chances of early sexual debut as the key focus of initiation ceremonies for both girls and boys remains that of advising them on the transition to a sexual world. Considering that the Yao ethnic groups in Malawi continues to perceive initiation rites as significant, there is need to restructure the whole process, especially the information given to the adolescents.

Conclusion: The study recommends an integration of active participation of all duty bearers in the socialization process of adolescents, enforcement of laws as well as policies and targeted programmatic interventions in order to reduce the incidences of early sexual debut.

Assessment of Type of Snack Foods Consumed by Children Attending Nursery School in Mzuzu City

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Abstract

Introduction: Childhood food choices have a high probability of being carried into adulthood, which would then determine the quality of adult life. However, snacks are unhealthy if they contain a lot of added sugar, are high in salt, or contain *trans* fats.

Objectives: To document the type and quality of snack foods consumed by children attending nursery school in Luwinga Township in Mzuzu City, and determine factors that influence caregivers to make such dietary choices for their children.

Methods: Cross sectional study which was conducted in 2016 recruited 110 preschool children who were randomly selected from four nursery schools. A food frequency questionnaire was administered to caregivers of eligible children to determine the type of snack foods the children usually consume. Likewise, factors that influence the caregivers to make such dietary choices for their children were investigated. Data were entered and analyzed using IBM SPSS version 20.0 to generate descriptive statistics.

Results: The results showed that 80.9% consume snack foods that are rich in fats, a lot of added sugar and salt such as popcorn, chips and *mandasi* at least every day, whose choices were influenced by convenience, low price and sensory appeal of the foods.

Discussion: High sugar intake increases the risk of high blood triglycerides in children and is associated with a higher incidence of dental caries.

Conclusion: In Luwinga township, the majority of the under children consume unhealthy foods of some kind or the other on a daily basis. Caregivers were compelled to give such foods to their children because of convenience, low price and sensory characteristics.

Assessing Health System Responsiveness to Vulnerable and Children with Disabilities: Results from 'Aiming Higher in Malawi' Project Survey

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Abstract

Introduction: Studies have shown that persons with disabilities do face challenges in accessing health services because of their disabilities and dependency on others. However, not much is known about the health system and provider related factors that might be contributing to the same. The objective of the study was to explore health system and provider related factors that influence disabled and vulnerable children access to health services and propose evidence - based means to which health system could respond to the needs of men.

Methodology: We conducted a cross-sectional study involving 403 guardians of disadvantaged children with different disabilities and their families in rural villages in Thyolo and Mulanje. Multi methods approach composed of both quantitative and qualitative studies was adopted. We also conducted ten focus group discussions with community members and 12 key informant interviews.

Results: Findings of our quantitative study show that disabled and vulnerable children are usually hidden and locked away, discriminated against, hence fail to access health services. Most guardians reported that disabled and vulnerable children lack the health services they want such as rehabilitative and physiotherapy services as they are not available in their local communities, and do not access even the general services available even in times of need.

Discussion and Conclusion: Apart from the outside factors, which obstruct disabled and vulnerable children from seeking care, service providers and the health system in general also play a crucial role. While disabled and vulnerable children needs are evident, most health systems are too slow to respond to their concerns. We recommend a shift from provider to people-centred health systems.

Year study conducted: 2016

Child Malnutrition in Malawi:

A quantile Regression Approach

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Abstract

Introduction

Malawi is among the countries with the highest stunting rates in Africa. In 2015, the World Food Programme reported that stunting affects 42 percent of children in Malawi. The economic repercussions of child malnutrition cannot be understated. Research shows that Malawi experiences annual losses of nearly US$600 million due to the associated costs of child undernutrition. This calls for a thorough understanding of heterogeneity in the determinants and trends in child growth in order to inform policy and intervention that might reduce malnutrition rates in Malawi.

Research Objective

The overall objective of this study is to examine trends and determinants of malnutrition in the period 2010-2015, in Malawi.

Methodology

Two sets of data from the Malawi demographic health surveys of 2010 and 2015, are used in the study. The analysis uses three indicators of malnutrition; Wasting, stunting and underweight. We employ the quantile regression methods in order to assess the heterogeneity in the determinants, at different percentiles of the malnutrition distribution. Trends were captured using graphical analysis.

Main results and policy implications

The results show a downward trend in stunting in Malawi between 2010 and 2015, this shows improvement in malnutrition. However, our results show that boys are more likely to have poor anthropometric measures in comparison to girls, in both age categories of 0-23 months and 24-60months. Mother's education matters at different quantiles for both 2010, and 2015 surveys, whereas location play no significant role. Our results therefore show the need for targeted policy based on gender and women education empowerment.

Trends in Child Malnutrition Inequalities in Malawi:

A Decomposition Approach

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Abstract

Introduction: The economic consequences of child malnutrition to individuals, households are well documented. In Malawi, there is an estimated annual loss of 10.3% of GDP due to child malnutrition. Moreover, it is reported that child malnutrition is more prevalent among children from poor households, implying the existence of inequalities. This study aims at decomposing the determinants of child malnutrition inequality in Malawi over time.

Methodology: The study uses concentration curves, concentration indices and the Recentered Influence Function regression based decomposition method on data from the Malawi Demographic and Health Surveys for 1992, 2000, 2004, 2010 and 2015.

Results: There is a slow declining trend in child malnutrition inequalities in Malawi, as indicate by the decline in the value of the concentration index from -0.141 in 1992 to -0.096 in 2015. Results of decomposition analysis show that residing in urban areas, having high socioeconomic status and higher levels of parental education are associated with low levels of child malnutrition inequalities while receiving skilled antenatal care is associated with higher levels of child malnutrition inequalities in Malawi. Additionally, the results indicate that mother's education is the highest contributor to child malnutrition inequalities and that child malnutrition inequalities are likely to decrease with higher levels of education for the mothers.

Conclusion: Since child malnutrition has been found to be more prevalent among the children from poor households, policy-wise, child nutrition programs should mainly target the poor households. In addition to this, there is need for income redistribution strategies in favor of the poor, and education policies that do not only aim at achieving universal primary education, but also secondary and higher education for both males and females. Mobile skilled antenatal care services like Medic Mobile should also be implemented to reduce child malnutrition prevalence and inequalities in Malawi.

NB: This research paper has been written in 2017.

Knowledge and Practices About Cervical Cancer Screening Among Married Men in Traditional Authority Nkhumba, Phalombe District

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Abstract

Introduction: Cancer of the cervix is still claiming the lives of women worldwide and Malawi has not been spared. Of the 16 countries with the highest incidence of cervical cancer in Africa, Malawi has the highest, with an incidence of 75.9. Being a reproductive disease, male involvement is critical as men control approximately 95% of sexual relationships in Malawi, but their role in cervical cancer prevention is not known. This study was carried out to investigate the knowledge and practices of married men regarding cervical cancer and screening.

Methods: A cross-sectional study recruited 396 married men. Collected data were analyzed by using SPSS for Windows version 20.

Results: The majority of respondents were not knowledgeable about cervical cancer and cervical cancer screening, as 84.1% did not know the cause. Only 4% of respondents knew the risk factors. On prevention, 76.5% had no knowledge, and 68.2% had some knowledge on treatment. Almost all respondents (99%) said would encourage their spouses to undergo screening, and 71.7% said that men are responsible for deciding whether their spouse should access screening services or not.

Discussion: Majority of the participants lacked specific knowledge probably because cervical cancer is viewed as a women's disease. However, majority of the participants felt that their partners were at risk as such they would encourage them to be screened. Participants said they are responsible for deciding screening accessibility probably because culturally men are said to be decision makers.

Conclusion: Men demonstrated interest in taking part in cervical cancer prevention. This is a window of opportunity that the Ministry of Health can use to develop strategies that are tailored toward men to participate fully in cervical cancer prevention to reduce its burden.

Note: This study was done in 2016

Factors that Hinder and Promote Parents' Involvement in Adolescent Sexual and Reproductive Health.

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Abstract

Introduction: Parents are regarded as one of the most reliable and available sources of adolescent sexual and reproductive health information and support. Open family discussion on Adolescent Sexual and Reproductive Health (SRH) issues usually leads to increased awareness on SRH matters and reduces risky behaviors such as early sexual debut, increased number of sexual partners and lack of condom use among adolescents. However, parents have not fully taken up this role due to several influencing factors which have not been studied fully. The study was conducted with the aim of getting deeper understanding of the factors in order to provide insight to programs targeting parents in the area of adolescent sexual and reproductive health.

Methodology: The study used a descriptive cross sectional research design Structured questionnaire was used for data collection. A random sample of 89 parents from five villages within TA Chitukula in rural Lilongwe district participated in the study. Data were analysed using Statistical Package for Social Sciences version 20.0.

Results and discussion: Factors that promote involvement included: Parents' assumption that ASRH discussion would improved education especially in girls; prevent embarrassment on parents following an adolescent pregnancy; Reduce HIV in adolescents and prevent adolescent pregnancy related deaths. While, lack of knowledge and culture were some of the factors that hinder parents' involvement. Strategies to promote their involvement included the use of booklets related to ASRH, trainings together with the teachers and adolescents, and radio programs.

Conclusion: Lack of knowledge and culture affects greatly their participation due to fear of embarrassment during the discussion and peoples' perception to ASRH discussion by parents. Hence need to support the parents with SRH knowledge and skill strengthening programs.

Neck Circumference is a Reliable Surrogate Indicator of Overweight and /or Obesity in Adult Malawian Men and Women.

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Abstract

Introduction: Body mass index (BMI) is an indicator of an overall adiposity while waist circumference (WC) and waist-to-hip ratio (WHR) are indicators for abdominal adiposity. However, BMI and WHR require two measurements and calculations, as such more time is needed to assess adiposity while WC may not be culturally acceptable especially in women as it requires removal of some clothes.

Objective: To determine the correlation among neck circumference, WC, WHR and BMI among adult men and women in a rural Malawian population.

Methods: Consenting adult males and females aged 25 to 45 years (n=100) were recruited at the Out-Patient Department (OPD) of Domasi Rural Hospital in Zomba. NC, WC, WHR and BMI were determined using standard protocols. Data were entered and analysed in SPSS. Pearson's correlation was carried out to establish the relationship among NC, WC, WHR and BMI. Scatter plots were generated and equations derived to estimate NC from WC, WHR and BMI, separately. Statistical analyses were performed at the $P \leq 0.05$ level of significance.

Results: There were significant correlations, in men between NC and BMI ($r=0.63$, $p \leq 0.001$), WC and BMI ($r=0.83$, $p \leq 0.001$) NC and WC ($r=0.45$, $p \leq 0.01$), and WC and WHR ($r=0.54$, $p \leq 0.001$). Again in women Significant correlations existed between NC and BMI ($r=0.78$, $p \leq 0.001$), WC and BMI ($r=0.87$, $p \leq 0.001$), NC and WC ($r=0.73$, $p \leq 0.001$) and WC versus WHR ($r=0.57$, $p \leq 0.001$). NC correlated significantly with BMI and WC in both males and females. However, correlation was stronger among women ($r=0.73$, $p \leq 0.001$) and moderate among men ($r=0.45$, $p \leq 0.01$) for NC and WC.

Discussion: The results of this study are consistent with findings in other studies which shows significant correlations among NC, BMI and WC in both male and female subjects. Except for findings in children, various studies that have been done in adults have revealed significant correlations among NC, WC and BMI in both males and females. These results indicate that NC can be reliably used as measure of obesity in adult Malawian men and women. Furthermore, the use of NC as a measure of adiposity could have a number of advantages; the neck is the most accessible in both males and females with no cultural barriers, it is cost effective requiring only the measuring tape which is far much cheaper as compared to a weighing scale and height board. NC also requires no calculations so long as standard cut off points are devised. This means that additionally to other anthropometric measures, NC can be used in determining overweight/obesity. This can ease work for those involved in assessments of adiposity in various health settings at the same time having more people being assessed. An increase in the number of people undergoing assessments for adiposity can go a long way towards preventing complications of obesity preventing sudden deaths associated with such disorders. The use of simpler methods like NC is therefore key to achieving this goal as assessments of adiposity will take little time for both the client and the provider.

Conclusion: An increase in NC significantly corresponds with an increase in BMI and WC in both males and females suggesting that NC may be used as a surrogate measure of adiposity as it has shown to have a significant positive correlation with BMI, which is recognised as a measure of overweight and obesity

Key words: Body Mass Index, Malawi, Neck Circumference, Waist Circumference, Waist-to-Hip Ratio.

Year of research: 2015

Equities in Skilled Attendance at Birth in Malawi:

A Decomposition Analysis

Dalitso Sydney Chikoti[1], Dr Spy Munthali[2], and

Dr Jacob Mazalale[3]

Abstract

Introduction

Maternal health related inequalities are some of the issues that recent government policy, both at international and country level, are trying hard to address. This is even emphasised locally in the Malawi growth and development strategy (MGDS) as well as the sustainable development goals (SDG3). Despite the various efforts, the maternal health disparities still exist, thus it is essential to understand the causes. Therefore, the objective of this study is to analyse wealth-related inequalities in child delivery by skilled health providers in Malawi..

Methodology

Our analysis uses the recent Malawi Demographic Health Survey 2015(MDHS), with a sample size of 24,562 female respondents.. To ensure robustness, two packages were used namely STATA 13, and the World Bank's ADePT software. Concentration index were computed to measure inequalities in the use of skilled attendants. Decomposition of the concentration index was then employed to disaggregate the contribution of the associated covariates.

Main results and policy implications

The computed concentration index was positive, indicating that use of delivery services by skilled providers favours women who are wealthier. The presence of these inequalities is determined by residence, wealth and mother's education. The sex of household head, region and household size do not have a significant impact on inequalities. Furthermore, the indirect standardization used to measure horizontal inequity showed that the inequalities which exist , are from non-need variables.

Policy indications emerging from the study there has to be more pragmatic approach to ensure that the poor are also accessing the skilled antenatal deliveries. Rather than an " all size fits all", there has to be provision according to need.

Effect of Nutrition Education and Milk Processing on Nutritional Status of Under-five Children Among Dairy Farming Households in Dedza District of Malawi

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Abstract

Introduction

Milk consumption and stunting affect under-five children in dairy farming households in Malawi despite the role dairy farming can play in mitigating impacts of under nutrition.

Methodology

A quasi-experimental design study involving 61 dairy farming households and 79 children aged 6 to 52 months, was conducted in two milk bulking groups (intervention and control) in Dedza district, from April to December 2016. The aim was to explore the effect of incorporating nutrition education and milk processing on child nutritional status. The intervention was provision of nutrition education concurrently with milk products processing four times at two months intervals. Chi square tests were done for proportions and t-test for means in SPSS. P-value < 0.05 was considered significant.

Results and Discussion

Stunting dropped from 34.2% to 20.5% and increased from 31.6% to 35.1% at end line for intervention and control respectively. Household milk processing increased by 93.5% and 3.3% for intervention at control groups respectively, resulting in a subsequent increase in consumption of homemade dairy products (86.2% and 3.6%). Differences in household milk product processing and consumption by under-five children were statistically significant. Despite stunting differences not being significant, mean height difference increased from 0.6 to 1.5 cm in favour of intervention group.

Conclusion

Study findings reveal that nutrition education and milk product processing training has positive effects on product processing, and consequently, consumption by under-five children hence improved nutrition status.

Key words: milk processing, dairy farming households, nutritional status, anthropometry

Facilitating Factors and Barriers to Malaria Research Utilisation for Policy Development in Malawi

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Abstract

Introduction

Research is key in providing evidence for policy development leading to successful interventions. However, research utilization in policy development is an intricate process requiring the understanding of contextual factors. There are factors which facilitate while others inhibit the process in a country. This study assessed factors which facilitate and/or hinder malaria research utilization for policy development in Malawi.

Methods

We used a qualitative approach through in-depth interviews with 39 key informants that included malaria researchers, policy makers, programme managers, and key stakeholders. Purposive sampling and snowballing technique were used in identifying key informants. Interview transcripts were entered in NVIVO 11 software for coding and analysis.

Results

The facilitating factors include global efforts in championing evidence informed policy making through knowledge translation, which has percolated to developing countries. Malawi's commitment has also shown to be key. Various government tools (such as guidelines for policy development and analysis, and the National Health Research Agenda) and the establishment of institutions, such as the Knowledge Translation Platform and Evidence Informed Decision-making Centre, have been identified to pursue utilization of research in policy development. Other facilitating factors include; the availability of research institutions and their collaboration with the National Malaria Control Programme; stakeholders supporting malaria research, promoting knowledge translation. The barriers to research utilization in policy development in Malawi included the lack of platforms for researchers to engage with the public, politics, researchers' lack of communication skills to policy makers, and collaboration with policy maker or among researchers themselves, funder-driven research, unknown WHO policy position, and the lack of a malaria research repository.

Conclusion

Overall, the study identified facilitating factors to malaria research utilization for policy development. These factors need to be systematically coordinated to address the identified barriers and improve on research utilization. Hence the need to develop a framework that can facilitate this process.

This study was conducted in 2015

Faculty Caring: Perspectives from Mzuzu University Nursing and Midwifery Students

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Abstract

Introduction

The concept of caring has to a greater extent been defined in the context of nursing practice and rarely in the context of nursing education. Caring for students and nurturing a caring attitude in nursing education is the first place for students to learn about the most significant values of their profession. A lot of research on perception of caring has been done in nursing practice and not in nursing education. In addition, there is limited literature in Malawi and Africa which explored the concept of caring in nursing education; specifically on how students experience caring from their faculty. Exploring students' perception of faculty caring provides a point of departure towards generating faculty awareness on what students perceive as caring.

Methodology

The qualitative research collected data through semi-structured interviews at Mzuzu University from 10 nursing and midwifery students who were purposively selected in August 2015. Data was analysed using Colaizzi's (1978) method.

Results and Discussion

The main themes that were generated are: Meaning of caring, student's perspectives on caring and uncaring faculty behaviours, and the impact of caring and uncaring faculty behaviours on students. Students described caring in nursing education as the faculty's ability to meet both educational and personal needs. They perceived that a caring faculty is one who is available, respectful, sees the person in the student, is fair and communicates to students in advance. Caring and uncaring faculty behaviours impacted on students learning, personal well-being and on patient care.

Conclusion

Findings have shown that nursing and midwifery faculty at Mzuzu University display both caring and uncaring behaviours; and its impact to students. The study recommends the incorporation of caring into the University's Nursing and Midwifery Curriculum and more studies in Africa to understand caring from an African perspective.

Promotion of Food Safety, Hygiene and Sanitation in Rural Markets Using Healthy Food Market Concept: A Case of Dembo and Bereu Markets of Chikwawa

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Abstract

Introduction

Health Food Market (HFM) concept started in 1996 by the World Health Organisation (WHO) to promote sanitation, food safety and hygiene (FSH) in rural food markets. (WHO, 2000) In Malawi the concept was introduced on pilot basis at Mfera and Dembo markets in Chikwawa district in 2014 as a component of the Healthy Setting Approach of Scotland Chikwawa Health Initiative (S-CHI) Project. The aim was to improve food safety, hygiene and sanitation status of the markets.

Objectives: The current study attempted to ascertain the impact of HFM concept interventions on FSH at Dembo market (intervention) using Bereu as a control market. Specifically, the study investigated the status of food safety, hygiene and sanitation, level of participation of stakeholders and assesses the level of knowledge and practices of food handlers in food safety and hygiene issues at Dembo and Mfera food markets.

Methodology: This was a descriptive study employing both quantitative and qualitative approaches. Data collection methods included face-to-face interviews with vendors and customers, key informant interviews with extension workers and heads of departments and focus group discussions with local leaders, market committees and village development committees. Complete participant observation was also done on personal hygiene of food handlers, actual food hygiene and environmental sanitation. Numerical data was analyzed using descriptive statistics and categorical data was analyzed using frequencies. All statistical tests were performed at 95% confidence level with statistical significance set at $p<0.5$.

Findings: Prior to the study, sanitation at Dembo food market was poor as waste disposal pit and latrines were full rendering them unusable. Food handlers had no comprehensive FSH knowledge. There was also inadequate participation of stakeholders in FSH development activities. FSH improved at Dembo market implementation of HFM interventions.as noted by the rehabilitation of market boreholes (1); construction of two new latrines, one waste disposal pit and provision of eight waste bins. Increase in cleaning and market inspection day (53 and 52 %, respectively improved tremendously at Dembo market. At Dembo, 41 % of the food handlers were trained in FSH with 25.0% of them applying the FSH concepts

Conclusion: Improving on provision of sanitation facilities, training of food handlers in food safety, hygiene and sanitation, and improvement in the participation of different stakeholders in the execution of rigorous food safety promotion activities may enhance and ensure success of the HFM concept in Malawi.

Knowledge, Attitude and Competencies of HSAs Towards Sanitation and Hygiene Disability Accessibility and Safety Audits: A Case of Rumphi District

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Abstract

The lack of inclusive facilities result in people with disabilities engaging in unhygienic and dangerous practices. At present there is unmet need for sanitation and hygiene disability accessibility and safety audits. These audits are the perfect tools for assessing sanitation and hygiene facilities for people with disabilities. They establishes concerns about safety especially on adolescent girls, women and children. Therefore, this study assessed the knowledge, attitudes and competencies of Health Surveillance Assistants (HSAs) towards sanitation and hygiene disability accessibility audits. Specifically the study identified knowledge levels among HSAs on sanitation and hygiene disability accessibility audits; explored the HSAs attitudes and practices with regards to disability audit.

Data was collected through in-depth interviews, field observation and disability audits. Study populations were HSAs, people with disabilities and caregivers. The study was conducted in Rumphi district, Malawi; in villages which were used previously on the inclusive CLTS pilot project.

The study observed that, most HSAs (80%, 8/10) were not conversant with the disability accessibility and safety audits tools and process despite being trained during the CLTS+ training. Moreover (20%, 2/10) of HSAs indicated that they did the disability audits at least twice in their villages but emphasis was on toilet seats adaptations.

Even though the majority of HSAs expressed unaware of the disability audits, they were informally conducting the audits by identifying and addressing some challenges which made the sanitary facilities ease to access and use for people with disabilities.

The disability audits provides opportunities for suggestions in changes and improvements of the existing facilities to accommodate the needs of people with disabilities. There is need to add the component of sanitation and hygiene disability accessibility and safety audits in routine village inspections done by HSAs and provide them with resources to conduct the audits.

Keywords: accessibility; audit; competencies; disability and knowledge

Investigating Health Expenditures During Births in Malawi

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Abstract

Introduction: Health financing is a major characteristic of an effective health system that promotes access and utilisation of services for the optimal well-being of all people. The Malawi government is a major provider of health services at a free cost. The national health accounts indicate increasing health expenditures with a deficit in budgetary allocation across the years. The deficit is borne by service users whose majority cannot afford paying for health services. This study aimed at examining health expenditures during births in Malawi

Methodology: A sample size of 100 women participants were interviewed. The data were collected on health expenditures and costs attributes incurred by women during births. Expenditures and costs reviewed included costs drugs and supplies, hospitalization, deliveries transportation and time.

Results: During births, mothers have very little money to help them meet costs for hospitalization and all births related costs. Caeserian section and hospitalization (admissions) costs are the largest costs (>70%) of all costs and are the determinants for women choice of where to give births.

Discussion: Birth preparedness including looking at expenditures associated with births in the society. Women and households do give very little attention to expenditures associated with births including transportation, food and costs related to guardianship during births in addition to hospitalization costs. These are not looked as significant because they are fixed costs regardless of paying or non paying services.

Conclusion: Malawi has significant potential to improve maternal health by focusing on birth preparedness that should include preparing women to have money for use in financing births. The study recommends the establishment of social insurance mechanisms that can help mothers have access to finances to help them during births.

Malaria Research in Malawi from 1984 to 2016: A Literature Review and Bibliometric Analysis

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Abstract

Introduction: Malaria research can play a vital role in addressing the malaria burden in Malawi. An organized approach in addressing malaria in Malawi started in 1984 by the establishment of the first NMCP and research was recognized to be significant. This study aimed to assess the type and amount of malaria research conducted in Malawi from 1984 to 2016 and its related source of funding.

Methods: A systematic literature search was conducted in the Medline/PubMed database for Malawian publications and approved malaria studies from two Ethical Committees were examined. Bibliometric analysis was utilized to capture the affiliations of first and senior/last authors, funding acknowledgements, while titles, abstracts and accessed full text were examined for research type.

Results: A total of 483 publications and 165 approved studies were analysed. Clinical and basic research in the fields of malaria in pregnancy 105 (21.5%), severe malaria 97 (20.1%) and vector and/or agent dynamics 69 (14.3%) dominated in the publications while morbidity 33 (20%), severe malaria 28 (17%) and Health Policy and Systems Research 24 (14.5%) dominated in the approved studies. The major research funders were the National Institute for Health/USA, Wellcome Trust and the US Agency for International Development. Only three (2.5%) out of 118 journals publishing research on malaria in Malawi were from Africa and the Malaria Journal, with 76 (15.7%) publications, published most of the research from Malawi, followed by the American Journal of Tropical Medicine and Hygiene with 57 (11.8%) in comparison to only 13 (2.7%) published in the local Malawi Medical Journal.

Discussion and conclusions: Clinical and basic research, which is mostly funded externally, in the fields of malaria in pregnancy, severe malaria and vector and/or agent dynamics dominated, while health policy and system research was least supported. The quantity may reflect scientific research activity but the initial primary impact is contribution to policy development.

The study was conducted in 2016

Challenges of Nurse Tutors' Classroom and Clinical Performance When Teaching

Mbirimtengerenji, N.D.,

Daniels, F. and Martin, P

Abstract

Introduction: Nursing is a dual profession that involves teaching both in class and at the clinical area. Nurse tutors meet a lot of challenges in their profession through their cognitive, affective and psychomotor nursing performance. The aim of this paper is to determine the challenges of nurse tutor clinical affective, cognitive and psychomotor performance in Malawi.

Methods: Mixed methods design was employed. Quantitatively, 129 students and 82 nurse tutors randomly selected were involved for the five ranked Likert Scale questionnaire, and 42 nurse tutors were involved in in-depth. While 8 focus group discussions were conducted in 8 nursing colleges. Descriptive and inferential statistics were used quantitatively for predictive variable of nurse tutor work experience and student study experience to compare with the dependent variables from the 39 cognitive, affective and psychomotor attributes.

Results: Both nurse tutors and students are not impressed with nurse tutors cognitive, affective and psychomotor performance during teaching. There is inadequate clinical orientation to students [OR ≤ 0.302; 95%CI (0.096 ± 2.955);p≥0.042] and inadequate funding from college administration [OR ≤ 1.013; 95%CI (0.271 ± 3.793); p ≥ 0.985] as a result it creates much pressure on teaching. Conclusion: There is a need to develop an effective teaching strategy that would be conducive and easy to use for the limited resource environments in Malawi.

Keywords: Nurse Tutor Challenges, Nurse Tutor Performance, Nurse Tutor Work Experience, Student Study

Experience:

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Prevalence and Intensity of *Schistosomiasis* in Communities around Water Reservoirs in Malawi

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Abstract

Although *schistosomiasis* is endemic in Malawi, its epidemiology in water reservoir communities is not known. However, there are more than 750 water reservoirs spread throughout the country, providing water for various activities. The present study was conducted to determine epidemiology of *schistosomiasis* in communities around water reservoirs in Malawi.

Methods: This was across sectional study conducted during the rainy and dry seasons in three water reservoir communities. A total of 1594 individuals aged from 1 to 78 years from 1-2km, >2-5km and 5km away from the reservoir were randomly selected and enrolled into the study. They provided stool and urine samples which were examined for Schistosoma eggs using Kato-Katz and sedimentation methods, respectively.

Results: A prevalence of 51.2% and 9.5% was found for *S. haematobium* and for *S. mansoni* respectively. Prevalence was significantly higher during the dry season (58.5%) than the rainy season (36.6%) (P=0.01). Prevalence was significantly higher in communities living 0-2km away from the reservoir than in those living > 5km away (P=0.00). Significantly higher number of individuals were infected with *S. haematobium* at Mlala than at Ukonde and Njala reservoirs (P=0.043). Similarly, significantly more individuals were infected with *S. mansoni* at Ukonde than at Mlala and Njala reservoirs (P=0.037). Age group of 6-15 years had significantly higher infection intensity, in both *S. mansoni* (129±3.6 epg) and *S. haematobium* (63.3±2.3 eggs/10ml of urine).

Conclusion: Water reservoirs in Malawi are infested with *Schistosoma* cercariae and the communities are at risk of contracting schistosomiasis. The closer to the reservoir, the higher the chances of being infected. We recommend annual MDA, since the prevalence found is within the ≥50% WHO recommended threshold for MDA. We also recommend a health education to the communities on transmission and prevention of schistosomiasis.

Keywords: *Schistosomiasis, Prevalence, Infection intensity, Water reservoirs*.

Mineral Composition and Medicinal Properties of *Adansonia digitata* L. Root Tubers in Selected Populations of Malawi

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Abstract

Introduction: *Adansonia digitata* (Baobab) is an indigenous fruit tree that belongs to the family Bombacacea. In Malawi, it occurs naturally in different silvicultural zones. Its root tubers are used for food and medicinal purposes. This study was conducted to identify provenances which would be selected to provide *A. digitata* root tubers of high mineral content and medicinal value.

Methodology: Seeds collected from Karonga, Salima, Mwanza and Chikwawa in 2016, were sown at Mzuzu University Forestry Department nursery. Atomic absorption spectrophotometric method was used to determine the content of magnesium, calcium, potassium, iron, zinc, copper and manganese in *A. digitata* root tubers at 4 months. Lead, chromium and cadmium were also determined as heavy metals. Alkaloids, saponins, terpenoids and flavonoids were analysed using standard methods.

Results: Generally, all samples contained high amount of calcium, magnesium and potassium. However, Karonga samples had highest amount of Ca, ranging from 35 to 87 mg/100 g (dry matter basis) but lowest amount of magnesium compared to the rest of the provenances. Zinc, manganese and copper were present in low concentrations. Lead was detected in all samples (0.03 to 21 mg/100 g (dry matter). Terpenoids and saponins were detected in all samples. Alkaloids and flavonoids were not detected in all samples.

Discussion: Differences in the mineral content and phytochemicals in A. digitata root tuber could be due to genetic variations as all the tubers from all provenances were raised in the same environment.

Conclusion

The study has shown that *A. digitata* tubers from all provenances contain minerals and phytochemicals which are essential for human body. The presence of high amount of calcium, magnesium, iron, terpenoids and saponins in *A. digitata* root tubers suggests their nutritional and medicinal values. However, more research is required to establish the cause of high levels of lead in the tubers.

Key words: Calcium, magnesium, provenances, saponins, terpenoids

Arm Span is a Reliable Surrogate Measure of Stature in 6-59 Month-Old Malawian Children Attending Routine Growth Monitoring and Promotion

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Abstract

Introduction: Stature is generally easy to measure, but its wide adoption in public health programmes such as growth monitoring and promotion (GMP) has been hampered by cumbersome and expensive equipment; inaccurate/irreproducible measurements; and, physical disability among some children. We tested the hypothesis that among 6-59 month-old rural Malawian children, arm span is a reliable surrogate measure of stature.

Methods: Apparently healthy children, (n=120) aged 6–59 months were drawn from routine GMP attendees at Balaka District Hospital in 2015. Stature (length for children <2 years; height for children ≥2 years), arm span and height were measured using standard protocols. Pearson's correlation was carried out to establish the relationship between stature and arm span. Scatter plots were generated and equations derived to estimate stature from arm span. Statistical analyses were performed $P<0.05$.

Results: In both male and female children, separately and combined, stature and arm span were very highly and significantly correlated ($r=0.997$, $P<0.001$), with a stature to arm span ratio of 0.99:1.00.

Discussion: Studies in other population groups have shown positive relationship between arm span and stature, but none has been this closely correlated. This study shows the potential of arm span as a surrogate measure of stature, and could be adopted in GMP to cut costs and time for caregivers, care providers and public health service.

Conclusion: Highly significant correlation exists between stature and arm span in children aged 6-59 months attending routine GMP in rural Malawi.

Key words: Arm span, Children, Height, Length, Malawi, Stature.

Aflatoxin Contamination in Whole Peanut Flour Produced by Small Scale Peanut Flour Processors in Malawi: Aflatoxin Awareness and Management Practices

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Abstract

Introduction

Whole peanut flour is affordable and widely used in Malawian dishes including in complementary foods for under-five children. Aflatoxins are major toxins affecting quality and safety of peanuts and peanut products in Malawi. A study to determine aflatoxin awareness and management practices among small scale peanut flour processors in Malawi was conducted to understand factors contributing to aflatoxin contamination in peanut flour on the retail market

Methods

A total of 166 peanut flour processors were interviewed in open markets from two urban centres (Lilongwe n=66, Blantyre n=40) and two peanut growing areas (*Mchinji* n=28 and *Kasungu* n=31) in Malawi. A kilogram of peanut flour from *Chalimbana*, CG7 and *Nsinjiro* varieties was collected from each participant.

Results and discussion

Processors (70.5%) had no awareness of adverse effects of aflatoxin consumption. Drying, cleaning and sorting as implemented by processors, was not in line with appropriate management practices to reduce aflatoxin.

Total aflatoxin content in peanut flours ranged from 0 ppb to 148 ppb. *Mchinji* had the lowest mean aflatoxin contamination; 21.96 ppb (-1.6 to 121.65) followed by Blantyre, 47.03 ppb (0.45 to 148.75); Lilongwe, 50.15 ppb (0.7 to 148.4) and *Kasungu* had the highest mean contamination, 56.68 ppb (4.1 to 147.1). Significant differences ($P<0.05$) in aflatoxin content were noted between *Mchinji* and *Kasungu* due to high awareness in *Mchinji* (88.89%) and better management practices (39% sorted their nuts) compared to the three districts. Peanut flours (68%) exceeded Malawi Bureau of Standard's (MS 1275) aflatoxin limit; 10ppb.

Conclusion

Raising processors' awareness on aflatoxin management might improve quality and safety of peanut flour in Malawi. Hence protecting consumers from aflatoxin consumption.

The Life-World: The Over-Arching Framework of Experiencing HIV and AIDS Information

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Abstract

Introduction

In the absence of HIV vaccine, HIV and AIDS information has played a pivotal role in influencing behaviour change in people. The ability to design successful HIV and AIDS information campaigns is highly dependent on knowledge of the people's information behaviour. Accordingly, there is need for good understanding of information behaviour of specific groups. The main objective of this research project was to investigate how serodiscordant couples in Malawi experience HIV and AIDS information. Serodiscordance has been identified by World Health Organisation and Malawi Government as the major driver of the HIV pandemic.

Methodology

The study used phenomenological interviews to invite serodiscordant couples in Malawi to describe how they experience HIV and AIDS information. The interview data were analysed using Van Manen's (1997) approach to analysis of phenomenological data to describe and interpret the experiences.

Results

This presentation will focus on the over-arching theme that emerged in the study findings: the life-world. The study found that HIV and AIDS information was experienced in the life-world. The life-world, as described by Van Manen (1997) has four structures, and these are the lived-body, lived-others, lived-space, and lived-time. However, based on the study findings a fifth structure is being proposed and this is Spirituality.

Discussion and Conclusion: The life-world is often ignored when designing HIV and AIDS information materials. However, practices during health care are in the context of the life-world. In my study, serodiscordant couples experienced HIV and AIDS information through their bodies. HIV and AIDS information was also experienced intersubjectively with spouses, family, friends and other people living with HIV. For all serodiscordant couples the home was the most important lived space where information was experienced. Other lived spaces were ART clinics and hospitals. HIV and AIDS information was experienced in the context of lived-time. Lived time was described as being truncated or reconstructed. Because of the uncertainty that came with HIV infection, most couples turned to religion.

Research was conducted in 2013

Impact of community-based WASH and food hygiene interventions on diarrhoeal disease incidence in children under 5

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Abstract

Introduction

Diarrhoea continues to be the second leading cause of death in children under five; worldwide, with approximately 760,000 deaths each year. Preventative measures include proven interventions such as improved sanitation, water access, vaccinations, handwashing and personal hygiene, but also modified behaviours related to food handling and the feeding of children.

Methodology: Our research aims to determine the relative effectiveness of food hygiene and WASH-based interventions on diarrhoeal disease reduction in children under five. We will determine the a) incidence of diarrhoeal disease in children under five, b) contamination of food and hygiene-related infrastructure c) the impact of behaviour change on disease and contamination.

We have implemented a before and after trial with two treatment groups and a control group in the Chikwawa region of Malawi. Each treatment group is comprised of 20 clusters of 20 children and the control has 10 clusters of 20 children, who will all be less than five years old by the end of the study. The total sample size of 1000 households all have a functioning latrine and access to a functioning water point.

Results and Discussion

Baseline results indicate that 45% (n=450) of children had at least 1 episode of diarrhoea in the last 2 weeks, though only 35 were treated. 35% and 54% of children under 6 months were consuming solid food and drinking water respectively. Adherence to vaccination schedules was high though dropped off as the child aged: 97% of children were fully vaccinated at 12 weeks, though only 62% of eligible children had received Vitamin A at 18 months. 26% of households had dedicated handwashing facilities, and 57% of households indicated they used soap for handwashing although this did not align with observations. We discuss the underlying factors for these results and how they were used to design the targeted WASH and food hygiene interventions.

Quantification of Healthcare Waste in Balaka

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Abstract

Health care services inevitably generate waste that is hazardous to health and has harmful effects on the environment. Estimations of healthcare waste used in the "National Health Care Waste Management Guidelines" for were based on data from Tanzania due to a lack of available data for Malawi. To address these gaps, a hospital based cross-sectional comparative study was conducted in randomly selected ten Health Centres in Balaka district to quantify healthcare waste generated and develop a predictive model for healthcare waste management. The quantities of healthcare waste was measured in both the dry and rainy seasons to understand seasonal differences.

Weigh scales were used to quantify the waste in each of the following departments: outpatient, dental, laboratory, HIV counselling and testing/ARV Therapy, male ward, female ward, pediatric ward (including maternity), dressing and injection room, and immunization sites. Furthermore, the waste was dissagregreated into infectious, pathological and sharps.

The final results revealed that the daily average mass (kg/day) for the dry season was 68.53kg/day, while in the rainy season it was 63.08kg/day. During the dry season total number of patients was 4,538 and an average of 14 grams was generated per patient, while in the rainy season the total number of patients was 6,872 each producing 10 g/ patient. The mass of infectious waste was 85.50 kg/wk in the dry season and 106.40 kg/wk in the rainy season; pathological wastes was 126.30 kg/wk in the dry season and 122.50 kg/wk in the rainy season; and sharps were 229.73kg/wk in the dry season and 250.80 kg/wk in the rainy season. The average daily healthcare waste generated per day was directly proportional to the number of patients per day, though model fits were higher for the rainy season.

These results will help in the planning and management of healthcare wastes in Balaka and more broadly with healthcare waste in Malawi.

Nonfulfillment of FANC Visits Among Pregnant Women at Nandumbo Village in Balaka

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Abstract

Maternal mortality remains a huge public health concern in developing countries including Malawi. One of the strategies to reduce maternal mortality is to improve maternal health by implementing appropriate Focused Antenatal Care (FANC) services. Antenatal Care (ANC) is defined as the health care of a pregnant woman and her fetus from conception to the onset of labor (WHO/UNICEF 2003).

This is a key entry point for a pregnant woman to receive a broad range of health promotion and preventive health services. Although ANC alone cannot directly bring reductions in maternal mortality, it is potentially valued as an entry point for expectant mothers into the health system as well as increasing the rates of deliveries assisted by skilled workers. FANC involves expectant mothers making four targeted visits to a health facility in which they are given an opportunity to choose their skilled birth attendant, encouraged on hospital delivery and they are also counselled on birth preparedness and complication readiness. However, the majority of expectant mothers do not fulfill the required FANC visits to the clinic.

The study conducted at Nandumbo village in Balaka District investigated the factors contributing to nonfulfillment of FANC visits among pregnant women. It was a crossectional study and adopted the simple random sampling technique. A total of 100 pregnant women from Nandumbo Village were randomly sampled. Questionnaires were used as a tool for collecting data.

The results revealed that knowledge of FANC among pregnant women was limited. Only <10% of the respondents made the correct number of visits (4) to the clinic that a pregnant mother is supposed to make. 60 % of the respondents indicated that they travelled a long distance to the clinic to access FANC services while 20% lacked resources to travel to the health facility.

Key words: Maternal mortality, Antenatal Care, counselling.

Pupils' Perceptions of their Needs in HIV/AIDS Education:

The Case of Zomba Urban Secondary Schools

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Abstract

The needs of young people in classroom based HIV/AIDS Education in Malawi, have been explored using questionnaires and interviews.

In contrast to previously reported literature on HIV/AIDS Education in Malawi, the present study has drawn pupils' needs directly from the pupils' themselves, focussed on classroom practice, and triangulated the various data sets to give a comprehensive narrative of what pupils' perceive to be their needs in HIV/AIDS Education.

Pupils identified the need for open discussion climates on HIV/AIDS issues despite a conservative cultural and religious adult world. They also identified a need for explicit and accurate knowledge on HIV/AIDS issues, opportunities to acquire behavioural skills for HIV prevention, and involvement of external speakers.

The findings suggest that in future, effective intervention through HIV/AIDS Education needs to be informed by the pupils' needs. Additionally, there is a need to examine the extent to which classroom practice has addressed these needs and the factors influencing classroom practice.

How do Diets of Infants and Young Children Aged 6-23 Months Whose Care Givers are in Care Groups Differ from Other Infants? A Case of T/A Kalumo, Ntchisi, Malawi.

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Abstract

Background

Malawi adopted the care group model to foster dietary diversity and appropriate feeding practices among the under five children through nutrition education to caregivers, thus reduce malnutrition, a problem of public health concern. Through the model, 10 to 15 households receive information and counselling through volunteers. A study was conducted to assess the effectiveness of this approach in infant and young child feeding practices.

Methods

Purposive and simple random sampling was used to select 70 women (35 Care group, and 35 non-care group). Additional information was collected through focus group discussions and key informant interviews.

Results

Although 54.3% of the children whose care givers were in care groups and 42.9% in the non-care groups, achieved minimum dietary diversity, and 80% and 71.4% achieved minimum meal frequency in the same order, differences were not significant. About a quarter of the children achieved the minimum acceptable diet in the non-care group compared to 34.3% in care groups.

Conclusion

Whether or not one belongs to care group does not matter and there is need to consider an extensive evaluation of the model to inform practice for what will work best for community nutrition and health.

Key words: Care Group, Diets, Infants and Young Children.

Assessment of Women's Awareness and Preferences for Birthing Positions and Midwives Practices in Chikhwawa District

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Abstract

Introduction

Studies have shown that the supine birthing positions during labour and delivery have many disadvantages to the mother, the foetus and on the progress of labour. In health facilities, women mostly use the supine positions for delivery. This forces some women to deliver in their homes. This study aimed at determining women's awareness of birthing positions as well as their preferences for any particular position.

Methodology

This cross-sectional, descriptive quantitative study was conducted at Chikhwawa District Hospital, St Montfort Hospital and Mfera Health Centre in Chikhwawa District. The study recruited 267 women aged 18 to 50 with at least a second pregnancy or second birth and attending antenatal or postnatal services following a normal delivery. The study also recruited 17 midwives who were working in the labour wards of the three facilities. The data for the women was collected using an interview schedule and an observational checklist was used for the midwives. The data was analysed using Statistical Package for the Social Sciences (SPSS) version 20.

Results and Discussion

Ninety eight percent (n=261) of the women were aware of the dorsal position and the sitting position was known by only 21% (n=56) of the women. Thirty two percent of the women had in-depth knowledge of the benefits of the upright positions and only12% (n=31) of the women preferred to use upright position. The women's location had an influence on their knowledge of the benefits of upright positions ($\chi 2=24.05$; P-value=0.001) and the women's age had an influence on their preference for upright positions ($\chi 2=21.14$; p-value=0.002). There were no information, education and communication (IEC) materials and equipment for positioning women in upright positions and all the midwives used the dorsal position when conducting deliveries.

Conclusion

Overall, there was some knowledge gap on upright positions among the women as well as the midwives.

Assessment of Microbial Contamination of Groundwater from Protected and Unprotected Shallow Wells in Mzuzu City

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Abstract

Introduction: Many people in most developing countries rely on groundwater as the main source of water supply for drinking and other domestic uses. However, water from fully, partially and unprotected shallow wells may contain pathogenic microbes which can increase the incidence and outbreaks of waterborne diseases.

Objective: This study was carried out to compare the bacterial contamination of drinking water from fully and partially protected shallow wells in Mzuzu City.

Methodology: Water samples (120) from protected (75) and unprotected (45) shallow wells in Chibavi and Mchengautuwa Townships in Mzuzu City were analysed for total coliforms (TC), fecal coliforms (FC), Escherichia coli (E. coli) and Salmonella spp. using standard methods.

Results: The results showed that 68 % of drinking water samples contained fecal coliforms ranging from geometrical mean of < 1 to 3100 cfu/100 mL and 32 % contained Salmonella spp. However, no significant ($P > 0.05$) differences were observed in levels of fecal coliforms and Salmonella spp. between water samples from fully and partially protected wells.

Discussion: The observed non-significant differences in bacterial levels between fully and partially protected wells could be attributed to groundwater contamination due to other pollution factors such as proximity to pit latrines and septic tanks. The presence of pathogenic bacteria in drinking water sources poses a risk of increasing incidences and outbreaks of waterborne diseases. However, further research is required to investigate the treatment of this water using solar radiation or any appropriate technologies for example, use of plant material.

Conclusion: The results from this study showed that drinking water from fully and partial protected shallow wells in the study areas contained pathogenic microbes, implying that water from these sources is not suitable for human consumption, unless it is treated.

Key words: Coliforms, facal coliform, salmonella spp. waterborne disease

NB: This study was conducted in 2017 during rainy season.

The Use of Maternity Waiting Home at Chiradzulu

District Hospital, Southern Malawi

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Abstract

In an effort to improve maternal and neonatal health in Chiradzulu District, maternity waiting home (MWH) was introduced at Chiradzulu District Hospital (CDH) in 2012. Since then, no study has been conducted to critically examine its use in the district. This study therefore was conducted to examine the use of MWH at the district hospital.

A comparative cross sectional study was conducted at CDH, postnatal ward. A total 266 mothers were enrolled and they were put into two groups depending on whether they used MWH or not. Each group had 133 mothers. A well-structured questionnaire was used to collect data and data analysis was done quantitatively using SPSS version 16.0. Chi-square test at 5% level of significance was used to determine associations as well as to compare the pregnancy outcomes of mothers who use MWH with those who did not use MWH.

Results showed no significant difference in demographic attributes between mothers who used MWH with those who did not use MWH ($p \geq 0.050$). However, results showed that pregnant mothers that had malaria, severe anaemia as well as breech presentation were more likely to use MWH ($P<0.05$). Furthermore, results showed no significant association between utilization of MWH and pregnancy outcomes.

In contrast to studies done elsewhere, the use of MWH at CDH did not significantly improve maternal and neonatal outcomes. This can be attributed to; lack of admission protocols, poor attitude of health care providers, lack of proper monitoring of mothers at MWH as well as poor quality of midwifery care during labour and delivery whereby most of the time there is prolonged observation without action. As a result the time the woman arrives in labour ward does not matter.

Data collection done between June to September 2015. Defence done in December 2016

A Large Majority of Children Aged 6–23 Months Living in a Poor Semi-urban Setting Consume Complementary Foods of Poor Nutritional Quality:

The Case Study of Mgona in Lilongwe

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Abstract

Introduction

For proper growth and development, children are supposed to be fednutritious anddiversified diets at a recommended frequency according to their ages. Presently, only 8.1%of Malawian children aged 6–23 months meet their minimum acceptable diet (MAD), more so in urban (16.6%) than rural (6.8%) areas. Considering thatthe urban poor may be masked in the 'urban' statistic, we set out to assess the quality of complementary feedingamonginfants and young children who live in a poor semi-urban setting.

Methodology

A descriptive cross-sectional study of children aged 6–23 monthswas carried in September 2016.A universal questionnaire for assessing infant and young child feeding practices was administered to randomly selected caregivers (n=90) in Mgona, a poor semi-urban location in Lilongwe, to assess minimum dietary diversity (MDD), minimum meal frequency (MMF) and MAD.

Results

Respectively, 72.9%, 41.0% and 36.6% of breastfed children met their MMF, MDD and MAD. The rates were much lower among non-breastfed children (43.8%, 17.8% and 4.4%, respectively).

Discussion

In spite of relatively higher rates of MMF, MDD and MAD among urban than rural children in the 20015/16 Malawi Demographic and Health Survey, the results reveal that child feeding is far worse in poor semi-urban areas. Such children are unlikely to meet their dietary requirements, thereby constraining their growth and development, which stagnates development.

Conclusion

Children who live in a poor semi-urban setting are likely to consume complementary foods of poor nutritional quality. Public health nutrition should pay close attention to this neglected population.

Exploring Effects of Flooding on Mental Health of Victims in Mzuzu City

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Abstract

Introduction: Floods caused by climate change leads to loss of lives and property and directly affect mental health of victims. The mental health effect of floods on victims is unknown.

Methods: A cross-sectional quantitative study was conducted in Mzuzu city to investigate the effect of the April 2016 flood on the victims. An interviewer administered structured questionnaire was used to interview conveniently sampled adults who were living in the affected area.

Results: A total of 351 interviews were completed; 29.3% of the respondents were male and 70.7% were females. The proportion of participants who reported that were happy, able to provide for their dependents, accessed health services and had a good appetite before the floods significantly decreased after the floods by 73.8%, 32.2%, 5.4% and 46.0%, respectively. The proportion of participants who had injuries before the floods significantly increased after the floods by 14.5%. Signs and symptoms of mental illness were reported in 55.9% of respondents. About 19.3% received no support like others in form of food, shelter and counseling. Of those that received support, 79.8% reported that the support received had no effect on their mental health. Hence 61.5%, indicated they needed to be provided with housing; 37.3% indicated they needed loans to start businesses to support themselves and their dependents; 1.14% indicated they needed counseling services, for their mental health to be at optimal level.

Conclusion: Victims of the flooding in Mzuzu city were affected mentally. Mental health effects and a comprehensive clinical mental assessment should be considered for flood victims. There is need for a climate change policy to directly and indirectly attain an optimal level of mental health of victims.

Year study conducted: 2017

Health Setting Approach – Is it the key to holistic Community Health and Development?

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Abstract

Introduction: The healthy settings approach has been shown to be an effective holistic method to reduce communicable and non-communicable diseases, rates of infection and incidence, and could be an effective tool to achieve one health. In Malawi, preventable diseases continue to be high, and this is often attributed to poor integration, and cultural, economic, environmental and social barriers.

Methodology: We piloted a healthy settings approach in rural communities to determine if it could drive change in key health indicators. This pilot sought to develop model villages using a process of community-led prioritisation and action planning in over 1800 households in 18 villages. The approach was community-led (transect walks (n=18); FGDs (n=108)), to identify key priorities and evaluate governance and social capital amongst community members (leadership, men, women, marginalized and youth). This data was consolidated into village profiles, which were used to develop action plans.

Results and Discussion: Priority setting outcomes showed variation both between villages, and communities, and social capital varied widely between population groups, with youth showing the lowest sense of belonging, and a low level of trust between communities, villages and extension workers overall.

Communities developed and implemented action plans over 2 years primarily targeting key areas of food security, water and health access. Significant challenges of governance, leadership and integration of plans had to be addressed through capacity building and mentoring to achieve progress. Initial end point evaluations indicate significant improvements in sanitation coverage (98.6%), client care in health facilities (94.6%) and reduction in diarrhoeal disease and malaria (data being finalized). Further data will be presented at the conference to demonstrate the impact of the healthy settings approach and potential for scale up in Malawi.

Years: 2013 – 2017

The Malawi fortification logo is not well-known among consumers in Zomba and does not help in making food choices

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Abstract

Introduction: The Malawi fortification logo was developed to increase awareness on fortification and to influence consumer choices of fortified foods for improved health. The extent to which these goals are met is not known.

Methodology: A cross-sectional study (n=79) was conducted among adult men and women aged (20-49 years old) in 2016 to assess knowledge of the fortification logo, and whether it influences food choices. Global guidelines for assessing nutrition-related knowledge, attitudes and practices were used to determine knowledge levels of participant. Data were entered and analyzed using SPSS.

Results: Most of the participants were not aware of the fortification logo as only (n=4, 5.1%) indicated that they knew it. Only (n=9, 11.4%) respondents said they use the logo most of the times; (n=3, 3.8%) respondents claimed that they use it not most of the times; and (n=9, 11.4%) respondents did not know when they had used it.

Discussion: It would appear that most consumers are not aware of the Malawi fortification logo. Not surprisingly, logo had very little influence on food choices because although they had recognised the image of the fortification logo, the consumers did not know what it meant when it was printed on food packages.

Conclusion: Contrary to its intended purposes, the Malawi fortification logo is not well known and dismally influences consumer food choices.

Key words: Fortification, Malawi fortification logo, awareness

ICT AND KNOWLEDGE MANAGEMENT

Adoption and Integration of Google Classroom in Teaching and learning: A Case of University College in Malawi

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Abstract

Electronic technologies have proliferated to all parts of the world. Malawi, a developing nation in Africa has also experienced a thrust in this area. Although it may lag behind in a number of ways in as far as technology permeation and adoption is concerned, a lot is being done to ensure that University lecturers at a constituent college of the University of Malawi own and utilize such technologies for teaching and learning. One such endeavor was the introduction of Google Classroom as a learning management system at the university. After the introduction of this learning management system (LMS), the college administration through the ICT department, organized week long training sessions for academic members of staff with the hope that they would upload their courses on this platform and start using Google Classroom as a tool for teaching and learning.

This study sought to find out if academic members of staff had started using the learning platform and identified factors that facilitated or hindered usage of the LMS. A survey questionnaire was sent out to all academic staff of Faculty of Education. Results indicate that very few lecturers had started using the platform. Reasons for low adoption were slow connection, little familiarity with the LMS and lack of knowledge on the benefits of using the platform. Some of the suggestions provided to improve usage of the platform, are; training for lecturers who did not take part in the initial trainings, and provision of house call services to lecturers right in their offices to help them with day to day issues in dealing with the learning platform; provision of orientation to students on how to use the platform and increasing computer and Internet access to students to enable them access the LMS.

Key Words: Adoption, Integration, ICT, Google Classroom, Learning Management System

Examining Secondary School Teachers' Use of Information and Communication Technologies (ICT) in the Teaching of Agriculture: The Case of Ndirande Zone

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Abstract

ICT-supported education can promote the acquisition of knowledge and skills that will empower students for lifelong learning. Although schools have had computers for about two decades, ways to use them effectively have evolved slowly and patchily. Technological revolution in schools has been beset by theoretical inadequacies that have kept educational technology at the margins of the established educational system. This creates a digital divide between the developed countries and the developing countries in relation to integration of ICTs in teaching and learning A descriptive survey was done in public secondary schools in South West Education Division (SWED) Ndirande Zone in Blantyre District.

The objectives of the study were; to determine teacher's knowledge, access and utilization, teachers and students perceptions on ICTs as a medium of instruction when teaching of Agriculture. Five public secondary schools in Ndirande were selected. In each school, 2 Agriculture teachers were selected to fill the questionnaires, 22 students were randomly sampled from the five schools and 5 head teachers from the five schools were picked to fill the questionnaires. Piloting was done to 5 fourth year Agriculture Education Students to test the validity and reliability of the research instruments. The data collected was analyzed using Statistical Package for Social Sciences (SPSS).

The study findings revealed that limited ICT knowledge and skills, inadequate ICT infrastructure, limited ICT access and utilization and teachers and students perceptions in ICTs hinder the use of ICT in teaching and learning of Agriculture as a medium of instruction. Recommendations include teachers and school administrators should familiarize themselves with national ICT policy on how to efficiently use ICTs in teaching and learning. The government should also intensify ICT funding in schools to help subsidize the high costs and increase the number of ICT materials in schools. Teacher training programmes in ICTs should also be promoted to enhance ICT skills in teaching and learning.

Tracking the Quality of YFHS using m-health Tools- a Case for Mangochi

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Abstract

Introduction: Youth Friendly Health Services (YFHS) is within the Malawi Government's Health Strategy, however the availability, quality and uptake of these services still remains low. This is due to low awareness among young people, lack of youth participation in designing services, negative attitudes of providers and luck of resource allocation to ensure facilities and staff have adequate capacity to provide these services. To address this, the Malawi YFHS (2015-2020) identifies, among others, two key strategies to improve YFHS: 1) Youth Participation, to improve information provision and increase ownership 2) Use of emerging/appropriate m-health technologies.

Methodology: This paper discusses how young people in Mangochi used mobile technologies to track and rate the quality of YFHS in five target health centres in T/A Mpondasi and T/A Nankhumba. The one year m-based research started December 2016 and is currently in its first phase. Leveraging on high level use of mobile phones among young people, a mobile scoring tool through GPS enabled phones and SMS was developed. Using these tools opinions of young people on different aspects of YFHS were collected. The first phase 112 youths from clubs took part followed by additional 74 youths from the communities.

Results: The preliminary opinions indicated low scoring in five health centers in services such as family planning, HIV services, condom use, STI, and antenatal services. Health centers registered 60% indicating not being satisfied with family planning and STI services while around 52.4% indicated that HIV services had a good rating. Issues of attitude by the service providers was rating poorly in most facilities.

Discussion: The preliminary findings have been indicative of which YFHS are lacking among the targeted health facilities. These are reflective towards which components needs improvements in the targeted facilities. The findings also indicate that the majority of the young people are afraid to communicate to the duty bearers on the challenges and therefore the need to find alternative mechanisms for communicating the problems. Finally, there is need for effective monitoring of the health structures at district levels

Conclusion: The use of youth-oriented activities often provides a comprehensive overview of the challenges and shortfalls that youths meet when they are accessing YFHS. Nevertheless, it is these weaknesses in YFHS that have weaken the uptake of YFHS by the youth here in Malawi

The Socio-Technical Nature of Secure Systems: Case of Malawi's IFMIS

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Abstract

Introduction: The proliferation of networked digital systems comes with its own (de)merits. Adoption of the Integrated Financial Management Information System (IFMIS), for instance, was aimed at automating business processes, thereby enhancing resource utilisation. Incidentally, a compromise of the same led to loss of billions of public funds in Malawi in 2013. This paper undertakes a theoretical review of the security infrastructure of IFMIS as implemented in Malawi with a view of identifying vulnerabilities that might have been and can still be exploited.

Methodology: Due to sensitivity and ethical implications surrounding the issue, we opted for desk reviews (of documents related to IFMIS, Baker Tilly's cashgate report, etc), and thematic analysis to identify core themes emerging from the data.

Main Findings:

1. The security infrastructure violates a core security principle of defence-in-depth (Prevent, Detect, React), and the property of accountability.
2. The analysis revealed an incomplete contextual security analysis, focusing on technical controls, easily circumvented by system users. (Security is a technical property of a system, but also a social-economic property of the environment in which it operates).
3. Lack of (or inability to enforce) a sound, contextually-grounded information security policy to guide staff operations.
4. Unawareness or negligence of individual security roles by users.

Discussion and Conclusion: Based on the findings, we make the following recommendations:

1. Conduct a thorough socio-technical, risk-based security analysis of IFMIS, using approaches such as AEGIS [1], complemented by cost-effective security design approaches that enforce defence-in-depth, such as SAEM [2].
2. Develop, communicate, and enforce a contextually-grounded information security policy.
3. Decentralise access management by creating local sites for departments/ministries, each with its own site administrator. This pushes control to endpoints, where functional and security trade-offs can be easily handled.
4. Conduct training and awareness of all system users about their required security practices.

Keywords: Knowledge management, lecturers, Mzuzu University, university

The State of ICT Security Education in Malawi

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Abstract

Introduction: Malawi as a developing country has seen a rapid increase in use of Information and Communication Technology (ICT) devices and services even though it is lower compared to some other African countries [1][2]. This has been necessitated by the use and integration of devices like smartphones and computers in supporting business processes, education and social economic endeavors. Aside from the benefits that are derived from adoption of ICT, there are security risk involved which in turn requires that the users are aware of the risk and how to protect themselves. User awareness calls for user education of ICT security risks. In this paper we study the status of ICT security education in Malawi focusing on government primary, secondary and tertiary institutions. This is due to high level usage of computing devices and services by young people.

Methodology: Document analysis, reviews and interviews were chosen as a means of doing our research. Government primary, secondary and tertiary institutions were chosen because they have the highest enrolment of the Malawi student's populace and well established structures for easy access to information. Another reason is that for primary and secondary schools the syllabus is set by the government hence the right entity to form a basis for our study. Tertiary institutions set their syllabi on their own after thorough consultation with ICT industry.

Main Findings

1. **Primary Schools**: Definite lack of ICT security education.
2. **Secondary Schools**: The syllabus for Secondary schools only cover safety use and management of computers but does not cover basic security concepts in detail [3][4].
3. **Tertiary Institutions**: Malawi University of Science and Technology provides an undergraduate course in Computer Systems and Security (MUST) [5].

Mzuzu University (MZUNI) has a postgraduate degree in coding theory and cryptography

University of Malawi has no specialist security degree nor postgraduate degree but some few ICT security modules in there IT/Computer Science Courses.

Lilongwe University of Agriculture and Natural Resources does not provide any ICT related education.

Discussion and Conclusion: ICT security education in Malawi lacks the basic component of ICT security at primary and secondary level. Much as some tertiary institutions such as MUST and MZUNI have specialized computer security programs at undergraduate and post graduate levels respectively, the use of technology by the youth is on the much higher side hence the need for basic security awareness that cuts across the board. This calls for the inclusion of basic ICT security concepts such as secure passwords, data breaches, safe computing, online scams, mobile protection, privacy and malware at elementary, intermediate and tertiary level, Such overhauls would position our country to get maximum benefits without unraveling ICT security risks and attacks that may lead to loos of data ,trust or money more especially considering the digitization process that the government of Malawi is implementing in all its ministries, departments and agencies, and also increase in use of technology by the youth. We also believe that by teaching basic ICT security from elementary level, learners could in turn teach their parents who at most are novices of the basics of ICT security.

The Link between Telecentres and Rural Community Telecentres in Malawi: The Case of Vikwa Community Telecentre

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Abstract

It is common knowledge that Information and Communication Technologies (ICTs) play a great role in development. Therefore, many developing countries are establishing telecentres which are facilities that provide public access to ICTs for educational, personal, social and economic development in order to develop. Just like in many developing countries, the Government of Malawi through Malawi Communications Regulatory Authority is establishing telecentres to accelerate socio economic development. So far, only three community managed telecentres are in operation and many more are yet to be established. The assumption behind telecentre establishment is that rural communities will be developed. However, literature shows that this is not always the case. In Malawi, little is known on how telecentres are contributing to rural community development.

The purpose of this study was to investigate the link between telecentres and rural community development in Malawi focusing on one telecentre: Vikwa Community Telecentre. It also examined the challenges that Vikwa Telecentre is facing in developing its community. The study, which was conducted in 2016, employed Sustainable Livelihoods Framework. Quantitative and qualitative were collected from 46 users through questionnaires that were given to them by a means of convenient sampling technique; and from the Telecentre Manager through interviews. Observations were also conducted within the Telecentre.

The study revealed that, through its services, Vikwa Telecentre is improving human skills and knowledge, strengthening the social life of the community, increasing the finances of the community and also overcoming geographical barriers by bringing the ICTs close to people. The main challenges that are being experienced at the Telecentre include frequent blackouts, slow Internet connection and high prices for consumables. The study recommends that the Telecentre should buy the generator as an alternative power source and that the Telecentre should change the Internet Service Provider.

Key words: Telecentres; Vikwa Telecentre; Development; Malawi

Adoption of Mobile Technologies in Malawian Academic Libraries: the Case of Mzuzu University Library and Learning Resource Centre

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Abstract

Many Malawians including university students own mobile technologies like mobile phones. Aside communication, these mobile technologies are also being used to seek information. The expectation is that academic libraries should take advantage of this because the use of mobile technologies in academic libraries offers several benefits. Mobile technologies help academic libraries to provide a better service to their clients or improve the service that they currently provide. Among others, mobile technologies offer convenient access to the library services; and allow access to the library catalogue 24/7. Therefore, it is important for every academic library to apply mobile technologies in their various services. Despite all these benefits of mobile technologies to academic libraries, the researchers have observed that there is limited application of mobile technologies in many academic libraries in Malawi. However, limited research has been conducted to understand the reason why.

The purpose of this study was to investigate the use of mobile technologies in Malawian academic libraries focusing on Mzuzu University Library. Specifically, the study aimed at determining: the extent to which mobile technologies are being applied in Malawian academic libraries; and the factors affecting the use of mobile technologies. Semi-structured questionnaire was used to collect data from 18 Mzuzu University Library staff through purposive sampling technique in 2016. The most common mobile technologies in the Library are smartphones and tablets. The study also reveals that almost all of its services have not gone mobile.

The main factors leading to low application and use of mobile technologies in the Library include: higher prices of buying mobile technologies; poor institutional ICT Policy; lack of skills in using mobile technologies; lack of training and awareness of mobile technologies. The researchers recommend that working on these factors for example, training librarians on the use of mobile technologies and coming up with ICT policy that encourages the use of mobile technologies would increase the use of mobile technologies in the Library.

Radio Listening Clubs in Malawi and How they Contribute to Expanding Ordinary People's Capabilities

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Abstract

This article examines how radio listening clubs (RLCs) established by community radio stations in Malawi help to expand ordinary people's capabilities. The RLCs provide a platform for ordinary people to assemble to listen to a designated radio programme, discuss the content for its merit and then decide how best to use the information to improve their livelihoods. The programmes are produced in such a way that they raise pertinent issues faced in the community and offer listeners suggested solutions to overcome those problems.

The findings discussed in the paper are based on data collected through focus group discussion with members of RLCs of Nkhotakota community radio, semi-structured interviews with its deputy station manager and other key informants, and participant observation of what goes on in the radio station. The article argues that the RLC has potential to expand the capabilities of ordinary people because the information they receive, share and discuss empowers them to make informed decisions and to be knowledgeable. By providing a forum for the discussion of issues affecting ordinary people, this article concludes that RLCs can help to raise people's awareness to existing problems and influencing them to do something about their situation. In this way, RLCs can help expand ordinary people's capabilities to achieve a life that they value.

Keywords: capabilities, community radio, human development, ordinary people, radio listening clubs

Security Services in Group Communications over Mobile Ad-Hoc and Wireless Sensor Networks Using Performance Analysis of Algorithms

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Abstract

Introduction: Group communications in wireless networks has been facilitating many emerging applications that require packet delivery from one or more sender(s) to multiple receivers. Due to insecure wireless channels, group communications are susceptible to various kinds of attacks. Although a number of proposals have been reported to secure group communications using Group management key, provisioning security in group communications in wireless networks remains a critical and challenging issue. This article presents a survey of recent advances in security requirements and services in group communications in three types of wireless networks, and discusses challenges in designing secure group communications in these networks: wireless infrastructure networks, mobile ad hoc networks, and wireless sensor networks.

Note: This article presents a survey of recent advances in security requirements and services in group communications in three types of wireless networks on India during 2014-2016, which can promote good strength in Malawi communication field also.

Aim: A group communication service forms an important building block for applications in dynamic distributed systems and is useful in many applications that involve collaborations among a group of people.

Methodology: it is cascading process of Tokens, Group authentication, Group Key Management, Routing Protocols in WSNs and user interface

Result: An important application of such algorithms is to ensure total order of message delivery in a group communication service.

Conclusion: Nowadays, most of the network system is established in the mobile environments. Every mobile ad hoc system should be accessed with the better performance. In this proposed system “Distributed Token Ring circulation in mobile Ad-hoc Networks”, to measure the performance of the local and global connectivity between the nodes.

Evaluating the Effectiveness of Malawi Traffic Information System in the Context of Public Service Delivery

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Abstract

Introduction: The purpose of this study was to evaluate the effectiveness of Malawi Traffic Information System (MalTIS) in the context of public service delivery. The objectives of the study were specifically to examine the users' views with regard to the system quality, service quality and information quality provided by MalTIS; determine the level of users' satisfaction towards using the MalTIS; establish the benefits of using the MalTIS; ascertain whether MalTIS is a success from the employee's perspective.

Methodology: The study was conducted at the Department of Road Traffic and Safety Services (DRTSS), Mzuzu Branch. Descriptive survey design was employed in which a questionnaire was used to collect data. Permission to conduct the study was sought from the DRTSS authorities. Altogether, 25 members of staff were sampled randomly comprising supervisors, managers, front desk officers and ICT officers. Data was analysed using Microsoft Excel in which tables, pie charts and percentages were obtained.

Results/Findings: The study established users' positive attitude towards MalTIS with regard to system quality, records quality, use, satisfaction and overall benefits to the organization. However, negative attitude was reported on service quality, particularly to responsiveness and understanding the MalTIS among the employees.

Conclusion/Recommendation: The study concluded that implementation of MalTIS has significantly improved public service delivery at the DRTSS, despite inadequate capacity building. The study therefore among others, recommends that regular training should be conducted so that users continue to gain more knowledge on the use of MalTIS. The study was guided by Delone and McLean's Information Systems Success Evaluation Model.

Key Words: Public Service Delivery, Information System, Mclean and Delone Model, Malawi.

Note: This study was conducted in May, 2017 by Donald Malanga as an independent academic researcher. It was meant for academic purpose only. No funding was attached.

Scaling-up of ICT-based Water Metering Technologies: Lessons from a Pilot Project in the City of Blantyre.

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Abstract

Although Information Communication and Technology (ICT) is recognized as an important productivity improvement tool in all social and economic sectors, application of ICT in the water sector in Malawi was mostly restricted to communication and accounting functions. Recently, Malawi has seen increasing interest by water boards to pilot-test ICT-based metering systems. The pilot projects were implemented but it seems lessons from the pilot projects have not been published and shared. This research was, thus, motivated by the identified gap in published literature.

The objective of the research was to assess the impact of the project on the operations of the water utility company and document lessons that could be critical for successful scaling up of such ICT-based water metering technology. The research adopted an exploratory study through literature review, interviewing key informants in the water utility company and administering a structured questionnaire to consumers in the pilot sites.Statistical Package for Social Scientistswas used to analyse the data.

The results from the study showed that the ICT-based water metering significantly reduced operational costs and improved revenue collection. It also empowered the water users to monitor and control their water usage. However, there were some grey areas that required refinement if the programme is to roll out to other areas such as standardization of water meters, meter technologies that are economically viable, training of staff in monitoring and servicing of the technology, raising awareness on the technology amongst users, increasing number of outlets to sell credit recharge vouchers and providing an option of buying credits online. Finally, there will be need to conduct research on all types of settlements (low, medium, high density areas) and user groups (domestic, institutional, commercial and industrial) where the water services reach in order to develop a complete picture of challenges and opportunities.

Key words: Blantyre, ICT, water metering.

N.B: This was done in 2016/17 as part of my MSc thesis at Malawi Polytechnic.

Teacher Sources of Information Knowledge, Attitudes and Practices on Climate Change Adaptation and Mitigation Strategies:

A Case Study in Lilongwe Central East Division

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Abstract

The concern of the study was to examine secondary school teachers' sources of information, knowledge, attitudes and practices of climate change, its impacts and mitigation strategies. Stratified and simple random sampling techniques were used in selecting the respondents for the study in public government secondary schools in Lilongwe central east division comprising of four schools; mkwichi secondary school and chigoneka community day secondary school in the urban, mitundu secondary school and mitundu community day secondary school in rural. The instruments for data collection were a teacher questionnaire and focus group discussion guide for learners.

The study was the descriptive in nature and the population comprised 40 teachers 10 from each public secondary school and 20 learners from each school making a total of 100 participants. Stratified random sampling and simple random sampling were used to draw 40 teachers and 80 learners used for the study. The instrument for data collection had 29 items that were validated and whose reliability co-efficient stood at 0.79. Mean was used to answer the research questions and T-test statistics was used in analyzing the hypotheses at 0.05 level of significance. The questionnaire and the focus group discussion guide was structured by the researcher and validated by experts.

The findings revealed that teachers have the knowledge of climate change impacts on man, animals, their environment, as well as the different mitigating strategies but they lack the resource to deliver accurate and updated information on the subject matter. The results also revealed that there's disparity between teachers' knowledge, attitude and practices of climate change in urban and rural secondary schools, between teachers in government secondary schools and those in community day secondary schools. The implication of the findings is that success of climate change education depends on the knowledge of the teacher which influences attitudes and practices. It is recommended that climate change education be introduced into the teacher training institutions and regular training and workshops be organized for teachers.

The Use of Koha Integrated Library System at Mzuzu University Library and Learning Resources Centre

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Abstract

The study was conducted primarily to explore the use of Koha Integrated Library System at Mzuzu University Library and Learning Resource Centre. Specifically, the study aimed at establishing the level of awareness of Koha, justifications for the selection of Koha, the extent of use of Koha, and the problems encountered with the use of Koha in the library. The study used Technology Acceptance Model (TAM) propounded by Davis (1989) as a theoretical framework because of its being closer to reality on how library staff come to accept and use technology.

The research adopted a case study design in which both qualitative and quantitative data were collected to answer the research questions. Questionnaire results were quantitatively analysed and presented in terms of frequency tables and graphs. Follow-up interview and observation results were analysed qualitatively. The study has established that a majority (100%) of library staff are aware of Koha.

The study has found that library staff were not involved in the selection of Koha. However, the study has also found that Koha has greatly increased their job productivity because it performs every function of the library integrated management system and that it is user friendly. The study has found that the major problems affecting Koha usage in order of priority are: insufficient manpower, lack of supervision, inadequate power supply, lack of technical knowledge from the Staff, apathy on the part of Library Staff, inadequate funding, and lack of training of staff.

This study recommends the need for the university library officials to frequently conduct an in-house awareness training of the functions of different modules of Koha, employ adequate number of library staff with appropriate computer skills, and provide uninterrupted power supply such as generators, solar system among others.

Key words: Malawi, Mzuzu University, Mzuzu University Library, Koha Integrated Library System, Technology Acceptance Model.

Date when the study was conducted: 2016

Understanding the Key Factors in the Implementation of the e-learning Programme at the University of Malawi's Chancellor College

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Abstract

For the past two decades or so, e-learning has been gaining prominence in the delivery of higher education throughout the world. However the implementation has encountered several challenges, some of which are peculiar to the contexts of implementation. Therefore, understanding the key factors in e-learning implementation in a given context is critical to the success of the programme.

This study adopted an interpretive approach and its main purpose was to produce an understanding of the key factors that enable or disable e-learning programme implementation at University of Malawi's Chancellor College. Purposive sampling method was used and eighteen participants, comprising of twelve academic staff, three administrators and three technicians were selected for interviews. The interviews were recorded with permission from the respondents. Data was analysed through detailed and repeated reading of data transcripts, and listening to recording to derive concepts and themes that describe the key factors in the implementation process.

The findings show that key factors in the implementation of e-learning programme at University of Malawi's Chancellor College relate to leadership, mindset of stakeholders, motivation, perceived strategy for personnel involvement, entry and exit provisions and perceived benefits and constraints of e-learning. The study concludes by making suggestions on how implementation of e-learning programme could be enhanced at University of Malawi's Chancellor College.

Keywords: e-learning programme; e-learning implementation factors

Making Access to Information on HIV and AIDS and Sexual Reproductive Health Cool for Young People:

The Role of Short Massaging Services and Social Media

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Abstract

Traditional messaging for behaviours change using information, education and communication materials has slowly become an old fashion. Young people are increasingly looking down than up and therefore difficult to find them. They are looking down on their mobile phones, IPAD and laptops to check emails and messages. Young people are members of various social media groups. Since the traditional communication structures is phasing away, youth in remote areas face a lot of problems due to lack of information being infected with HIV and STI's, getting unwanted pregnancies among other. Information communication technology offers an opportunity to reach out to young people on sexual and reproductive health (SRH&R), HIV and AIDS and behaviour change.

Innovation and Research: YONECO SMS systems and Social media is a robust semi-automated system that is used to disseminate information on a number of issues that are affecting young people. YONECO utilizes social media as well as Short Messaging Services to provide access to services and information to young people and vulnerable groups. Through the use of mobile platforms, YONECO has developed android applications and mobi-sites with support from different partners. YONECO through the Helpline Services has been able to escalate and engage more young people on SRH&H as well as utilize these mobile technologies and reliable mapping platforms to disseminate SRH&H information which is at the finger tips and/or touch of a button by the youth. The paper therefore considers how research and ICT for development can enhance effective communication and behavior change among the Malawian youth in the rural communities with use of ICT for development.

TECHNOLOGY, INNOVATION AND ENTREPRENEURSHIP

A Comparative Analysis of the Quality of Solar Tent (Samva Nyengo) and Open Sun Dried Usipa Fish (Engraulicypris sardella) Pisces; Cyprinidae

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Abstract

This study assessed the effects of two processing methods solar tent drying and open sun drying on nutritional and microbial safety of Engraulicypris sardella (local name Usipa), a pelagic cyprinid endemic to Lake Malawi which supports a substantial fishery in Malawi. Solar tent dried and open sun dried Engraulicypris sardella contained 63.77±0.12 % and 63.62±0.28 % of crude protein, 22.79± 0.20 % and 22.9± 0.24 % of fat, 6.29 ± 0.10 % and 15.48± 0.11% of moisture, and 13.87± 0.16 % and 20.18± 0.60 % of ash respectively. Ash and moisture were significant difference ($p = 0.001$) however, crude protein and crude fat showed a non-significant difference ($p = 0.05$).

Total viable bacteria counts were significantly higher in open sun dried (4.1×105 CFU/g) than solar tent dried fish (2.5×102 CFU/g) although, populations were not above acceptable norms (108cfu/g2). Common isolated bacteria from solar tent dried and open sun dried Engraulicypris sardella were 1.0×101 and 5.1×103 for Total coliform, 0 and 4.7×103 for Escherishia coli, 0 and 6.5 × 104 for Salmonella, 0 and 5.7×102 for Shigella, 0 and 2.2 ×103 for Bacillus, 1.2×102 and 5.4×106 for Staphylococcus, 0 and 6.0×106 for Vibrio and 1.7×102 and 3.4×105 for Pseudomonas. Low moisture content, absence of pathogenic and spoilage microbes suggests that solar tent dried were superior over open sun dried Engraulicypris sardella. This demonstrates solar tent drying as a classical SMART innovation on how sun's free energy could be effectively utilized for value addition of quality small fish products in Malawi without affecting the environment.

Keywords: *Engraucypriss sardella, pathogens, microbiol load, proximate, Lake Malawi*

Design, Construction and Performance Evaluation of Automatic Poultry Egg Incubator

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Abstract

Introduction: Artificial incubation is rapidly becoming the predominant method for incubation of poultry eggs worldwide. It is favoured in order to increase the production of chicks and protein intake, particularly in the developing countries. Electrical incubators are the best where the supply of electricity is readily available and cheap. However, the absence of local equipment like an incubator suitable for small scale poultry production is one of the challenges facing the poultry industry. The purpose of this study was to design, fabricate and test the performance of an automatic poultry egg incubator for the purpose of meeting the protein needs of the Malawian population using locally available materials.

Methodology: A total of 3362 eggs [trial 1 (n = 683, BA); trial 2 (n = 1404, HL); trial 3 ([n=398, BA); and trial 4 (n=598, HL and n =279, HL)] were used for hatchability tests. The eggs were divided into two treatments: treatment 1 (60% RH; temperature =38°C; n=1275) and treatment 2 (65% RH; temperature = 39°C; n = 2087). Each treatment group of eggs was incubated in an individual incubator, according to its experimental temperature and relative humidity during incubation. The incubating chamber was maintained throughout the incubating period within a temperature range of 35°C to 38° C and relative humidity range of 48 % to 68%.

Results and Discussions: The results of this study showed that the percentage fertility and hatchability of eggs were 80% and 66%, respectively. Chicken eggs incubated at a lower temperature (38°C) and lower humidity (60%) presented the highest level of hatchability (73%) compared to higher temperature (39°C) and relative humidity (65%). These results suggest that the locally- manufactured electric egg incubator may be used for artificial incubation, aimed at enhancing production of day-old chickens.

Conclusions: This work focused on the design, construction and performance evaluation of an automatic egg incubator using locally available materials. The results from the tests showed that the prototype incubator functioned according to the designed operating temperature, humidity, and frequency of turning the eggs during the performance test. The study has also shown that a stable power supply is needed for the optimal hatching performance of the incubator.

BA = Mikolongwe Black Austrolop. HL = Hy-line (broiler)

Kasonga Micro-Hydroelectric Power Scheme

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Abstract

In order to ensure reduced poverty and inequality at all household levels and protection of the country's environment though use of affordable renewable energy sources, briefly, we propose an innovative micro-hydroelectric power project aims at addressing the need for adopting, developing, and optimizing and promoting usage of electrical energy efficiency technologies and practices during production, transmission, distribution and utilization of energy at household level. This is in support with the NCST 's main agenda 6.6 [Energy] of the 2014-2019 report for the National Research Agenda in Energy, Industry and Engineering. Since the intended objective is to increase number of rural electrified households through improving both capacity and efficiency in energy generation, transmission, distribution and power utilization to meet the national socio-economic demands, sustainability and contribute towards improved human health, climate change mitigation and adaptation, this project is in line with the prioritized research and developmental strategy of ensuring energy efficiency and conservation.

We therefore exhibit a description of its technical specifications and originality, and how the intended project uses locally available materials in its development. Besides, the project's scheme presents a potential for replication and commercialization and provides presumptive socio-economic benefits of the technology/innovation to the people living in the community of Kasonga area in Zomba district, and to the entire society at large.

Note: This research project is being jointly carried out by researchers from Malossa Vocational Training Centre and Chancellor College Fibonacci Science Research Group as an innovative solution to increase in electrified houses in rural areas with an aim of reducing much reliance on bio-mass as source of fuel.

An Examination of the Impact of the Bicycle Taxis Business of Family Relations

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Abstract

Any business venture has consequences, whether negative or positive: this is also true of the bicycle taxi business. The impacts not only affect the individual concerned but also the family and the larger society. To the researcher's knowledge, a gap in knowledge was found where most of the research relating to the bicycle taxis did not touch on the impacts the bicycle taxis business has on family relations hence a gap that this study was aimed to fill.

The main objective of the study was to investigate the impacts of the bicycle taxis business venture on family relations. Two focus group discussions (FGDs) consisting of 8 bicycle operators in each group were conducted along with in-depth interviews with 16 wives and 2 children of the bicycle taxis operators. The researcher also used observation method. The study was done at Chitakale Trading Centre (TC) and the surrounding group villages of Mikundi, Makaula, Minimini and Lijanga in Mulanje district.. The study used Merton's theory of manifest and latent functions. To find out observable consequences or outcomes that are intended to happen and those that are unintended or unexpected due to engaging in this business.

The research found that there are differences between the income earned and what was disclosed to the family. Secondly, the time spent at work meant less time spent with the children and the wife. Also the farm work suffered negatively as a result of this business venture as well as quantity and quality of sexual intercourse with their wives.

Based on these findings, it can be established that as much as this business is a source of income to many school drop outs, but it is merely a survival tool not a means for long term economic liberation as stipulated by the previous literature reviewed. The study concludes that the business has adverse effects on family life.

Pit Latrine Fecal Sludge Resistance Using a Dynamic Cone Penetrometer in Low Income Areas in Mzuzu City, Malawi

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Abstract

Pit latrines can provide improved household sanitation, but without effective and inexpensive emptying options, they are often abandoned once full and may pose a public health threat. Emptying techniques can be difficult, as the sludge contents of each pit latrine are different. The design of effective emptying techniques (e.g., pumps) is limited by a lack of data characterizing typical in situ latrine sludge resistance. This investigation aimed to better understand the community education and technical engineering needs necessary to improve pit latrine management. In low income areas within Mzuzu city, Malawi, 300 pit latrines from three distinct areas were assessed using a dynamic cone penetrometer to quantify fecal sludge strength, and household members were surveyed to determine their knowledge of desludging procedures and practices likely to impact fecal sludge characteristics.

The results demonstrate that there is a significant difference in sludge strength between lined and unlined pits within a defined area, though sludge hardened with depth, regardless of the pit type or region. There was only limited association between cone penetration depth and household survey data. To promote the adoption of pit emptying, it is recommended that households be provided with information that supports pit emptying, such as latrine construction designs, local pit emptying options, and cost. This study indicates that the use of a penetrometer test in the field prior to pit latrine emptying may facilitate the selection of appropriate pit emptying technology.

Keywords: developing countries; faecal sludge management; peri-urban; sanitation

This research was conducted in Mzuzu city in 2016

Performance of Low Cost Cooling Systems in Enhancing Shelf Life of Selected Vegetables in Malawi

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Abstract

Cooling systems are technologies designed to enhance shelf life of produce by proving cool air. Three cooling systems (Zero Energy Cooling Chamber (ZECC), Zeer pot and Refrigerator) were assessed on their capacity to enhance shelf life of selected vegetables at Lilongwe University of Agriculture and Natural Resources (LUANAR)-Bunda campus, Horticulture Department from August to November, 2016. Three vegetables type (tomato, rape and green peas) were selected for assessment. The three vegetables were randomly stored into the three cooling systems and were replicated three times. Data was collected on temperature, humidity in the cooling systems and on respiration rate, colour change, total soluble solids, firmness and weight loss for all vegetables.

Results were subjected to Genstat computer package and were analyzed using Analysis of Variance (ANOVA) and the means were separated by turkey test. The analysis showed that the refrigerator registered the lowest temperature of 10.7oC, followed by Zeer pots 16oC then ZECC 18oC and open environment with 23oC. The refrigerator had the highest average humidity, 88% followed by Zeer pot and ZECC with 77% then open environment with 43%.

Results showed that type of cooling systems had significant effect on respiration rate, total soluble solids and weight loss and color change. On contrary, the effect to the humidity and color were insignificant. The experimental results showed that Zeer pot was the best cooling system for rape, it took them seven (7) days without appreciable deterioration. ZECC emerged the best for tomato, it took them nine (9) days without appreciable deterioration while in other storages were totally spoilt. Keeping green peas in Zeer pot was similar as to keep them in ZECC, as they both contained peas for seven (7) days. At an open environment, peas and rape were completely deteriorated on day three while tomato were completely spoilt on day four. For the refrigerator, vegetables experienced chilling injuries due to lower or chilling temperature (above 00c but below 10-120c). The refrigerator is the best all assessed cooling system for the storage where texture change matters less.

Chemical Variation and Insecticidal Activity of *Lippia Javanica* (Burm. f.) Spreng Essential Oil Against *Sitophilus zeamais* Motschulsky

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Abstract

Lippia javanica (Burm. f.) Spreng is used commercially as a herbal tea and medicinal plant in sub-Saharan Africa. Here we investigated the chemical variation and pesticidal potential of L. *javanica* leaf oils from Nchenachena and Champhira extension planning areas (EPAs) against a major stored maize insect pest, *Sitophilus zeamais*. Steam distillation and gas chromatography-mass spectrometry were used to extract and identify the volatile compounds in the oils, respectively. The efficacy of the oils and their constituents was evaluated in contact and fumigant toxicity against the test insect. Two morphologically distinct varieties of *L. javanica* growing in Chikangawa, Jenda and Nchenachena were identified as *L. javanica* var. *whytei* and *L. javanica* var. *javanica*, respectively.

The two varieties showed distinct variations in their oil content (20.4, 19.3 and 11.1 %, respectively) and chemistry. Perillaldehyde was the major constituent (63.25 ± 2.96 %) in oil of *Lippia javanica* var. *javanica* while myrcenone (ipsdienone) was the major compound in oils of *L. javanica* var. whyteii (54.52 ± 2.68 %). Myrcene, linalool, ±carvone, β-caryophyllene and germacrene D were identified as the most significant other components in oils from both varieties. Perillaldehyde, linalool, ±carvone and *L. javanica* oil from both varieties were all biologically active against adult *S. zeamais*. Myrcenone, however, was not biologically active against this pest. Chemical variation in Lippia underpins its use and value as a medicine or pesticide and needs to be understood before any potential commercialization. We show that this chemical variation is associated with morphologically distinct varieties. The high efficacy of *L. javanica* oil against *S. zeamais* and low toxicity suggest it is suitable to be used as a botanical insecticide to control S. zeamais in stored maize. However, further research is required to evaluate its activity against *S. zeamais* and other storage insect pests under farm conditions.

Key words: chemotype, ipsdienone, perillaldehyde, botanical pesticide, pest management

Intergenerational Survival of Family Businesses: Factors Affecting Succession Success of Family Owned Businesses in Malawi

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Abstract

Globally, family owned businesses make a significant contribution to the social and economic development of communities and countries. The proportion of Malawians in formal employment is very small thus compelling a large portion of Malawians to set-up family businesses. It is thus imperative to study and better understand this ubiquitous and important organizational form.

The study aimed to investigate and analyse factors that affect the continued survival and success of Malawian family owned businesses after the exit of the businesses' founder.

The study deployed a case(s) study research strategy. It studied fourteen family owned businesses that had gone through an intra-family succession. Seven of the case businesses had successful successions as observed in the continued operation and success of the businesses. Seven of the case businesses had failed successions as observed in the non-continuance of the businesses or limited operational success. Data was generated in 2016 through archival documents, interviews, and focus group discussions. The generated data was content analysed using the software Atlas.ti.

The study discovered the key factors influencing the outcome of family business succession as depth of planning, financial knowledge and discipline, control of business operations, family cohesion and culture, business networking. Among recommendations emanating from the research include the need for business owners and family members to develop skills in planning and financial management, business associations to better facilitate networking among their members, the education system to incorporate issues of business management from early levels of learning.

Keywords: Family businesses; management succession; general management; business continuity; Malawi.

Perception Regarding Entrepreneurship as a Successful Career Option: The Case of Malawians in Traditional Organisational Employment.

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Abstract

Entrepreneurship has attracted a lot of attention in the 21st century particularly in developing economies characterized by increasing unemployment rates and job insecurity such as Malawi because it contributes significantly to job creation, innovation, poverty reduction and economic growth. In such economies concerted efforts are undertaken by relevant stakeholders to attract various individuals to venture into entrepreneurship. There is a lot of existing literature emphasizing on the entrepreneurial intentions of graduates/students. However, little is known about how individuals in traditional organizational employment perceive entrepreneurship as an alternative career choice. Research on how individuals define a successful career is very important because it brings to the fore what goals individuals value most and would strive to attain as they progress through the various stages of their careers. Individuals in traditional organizational employment represent untapped potential group of entrepreneurs.

Therefore, this study examined the perceptions of Malawians in traditional organizational employment regarding entrepreneurship as a successful career option. Drawing upon survey data collected from 403 respondents, the study established that in spite of high rates of unemployment and job insecurity, individuals in traditional organizational employment do not really conceptualize their career success in terms of being an entrepreneur. Applying insights from the theory of planned behavior, the study concluded that individuals in traditional organizational employment hold unfavorable attitudes towards entrepreneurship, have negative subjective norms, and low perceived control of entrepreneurship behavior.

Therefore, to enhance entrepreneurship growth policy makers can direct their efforts toward investments in entrepreneurship education and training to create greater awareness of entrepreneurship as a successful alternative career option even for individuals in traditional organizational employment.

Key words: Career Success, Entrepreneurship, Traditional Organizational Employment,

Theory of Planned Behaviour

Microbiological Quality of Traditional and Improved Kiln Smoked Catfish (*Clarias gariepinus*) in Lake Chilwa Basin

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Abstract

Microbiological quality of smoked catfish (*Clarias gariepinus*) was assessed in this study where traditional and improved smoking kilns were used to smoke fish. Catfish is common fish caught in abundance in the Lake Chilwa basin and the fish is usually smoked to reduce post-harvest losses and increase shelf life.

Samples were collected in newly bought polythene bags, well labelled and collected in cooler boxes transported ready for laboratory analysis. One gram (1g) representative sample was obtained aseptically from the muscle of the fresh and smoked catfish (Mlamba) samples. The samples were grounded and serial dilutions (10-1 to 10-4) of the homogenized samples were made using sterile distilled water.

Fish samples were analysed for total plate count (TPC), Total fungal count (TFC), E. coli counts and for pathogenic organisms (*Salmonella*) following the methods prescribed by (AOAC, 2000). Each analysis was carried out in triplicates.

There were significant differences ($p = 0.05$), with respect to total viable bacterial counts between traditional kiln smoked and improved kiln smoked catfish (5.6 x 106 CFU/g, 1.9 x 106 CFU/g, respectively). Traditional kiln smoked catfish harboured significantly higher total viable counts as well as a higher population of *Escherichia coli* compared to improved kiln smoked catfish. However, for both types of smoking kilns there were detected levels of pathogenic bacteria *Salmonella* with traditional kiln smoked catfish containing 2.1 x 104 CFU/g which were significantly higher than amount found in improved kiln smoked catfish (1.5 x 104 CFU/g). *Salmonella* is a microbe of public health importance and has implications on the handling and source of the fish. Overall, bacterial populations were not above acceptable norms (108cfu/g) for both processing methods implying that the two methods can be deployable without public health concerns.

The study for which this abstract is submitted was conducted in the year 2016.

Using Nanotechnology to Fabricate Polyethersulfone Nanocomposite Membranes for Removal of Emerging Micropollutants From Water

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Abstract

The occurrence of emerging micropollutants (EMPs) in water is a new challenge to scientific community and ecosystems health worldwide. The existing conventional water and wastewater treatment methods are not specifically designed with the aim of removing EMPs from water. Nanotechnology, the manipulation of matter at the nanoscale (1-100 nm) level, provides a unique opportunity to fabricate novel nanomaterials which have the potential to remove EMPs and other pollutants from water. In this study, nitrogen-doped carbon nanotubes/polyethersulfone (N-CNT/PES), silicon dioxide (silica) (SiO2) and germanium dioxide (GeO2) embedded polyethersulfone (PES) nanocomposite membranes were fabricated using phase inversion method. Multivariate statistical analyses were used for comprehension of major underlying factors behind the performance of the membranes.

Strong statistically significant positive correlations were observed between removal efficiency of all analytes, namely, carbamazepine (CBZ), tonalide (AHTN), galaxolide (HHCB), caffeine (CAF), technical 4-nonylphenol (NP) and bisphenol A (BPA) and various membrane characteristics such as pore density number, ultimate tensile strength, Young's modulus, flux recovery ratio (p-value < 0.05, 95% confidence level). Furthermore, statistically significant negative corrections between the removal efficiency of the EMPs with pore size, contact angle and surface roughness. The EMPs were observed to be removed from real water samples in the following order: HHCB > NP > AHTN > BPA > CBZ > CAF. The removal of the EMPs followed the order of the decrease in hydrophobicity. It was also observed that modification of PES membranes with N-CNTs, SiO2 and GeO2 nanoparticles enhanced the fouling resistance of the nanocomposite membranes. Of the three, the SiO2/PES blend membranes were most efficient membranes in removing EMPs from water.

The results showed that the capability fabricated blend membranes in removing EMPs from water was superior to the majority of methods reported in the literature.

Key words: Emerging micropollutants; Multivariate statistical analyses; Nanocomposite membranes; Nanoparticles; Nanotechnology; Polyethersulfone.

New Features for Copy-Move Image Forgery Detection: A Specific Application in Digital Image Forensics.

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Abstract

A novel set of features for copy-move image forgery, CMIF, detection method is proposed. The proposed set presents a new approach which relies on electrostatic field theory, EFT. Solely for the purpose of reducing the dimension of a suspicious image, the algorithm firstly performs discrete wavelet transform, DWT, of the suspicious image and extracts only the approximation sub-band. The extracted sub-band is then bijectively mapped onto a virtual electrostatic field where concepts of EFT are utilised to extract robust features which can be used for detecting digital image forgery, among other digital forensic purposes. The extracted features are shown to be invariant to additive noise, JPEG compression, and affine transformation. The proposed features can also be used in general digital object matching.

Keywords; Virtual electrostatic field; Features; Affine transformation.

Selecting Organic Waste Treatment Technology in Limbe Market

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Abstract

Introduction

Blantyre is Malawi's second largest city where all the generated waste is transported to the unmanaged city dumpsite. This poses a serious environmental threat since 68% of the generated waste consists of organic waste. "Selecting Organic Waste Treatment Technology" (SOWATT) is a decision support tool that can be used to choose appropriate organic waste treatment technologies. Limbe Market (LM), the largest of the two Blantyre markets, was selected as the first location in Africa to test the SOWATT method.

Methodology

Market waste was quantified and characterised for 6 consecutive days using a metal drum (50 litres). Three samples of mixed waste were collected from the skip each day for measurements. The volume of total mixed waste generated was 5.25 m3/day, with an average bulk density of 227 kg/m3. Out of the mixed waste generated, organic waste ranged between 79 - 96 %. The mass of organic waste generated was an average of 1072 kg/day.

The SOWATT manual provides six treatment technology alternatives to consider for the waste that was identified. Additionally, the manual presents a hierarchy of objectives (e.g. social acceptance, economic sustainability) The objectives and their attributes were validated by stakeholders through an objective validation exercise with each of the stakeholder groups. The stakeholder preference elicitation exercise was conducted using Swing and Reverse Swing questionnaires to obtain the importance of each objective by the stakeholder. After obtaining weights for the objectives from all stakeholders the next step was to calculate the values or scores of the organic waste treatment technology alternatives for LM.

Results

The final results of the study show that vermicomposting had the highest overall score. In-vessel composting scored the second highest value thereby becoming the second most suitable option. Black Solider Fly (BSF) processing ranked as the least suitable technology option to implement at LM.

Can citizen science play a role in building resilience to hazards in urban WASH systems? The case of Karonga Town, Northern Malawi

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Abstract

Karonga Town is one of the urban areas in Malawi that has been experiencing a wide range of every day, small, large risks such as floods, strong winds, earthquakes, unsafe water, poor-quality sanitation and hygiene within households. Attempts to build resilience are hampered by widespread data gaps coupled with weak governance structures. This study employed the citizen science approach in which non-scientists participate in scientific research to build the capacity of citizens and to build resilience to water quality and water, sanitation and hygiene (WASH) related hazards in Karonga Town. Data was collected with assistance of 8 self-motivated and trained citizen science research counterparts between January-December 2015. Standard sampling procedures were used to collect water samples from a total of 27 unsafe water sources, which were analysed for biological, physical and chemical parameters using standard methods. Physical visits were made to the facilities to determine major sanitation and hygiene related risks impacting on water sources in the town. The results show that water from the majority of water samples were contaminated with Escherichia coli at levels considerably higher than Malawi Bureau of Standards water quality specifications for drinking water. A wide range of anthropogenic activities were observed to be aggravating sanitation and hygiene related risks impacting on water sources. The findings of this study have shown that application of the citizen science approach, where highly motivated community members are actively involved in scientific research can help: (1) communities to acquire knowledge and expertise; (2) diffuse the knowledge and skills to peers by way of social networks, focus groups as well as education of other non-scientist citizenry; and (3) to have a multiplier effect on capacity of communities to build resilience to hazards in urban water, sanitation and hygiene systems.

Key words: Citizen Science; Resilience, Urban risks; Water quality index, WASH

Impacts of malaria on pregnant women lead to maternal death in Mangochi District

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Abstract

Introduction: Malaria in pregnancy is a significant cause of maternal mortality. Malawi is one of the countries in Sub-Saharan Africa with the largest burden of malarial disease, with over 90% of the world's malaria related deaths occurring in this region. Twenty five million pregnant women are currently at risk for malaria and with malaria accounts for over 10,000 maternal deaths per year. Mangochi being one, the district were cases of Malaria are very high, this mainly due to the presence of stagnant pools of water. Pregnant women are most affected with Malaria because pregnancy reduces women's immune system and making them more harm to malaria infection and increasing the risk of illness such as severe anemia which easily led to maternal death.

Aim: The main objective of present study was to gain insight of impact of Malaria on pregnant women and how it has led to maternal death.

Methodology: The study was carried out in several hospitals in Mangochi district. 10 health workers were randomly sampled, required data was drawn from primary and secondary sources and in addition data was collected using a questionnaire as a collection tool.

Results: The study reveals that, malaria in pregnancy is caused by Plasmodium with 46.7%, 40% mosquito and some respondents said that pregnant women suffer from malaria because they report late for antenatal clinics which are very important for their health as well as the unborn child.

Discussion and Conclusion: Malaria mainly affects women's health and community. The government has taken part in reduction of maternal due malaria by supporting up with policies and programs that focus on malaria prevention and maternal reduction. Despite these efforts taken by government in improving maternal health, the Mangochi district hospital and non-governmental organizations should tackle the problem from the grass root level in terms of improving women's living standards. The hospital management should encourage relationship between health personnel and pregnant women seeking health service.

Note: The present research/study has been conducted since April of 2017. Even the research/study is in continuous process of collecting data regarding total number of maternal death by malaria for the last two years.

But it will finish in June or July of 2017.

An Analysis of knowledge and skills Acquisition in Home Economics in Integrated Science and Technology Curriculum in Selected Teachers' Training Colleges in Malawi

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Abstract

This study is an interpretive analysis of knowledge and skill acquisition in Home Economics in the integrated Science and Technology curriculum in the Teachers' Training Colleges in Malawi. The study was situated within the interpretive paradigm and constructivism theory. The research design which guided this study was mixed method but biased towards qualitative paradigm with the critical research question as: How has the introduction of the Integrated Science and Technology curriculum affected the acquisition of knowledge and skills in Home Economics?

Five methods were used to collect data which include: document analysis, questionnaires, classroom observations, face- face interviews and FGDs. The research sites were the two TTCs Kasungu and Lilongwe. The sites had a sample of ten lecturers and twenty students currently teaching and learning integrated Science and Technology.

The results have revealed that there is less knowledge and skill acquisition in Home Economics while integrated in Science and Technology curriculum among learners. What was observed was theoretical teaching and assessment without or with few resources. Less challenging activities were carried out which were attributed to lack of subject substantive dimensions from lecturers. These were attributed to: background factors as a result of inadequate training at the university colleges, as well as, teaching colleges in inform of CPDs and Curriculum structure factors.

The study proposes that teaching of Home Economics can be improved if subject integration begins from university colleges. Home Economics to be taught as a separate subject and the lecturers should receive enough financial and administrative support.

Submitted for consideration as a paper or poster presentation

Supply response of Maize to Price and Non-Price Variables in Malawi

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The study was conducted in 2016.

Abstract

Maize a cereal crop is one of the major crops grown in Malawi. Malawi's food security is defined in terms of adequate production of and access to maize, the country's staple crop. Maize, in Malawi, is grown by almost 90% of the farm household and account for over 80% calorie consumption. Nevertheless, dependency on erratic rainfall, small farm size, and limited use of modern farm inputs and poor access to markets play an imperative role in trapping farmers in maize poverty trap. Thus, this study is aimed at examining the supply response of farmers to price and non-price variables in Malawi. Time series data spanning from 1980 to 2015 was employed in the study. Analysis was done using descriptive and econometric models such as Nerlove partial adjustment, Co-integration test and Error Collection Mechanism (ECM). The results exhibited that own producer price has a positive impact on hecterage allocated to maize in both short and long-run. However, own price is statistically significant at only 5%level of significant in a long-run. A change in price of maize act as an incentive to farmers to increase maize production. This is done by redirecting resources to maize from other crops like tobacco and rice. Thus, in Malawi offering price incentive can also be lucrative in a long-run. Rainfall appeared to have significant influence on the area allocated to maize in both short and long-run at 10% level of significant. Fertilizer Input subsidy Program (FISP), a dummy variable, showed that there was a 278.59 impact on land area allocated to maize as it moves from 0 to 1.The study proposes the use of aggressive irrigation technique, revising the FISP program, and consult farmers representative widely to ensure the effectiveness and efficiency of maize price policy, as policy recommendation.

Effect of homogenization stirring speed on mechanical and water barrier properties of gallic acid treated zein-oleic acid composite films

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Abstract

Introduction: The use of biodegradable films is highly favoured over synthetic films because of benefits related to environmental protection and low cost. However, biodegradable films are usually characterized by poor mechanical and water barrier properties hence requiring approaches to address the shortcomings. It is generally acknowledged that methods used in production of edible films can significantly affect the film properties.

Methodology: In this study, gallic acid treated composite films were produced using zein and oleic acid. Briefly, zein (6g), a corn protein was dissolved in 100 mL heated (80oC) 95% ethanol using a hot plate with a stirrer for 30 min. Thereafter, ethylene glycol a plasticizer was added to the mixture at 27% and stirred for another 30 min. The zein solution was then cross linked with gallic acid (40mg/g zein) and four different concentrations (1%, 2%, 3%, 4%) of oleic acid were added. The composite solutions were then homogenized using four different homogenization stirring speeds (10,000rpm, 12,000rpm, 16,000rpm, 20,000rpm), dried for 24 hour and subsequently, the mechanical and water vapour permeability of the films were evaluated.

Results: Lower homogenization stirring speeds resulted in higher tensile strength and low water vapour permeability. A higher tensile strength of 33.4MPa was registered in the composite films containing 2% oleic acid homogenized at 12,000 rpm while a lower water vapour permeability of 0.23 (g mm m-2 h-1 kPa-1) was registered in gallic acid treated sample homogenized at 10,000 rpm

Discussion: The results on the film properties suggested that the higher stirring speeds were weakening the film structure previously strengthened by the action of gallic acid subsequently resulting in lower tensile strength and higher water vapour permeability.

Conclusion: The study findings have demonstrated that higher homogenization stirring speeds compromised the film properties of the gallic acid treated zein-oleic acid composite films.