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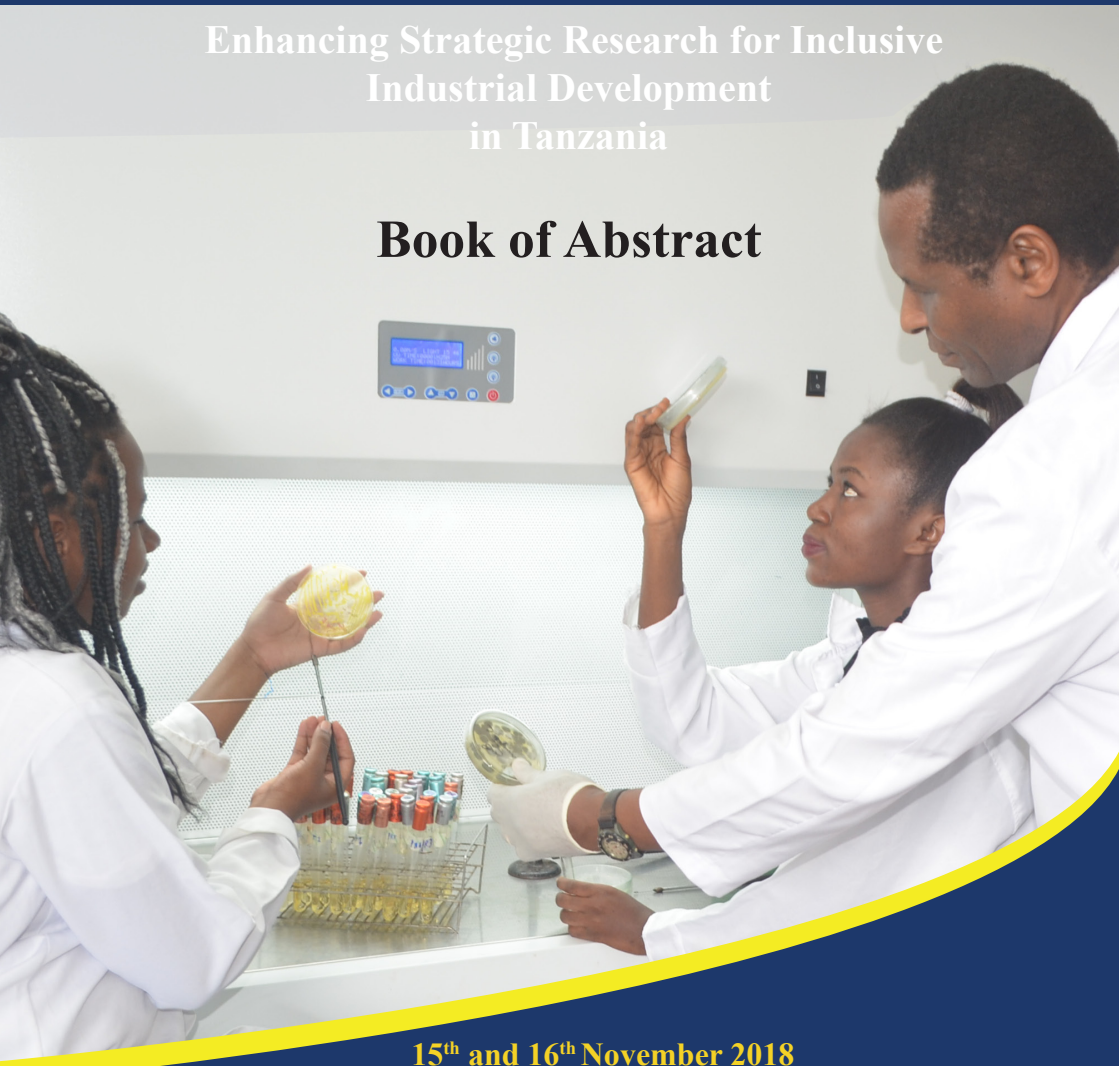
Enhancing Strategic Research for Inclusive Industrial Development in Tanzania

Book of Abstract



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Nkrumah Hall, Mwalimu J. K. Nyerere Mlimani Campus

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Sub-Theme 1: Aqua for Inclusive Industrial Development

Hybrids Production as a Potential Method to Control Prolific Breeding in Tilapia and Adaptation to Climate-Induced Drought in Aquaculture: Efficacy of All Male Tilapia Fingerlings Production, their Growth Performance and Survival Rate at Different Salinities

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ABSTRACT

Establishing suitable salt tolerant all-male tilapia strains with fast growth rate is a crucial requirement for successful euryhaline farming required for controlling prolific breeding and as adaptation to the effect of climate induced drought. The aim of this paper was to assess the percentage male fingerlings, the growth performance and survival rate of tilapia hybrids produced by crossing Nile tilapia (Oreochromis niloticus) female and Rufiji tilapia (Oreochromis urolepisurolepis) male at different salinities. The fingerlings were reared for 70 days in triplicate concrete tanks (1 m3), each stocked with 15 fish weighing around 1.62 ± 0.03, 1.69 ± 0.02 g and 1.41 ± 0.06 g and exposed to salinity of 2, 15 and 35 ppt, respectively. Acclimatization was done by adding seawater to freshwater at a rate of 2 ppt per day for 18 days. Fish sexing was done by visual assessment of the genital papilla followed by keeping the hybrids for 6 months to observe reproduction. Hybrids reared at a salinity of 2 ppt had higher growth performance than those reared at 15 and 35 ppt. Similarly, hybrids cultured at 15 ppt had significantly higher growth performance than those reared at 35 ppt.The cross between O. niloticus (female) and O. urolepisurolepis (male) produced hybrids that were all-males without any reproduction within six months post hybridization and their survival rate was 100%. This study indicated that, all-male tilapia produced by crossing between O. niloticus (female) and O. urolepis (male) can be used by fish farmers as alternative species for mariculture development to control prolific breeding and as an adaptation strategy to climate change.

Key Words: Monosex culture, Hybridization, Mariculture, All-male hybrids

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Occurrence of Fungal Infection in Rufiji Tilapia and Hybrids of Nile Tilapia ♀ and Rufiji Tilapia ♂at Different Salinities

Ramadhani[1]

ABSTRACT

The study was aimed at isolating fungal species (Aspergillus flavus and Aspergillus niger) and determining their infections in fish at different water salinities. The hybrids of Nile tilapia ♀ and Rufiji tilapia ♂ sample organs (n=48 for each fish species) were randomly collected from the hatchery at IMS-MC. An experimental design was conducted to determine and characterize the occurrence of A. flavus and A.niger in farmed tilapia. Two different Aspergillus species were isolated in Rufiji tilapia stocked at different salinities of which 73.7 % and 13.1 % were A. niger and A. flavus whereas 74.2 % and 20.9% were for A. niger and A. flavus isolated from organs of hybrids of Nile tilapia ♀ and Rufiji tilapia ♂ at different salinities, and about 85.7 % and 14.3 % for A. niger and A. flavus isolated from water of the hybrids of Nile tilapia ♀ and Rufiji tilapia♂. Despite the percentage variations for fungal isolates, there was no significant difference in fungal isolates between different salinities ($p>0.05$) for both Rufiji and hybrids of Nile tilapia ♀ and Rufiji tilapia♂. However, there was a significant difference ($p<0.05$) between the fungal isolates in some of the fish organs where there was a reduction of fungal isolates with increasing salinities. DNA was successfully isolated from the Aspergillus species from plate cultures by using a kit. PCR based analysis detected bp 400 and 895 for Aspergillus flavus and bp 290 for A. niger by using target gene after observing in UV- transilluminator. The simultaneous occurrence of A. flavus and A. niger emphasizes the need for further research to better identify and characterize the risk to the health of fish farms and their implications for the health of consumers.

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Chronic Exposure to Low Environmental Concentrations and Legal Aquaculture Doses of Antibiotics Cause Systemic Adverse Effects in Nile Tilapia (Oreochromis Niloticus) and Provoke Differential Human Health Risk

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ABSTRACT

Antibiotics used globally to treat human and animal diseases exist ubiquitously in the environment at low doses because of misuse, overdose and poor absorption after ingestion, coupled with their high-water solubility and degradation resistance. However, the systemic chronic effects of exposure to low environmental concentrations of antibiotics (LECAs) and legal aquaculture doses of antibiotics (LADAs) in fish and their human health risk are currently unknown. We investigated the in vivo chronic effects of exposure to LECAs and LADAs using oxytetracycline (OTC) and sulfamethoxazole (SMZ) in Nile tilapia and their human health risk. Twenty Nile tilapia weighing 27.73 ± 0.81 g were exposed to water containing LECAs (OTC at 420 ng/L and SMZ at 260 ng/L) and diets supplemented with LADAs (OTC 80 mg/kg/day and SMZ100 mg/kg/day) for twelve weeks. General physiological functions, metabolic activities, intestinal and hepatic health were systemically evaluated. The possible human health effect was assessed by using risk quotient. The results showed retarded growth performance accompanied by reduced nutrients efficiency, organ indices, and lipid body composition in treated fish. Antibiotics distorted intestinal features subsequently induced microbiota dysbiosis and suppressed intestinal tight junction proteins. Exposure of fish to LECAs and LADAs induced oxidative stress, suppressed innate immunity, stimulated inflammatory and detoxification responses, concomitantly inhibited antioxidant capacity and caused lipid peroxidation in intestine and liver organs. Both LECAs and LADAs enhanced gluconeogenesis, inhibited lipogenesis and fatty acid beta oxidation in intestine and liver organs. The exposure of fish to LECAs and LADAs induced anaerobic pathway and affected fat catabolism in intestine and liver organs. The hazard risk quotient in children for fish treated with OTCD was > 1 indicating human health risk. Overall, both LECAs and LADAs impair general physiological functions, nutritional metabolism, and compromise fish immune system. Consumption of fish fed with legal OTC provoke health risk among children.

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Population Structure and Genetic Diversity of Nile Tilapia Oreochromis Niloticus Strains Cultured in Tanzania Using SNPS Markers from ddRAD Sequences

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ABSTRACT

Oreochromis niloticus is one of the most cultured fish species in Tanzania. Information regarding genetic diversity and population structures among local Nile tilapia cultured in Tanzania is important for future breeding programmes. In this study we investigated genetic diversity and structure of seven populations of O.niloticus from the government aquaculture centres and the wild based 2182 SNP loci. DNA were extracted from finclips of 140 fish individuals and double- digest restriction site-associated DNA ddRAD libraries were prepared and sequenced by Illumina (HiSeq4000) platform. The population structure was determined using model-based clustering discriminant analysis of principal components (DAPC). The results revealed clear structure between FETA, TAFIRI, Igunga and Lake Victoria. Pairwise FST showed strong genetic differentiation between FETA ,Lake Victoria, Igunga, TAFIRI and Karanga populations with FST values 0.548 0.538 0.533 and 0.445 respectively. AMOVA showed the highest level of genetic variation among populations than within one population. NJ tree showed branches of closely related isolate populations and evolutionary relationship among populations were observed. Individuals from FETA (F) Lake Victoria (LV) and Igunga (IG) were clustered together while TAFIRI and Karanga seemed to be genetically distant from other populations. We found that those populations which grouped together in the same cluster were the genetically closer ones. For the future need of an optimum Tilapia breeding program in Tanzania, there is a necessity to understand the genetic structure of Tilapia species populations cultured in Tanzania. The results for population structure and genetic variation of Nile tilapia cultured in Tanzania can provide insight into which strain of tilapia can be exploited more for future tilapia breeding program.

Key words: aquaculture, breeding program, population differentiation, Nile tilapia, genetic diversity.

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The Need of a Structured Tilapia Breeding Programme in Tanzania to Enhance Aquaculture Production

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ABSTRACT

Breeding programs are crucial for improving and boosting productivity in domesticated fish species. The demand for fish in Tanzania has increased tremendously during the past few years, but the local aquaculture production has not increased accordingly and Tanzania relies on import of fish from mainly Asia to meet its demand. The success of aquaculture depends on several factors, namely quality fingerlings, quality feeds, and good culture system management. The availability of good fingerlings is key to improvement of aquaculture production in the country. This paper points out why Tanzania needs a structured sustainable Tilapia breeding program with biosecured and reliable hatcheries to enhance aquaculture production. Tanzania must have a moderate scale tilapia breeding program that will produce good fingerlings at affordable prices for smallholder fish farmers. The introduction of exotic species in Tanzania should be carefully managed because introduced species have many negative impacts to the indigenous species. To ensure a sustainable future of a national tilapia breeding program, it is important to maintain natural and diverse local tilapia strains.

Key Words: aquaculture, breeding programs, exotic species, Nile tilapia, strain.

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Sub-Theme 2: Bioscience and Inclusive Development

Phylogenetic Position and Taxonomy of Kusaghiporia Usambarensis gen. Etsp. Nov. (Polyporales)

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ABSTRACT

Polyporales represent a large group of Basidiomycota, containing more than 1,800 species in over 216 genera and 37 families. Seven clades are recognized in Polyporales; antrodia, core polyporoid, residual polyporoid, phlebioid, tyromyces, gelatoporia and fragiliporia. Currently antrodia clade contains more than 26 genera,which are of economic importance as a source of food, as well as pharmaceutical and biotechnological products. However, some species are plant pathogens. "Kusaghizi" is a local name of a large polyporoid mushroom from West Usambara Mountains in Tanzania. The mushroom produces large dark brown fruiting bodies up to 60 cm wide, which at maturity may weigh more than 10 kg. It has a high rate of mycelial growth and regeneration and was found growing on both dry and green leaves of shrubs; attached to the base of a living tree. It was also observed to degrade dead snakes and insects coming into contact with it. This mushroom has a long tradition of being used as food and medicine by local communities although no scientific description on it has been found.This study aimed to describe the species and infer its phylogenetic position. Morphologically, the mushroom produces dark brown basidioma with globose to sub-globose basiodio spores. BLAST results from GeneBankon RPB2 and TEF1 were: Query cover 99% and Identity 87%, and Query cover 99%, Identity 84%, respectively. For nrSSU the highest similarity has a Query cover of 91% and Identity 87%; while for nrLSU the Query cover was 100% and the Identity 86%. Phylogenetic analyses based on individual and concatenated data sets of nrLSU, nrSSU, RPB2 and TEF1 genes grouped the mushroom together with Laetiporus and Wolfiporia, with strong support (Posterior Probability 1,Maximum likelihood boostrap 91%), to form a monophyletic group in antrodia. A new genus and species was described as Kusaghiporia usambarensis to accommodate the species investigated.

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Isolation and Characterisation of Endophytic Fungi from Medicinal Plant Moringa oleifera (Lam.) of Tanzania

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ABSTRACT

Moringa oleifera Lam is among the most useful trees due to its medicinal and nutritional properties in the world and thence it is described as a 'miracle tree'. Medicinal plants harbour endophytic fungi which produce secondary metabolite with bioactive compound similar to their host thus being important in pharmaceuticals' for novel discovery processes. The present study isolated endophytic fungi from this miracle tree found at the University of Dar es Salaam, and established their antimicrobial activities against microbes of medicinal importance. The fungal endophytes were isolated aseptically by cultivation of the tissues from healthy leaves, barks, seeds and roots in Potato Dextrose Agar (PDA). Identification was performed using both micro-morphological and molecular data through BLAST search on the Gene Bank of the ITS region of 5.8s rRNA sequences which revealed them to be Fusarium and Nigospora species. Antimicrobial activity of the ethyl acetate crude extract from endophytes metabolites was performed against four human pathogen Bacillus substilis, Staphylococcuss aureus, Escherichia coli and a pathogenic fungi Candida albicans. Endophytes from leaves and roots portrayed strong antimicrobial test against Bacillus substilis, Staphylococcuss aureus and Candida albicans while those from seeds showed weak antimicrobial test against two Gram-positive bacteria and fungi. Similarly, those from barks showed weak antibacterial activity to Bacillus substilis and none to other tested pathogens. Gram-negative bacteria Escherichia coli showed negative results to all tests. This study revealed that endophytic fungi from M. oleifera have bioactive compounds with antimicrobial potential to pathogens of medical importance. With the current advancement in modern biotechnology this important microorganism resource can be up scaled and transformed to more benefits for the betterment of mankind.

Key Words: Endophytic fungi, Ethnobotanical, Medicinal plants, Moringa oleifera, Tanzania.

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Usnea in mountain rain forests of Tanzania: A study of species diversity and phylogenetic relationships

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ABSTRACT

Usnea (Parmeliaceae) is a species rich lichengenus with more than350 species worldwide.It is characterized by a fruticose habit, an elastic central chord inside the branches and the presence of usnic acid in the cortex. Many species are considered to havewide distributions. Usneain Africa has been insufficiently studied and the availabilityof molecular data isvery limited.The taxonomy ofUsneais difficult due to the high morphological plasticity and chemical variability of thespecies. Therefore,molecular data is much needed in order to ascertainspecies recognition. In this study,adataset of sequences of five nuclear markers (ITS, LSU, SSU, MCM7 and Beta-tubulin) of Usnea samples from Tanzanian mountainous rainforests were generated. These were used for elucidating their phylogenetic relationshipsin a wider sampling of Usnea, covering many of the Usnea sections. Bayesian analysis was used to infer phylogenetic relationships among the species. The morphology of the samples was assessed and important features such as apothecia andthe occurrence and type of soralia, isidiomorphs and fibrils were recorded, along with features such as the cortex and medulla pigmentation,the branch surface characteristics and the branch anatomy. Thin layer chromatography was used to investigate the secondary chemistry. In this study a presentation of the phylogeny ofsome TanzanianUsneafrom mountainous rainforests is presented, which based on sequence data suggests species identifications and species circumscription.

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Sub-Theme 3: Engendering Agribusiness and Entrepreneurship for Inclusive Industrial Development

Functional Upgrading in Agricultural Value Chains: Does Gender Matter?

Mesia Ilomo and Lettice Rutashobya

ABSTRACT

Gender equitable agricultural development has recently emerged as an important component of value chain development and has become a critical part of the development agenda of many Sub Saharan African (SSA) countries. Despite this growing interest and efforts to integrate gender in agricultural value chains (VC), the extent of participation of men and women appears to vary from one VC node to another, and from one chain to another, with women mainly occupying the upstream (farming) node/activity, and the most unprofitable chains respectively. Existing literature on agricultural VC in SSA has reported women's limited involvement in downstream activities such as processing and trading. The literature has further documented a gendered pattern of cropping, with men and women found to dominate highly-valued crops, and low-valued crops respectively. A gendered pattern of cropping trajectories has also been found to change over time, with men taking control of products as they gain value. Such gendered VC to the disadvantage of women presents household livelihood challenges, as the literature has pointed out that women tend to allocate more income to household food, health and education. Engendering VC, therefore, can lead to improved food security and nutrition for all, and has implications for the functioning of, and the upgrading prospects within VC. Shift to higher skills and knowledge content nodes (e.g trading and processing), that is, functional upgrading, can empower women farmers and provide more financial support to their families. Despite the growth of gender and agricultural VC literature in the past two decades, factors contributing to gendered VC remain underexplored. This paper draws on VC, socialist feminist, and institutional frameworks to understand the gendered pattern of VC in an SSA context. It examines (conceptually) the relationship between gender and functional upgrading of smallholder women and men farmers. Arguments on intra-household dynamics to better understand the way gender affects functional upgrading and vice versa are also presented. This is particularly relevant in Africa, where normative institutions including gender norms and practices, appear to shape unequal participation of women and men in economic activities and their subsequent outcomes, as well as unequal access and control over resources. The paper concludes with a conceptual framework and research questions for future research.

Keywords: Value chains, gender, functional upgrading, SSA

Conceptual Paper on Rural Entrepreneurship in Africa

Mohamed A. Semkunde

ABSTRACT

Recently rural entrepreneurship has been a subject of interest among researchers in entrepreneurship field. The debate has been on how contexts affect entrepreneurial outcomes. In the African context, the understanding of this concept is not clear to the point that some individuals particularly practitioners do speak of entrepreneurship in the rural synonymously to rural entrepreneurship. This conceptual paper suggests that, the conceptualization of rural entrepreneurship should also reflect contextual factors since rurality is unique in developing countries compared to developed countries. Based on literature review, the paper reviews the rural entrepreneurship and uncovers the ambiguity around the concept in relation to the African perspective.

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Revisiting Gender Roles in the Rice Value Chain: Insights from Kyela, Tanzania

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ABSTRACT

Both women and men play a significant role in agriculture in developing countries. Women are considered to dominate farming with limited involvement in higher value chain nodes like processing and trading. This is a common claim, but which is also repeatedly refuted. Hence, there is need for more empirical evidence. This study examines how the rice value chain in Kyela-Tanzania is gendered. Rice, which is gaining value in Tanzania, puts the position of women in the value chain at risk, as men tend to take control of products as they gain value. Through four focus group discussions with women and men farmers and traders in Kyela, the study concludes that none of the value chain nodes are exclusively occupied by either women or men. None of the work tasks in rice farming in Kyela are purely for women or men. Planting and harvesting are equally shared, while men dominate in land preparation and women in weeding. Moreover, women dominate in both processing and trading. Thus, the findings in this study cannot support the traditional claims, and it is argued that generalizations on women and men's labour in the agricultural value chain appear to be more logical at task level than node level. Therefore a gender analysis needs to look at tasks rather than aggregated value chain nodes in order to unveil gender divisions of labour.

Key Words: Value chains, gender, Tanzania

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Sub-Theme 4: Food Security for Inclusive Industrial Development

Optimization of Process Parameters for Mechanical Pressing and Extraction of Banana Juice Using Surface Response Methodology

Nuria Majaliwa

ABSTRACT

Indigenous banana juice processing method is regarded as a rudimentary and unhygienic process with some intermittent juice failure. This process has been improved by replacement of traditional facilities with a mechanical blender. However, factors responsible for the juice release are not well understood. This study aimed at identifying and optimizing significant factors associated with juice release. Banana juice extraction by mechanical pressing was done by blending and pressing pulp without the application of enzyme, hot water or grasses (Imperata cylindrical).A Box-Behnken design of Response Surface Methodology (RSM) was used to investigate the effects of three independent parameters on the banana juice yield and optimizing the processing conditions for mechanical extraction of banana juice. Optimization was done using an experimental design with the three independent variables that were set at three levels; revolution speed (1000–3500 rpm); extraction time (30-240 s); stage of ripeness, (3-7). A second order polynomial equation was created, which showed the relationship between dependent and independent variables. The results showed that juice yield increased with revolution speed, extraction time and stage of ripeness, while effect of these factors squared (quadratic effect) showed a significant decrease on juice yield. Optimum juice yield was observed when the revolution speed was at 2650 rpm, extraction time at 162 s and ripeness stage 5. Analysis of variance showed that the stage of ripeness significantly ($p \leq 0.000$) affects juice yield. Better understanding of the processing conditions will enhance scaling up of the new banana juice processing technology.

Forest Dependency in Tanzania: Review on Household's Heterogeneity, Household's Revealed Energy Choices, Forest Products Transportation Chain and Links between Forests and Food Security

Matilda Ntiyakunze

ABSTRACT

This paper reports on a literature review on the role of households' heterogeneity in forest dependence, determinants of the revealed preference on the households' energy choice, analyses of forest products transportation chain and assesses the impact of forest degradation on food security. The purpose of this literature review is to summarize relevant research on these topics for Tanzanian forest use, but relevant papers from other countries have also been reviewed where these studies can help shed light on the Tanzanian situation. Forest management faces some challenges, unsustainable uses and conversion of forests into alternative land uses are among the threats. Several initiatives have been taken to manage forests and reduce the problems associated with common pool and open access natural resources. Findings from the literature review indicate that there are different channels through which forest products make their way from the producers to the consumers. From the results, the charcoal value chain can sometimes be longer or shorter depending on the type of market and institutionalization of traders. Food security in rural areas has also been found to be depending on the availability and quality of forests, both directly through access to forest products for sale or for own consumption, but also indirectly through local climate regulation and soil carbon storage. From the literature reviews it can be concluded that many studies have analyzed forest dependence on the stated objectives; however, proper management of forest resources is required by determining the optimal rate of forest extraction to ensure forests sustainability. In the absence of optimal utilization of forests, benefits provided by forests declines, thus reducing the value of dependence on forests.

Rangeland and Livestock Management among Pastoralists and Agro-Pastoralists in Miombo Woodlands in Eastern Tanzania

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ABSTRACT

Rangeland management practices, forage quality and availability, and livestock production by pastoralists and agro-pastoralists in miombo woodlands were investigated in a study conducted in Kilosa district, Tanzania. The study methods comprised household interviews, key informants focus group discussions, and forage laboratory analyses. Preferred forage species and traditional livestock-rangeland management practices of pastoral and agro-pastoral communities in miombo were identified and the nutrient content of the forages was determined. Livestock in miombo contribute greatly to household livelihoods and food security, but forage scarcity was identified as a limiting factor. Moreover, the nutritional value of some native forage species identified in miombo was found to be too low to meet the nutrient requirements of livestock. In general, rangeland management in the study area faces challenges such as unclear or disputed land tenure regime and lack of technical knowledge. Overall, it was concluded that rangeland improvement practices are poor or non-existent in allocated grazing areas in miombo woodlands.

Key Words; Dry woodlands; Land use plan; Rangeland condition; Traditional herders

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Sub-Theme 5: Managing Safe and Clean Water for Inclusive Industrial Development

Challenges for Universal Safe Drinking Water Access: Perspectives on Knowledge and Innovation Management and Business Opportunities for Safe Groundwater Exploitation in Tanzania

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ABSTRACT

Access to safe drinking-water is a basic human right and a component of effective health protection policies. Apart from water, sanitation and hygiene are other pivotal points for global health and sustainable development. This is because lack of access to safe water supplies and pollution is among the six key environmental problems stated by the Tanzania National Environmental Policy (1997). Changes in climatic conditions, population growth, urbanization, as well as industrial activities have resulted in a sharp decline of the quality and availability of surface water. Presently the demand for drinking water supplies is mostly covered from groundwater resources. The ubiquitous presence of the geogenic contaminants such as arsenic (As), fluoride (F-), manganese (Mn) and a range of other co-occurring toxic elements in groundwater, detected since past decades, severely constrain its use for drinking. Drinking water quality is also influenced due to microbial contamination together with other anthropogenic contaminants including toxic metals mercury (Hg), cadmium (Cd) and pesticides, pharmaceutical substances and antibiotic residues. Drinking water management system involves an integrated process, linked with the availability and the quality of sources, the adaptive systems for treatment and efficiency, the distribution and storage system, as well as the consumer networks. Water Safety Plan is an instrument to ensure the safety of the drinking-water supplied by a comprehensive risk assessment and risk management approach that encompasses all steps in water supply chain from catchment to consumers. The choice between source substitution and treatment should be carefully made based on multi-criteria approaches driven primarily by SDGs. There is a growing need for technology innovation specifically for the assessment of hydrogeological characteristics of drinking water catchments, monitoring of water quality, and robust sets of actions and technology innovation alternatives. Towards promoting circular economy in the water sector, business sense is an important concept that has a critical role to play by integrating the knowledge base, expertise, experience

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and financial support for developing, implementing and scaling-up focused solutions for drinking water systems through partnerships.

Key Words: Drinking water, Water Safety Plan, geogenic contaminants, groundwater, knowledge management, innovation, treatment systems, circular economy.

Fluoride Removal Technology with Improved Sorption Performance in Drinking Water in Tanzania

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ABSTRACT

Inadequate access to safe drinking water has become one of the most decisive and challenging environmental problem for all forms of life on earth. Therefore, groundwater is among the most exploited sources for drinking water constituting 97% of the global freshwater. Fluoride is a trace element available at different concentrations in the atmosphere, soils and rocks, natural waters and organisms. It can get into the environment through natural processes such as weathering reactions, biological activity, volcanic emissions, as well as through a range of human activities, such as mining, industry and agricultural use of pesticides. It is an odourless and tasteless highly toxic metalloid which occurs in both organic and inorganic forms. Drinking water is potentially the greatest sources of fluoride in the environment. Tanzania is one of the countries with the problem of excess fluoride in groundwater and in some regions people are highly affected with fluorosis. Like most of the developing countries, fluoride removal in water is still a problem because its chemistry is complex in aquatic environment and most of the techniques which have shown good performance are highly expensive. Bauxite is plenty in Tanzania but the studies show that raw bauxite has poor adsorption capacity for fluorine. Hence the improvement of the adsorption performance of raw bauxite is highly important.

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Drinking Water Quality Status in Tanzania: Challenges and Possible Mitigation Measures

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ABSTRACT

Potential fluoride contamination of drinking water resources in Tanzania dates to the 1950s. Inspite of the efforts made by the government through the Ministry of Water and Irrigation (MoWI) to defluoridate drinking water in fluorotic regions, sustainable solution remains a challenge. Recent studies have associated the elevated levels of fluoride with local geologic settings and volcanic activities. This study gives an overview of drinking water quality in different lithostratigraphic units, spatial distribution of fluoride contamination using concentration levels and challenges hindering accurate and precise understanding of occurrence and mobility of fluoride in drinking water sources. The study area was divided in four (4) zones namely, lake zone (LZ), western zone (WZ), northern zone (NZ) and central zone (CZ) based on water sampling strategy developed by MoWI in 2015/2016 and regional climatic conditions. A total of 2,282 water samples from MoWI database were distributed as follows: 496 samples in LZ, 311 samples in WZ, 1173 samples in NZ and 302 samples in CZ. They were analysed using spatial statistical and geographical information systems (GIS) functions. Spatial queries were developed in GIS and used to determine the number of water samples in different lithostratigraphic units in each study zone. It was envisaged that water samples required studying the occurrence and distribution of fluoride levels range between 96.60 and 98.98% in different lithostratigraphic units assuming sampling of one drinking water wells per square kilometre. Exploratory data analysis using box and whisker plots indicated that fluoride contamination in the same lithostratigraphic unit varies in different climatic zones. With a few exceptions, global Moran's I test on spatial autocorrelation indicated positive spatial autocorrelation in fluoride concentration levels in many lithostratigraphic units. This implies that fluoride contamination level is not a random process, but a regional phenomenon controlled by geological settings, topography and climatic conditions in the East-African rift valley.

Key Words: Fluorotic regions, GIS, Spatial statistics, Tanzania, Water quality.

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Sub-Theme 6: Managing Sanitation for Inclusive Industrial Development

The Potentials and Constraints of Local Conditioners on Faecal Sludge Treatment

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ABSTRACT

Globally, around 2.3 billion people still lack basic sanitation services. They either practice open defecation or use unimproved facilities. Improved sanitation has significant impacts not only on health, but on social and economic development, particularly in developing countries. Over 80% of the population in Sub-Saharan African countries relies on on-site sanitation systems. A challenge to the use of on-site sanitation is the management of accumulating faecal sludge (FS). The major challenges for managing FS are about its contents. FS contains large amounts of water, but also solid waste, pathogens and nutrients. If managed in safe way FS could be recovered and used for energy and/or agricultural purposes and be an income source to people. Currently FS dewatering is being done by applying chemical conditioners, which are both hazardous and expensive. Although the feasibility of applying local conditioners for dewatering of FS has been done,, its potentials and constraints to enhancement of resource recovery have not been well documented. Although the feasibility of applying local conditioner in dewatering of FS has been studied, its potentials and constrains to enhance resource recovery in economic viability has not been well documented. The purpose of this article is to review and document potentials and constraints of local conditioners in view of recovering resources from FS. It was accomplished through review of the systematic searched articles published in various databases. Findings of the review indicate that there are potentials of local conditioners linked to dewatering, removal of heavy metals and pathogens in supernantant of FS, increasing efficiency of treatment plants and reduce treatment costs. However, some constraints observed are linked to increasing of COD in treated effluent which could increase operational costs and accumulation of heavy metals and pathogens in the biosolid produced.

Key Words: potentials, constraints, local conditioners, faecal sludge, review

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Drivers of Safe Faecal Desludging in Unplanned Settlements in Dar es Salaam

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ABSTRACT

Onsite sanitation systems are still the major means for providing sanitation service in unplanned urban settlements of Sub Saharan Africa. However due to limited space, construction of new toilets to replace the filled ones is practically impossible. Hence, the viability of onsite sanitation depends on desludging services which in most cities are limited. The purpose of this paper is to present the current situation of faecal desludging and associated factors in the unplanned settlements of Manzese, Keko and Kipawa in Dar es Salaam, Tanzania. This was a cross sectional study in selected unplanned settlements where mixed methods including observations, key informant interviews and a survey of 395 households were used to collect and analyze data. The findings of this study contribute to addressing the challenge of poor sanitation and its health and social impacts in these settlements

Key Words: Safe desludging, onsite sanitation, Mixed methods, unplanned settlements, Dar es Salaam

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Surface Water Pollution from a Municipal Solid Waste Dumping Facility: A Case Study of Kanoni River, Bukoba – Tanzania

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ABSTRACT

In this study, water samples were collected from five different points along River Kanoni, in the United Republic of Tanzania, to assess water pollution caused by a nearby Municipal Solid Waste dumping facility. Some physico-chemical parameters (pH, electrical conductivity (EC), total dissolved solids(TDS) and temperature), nutrients (nitrates and phosphates) and heavy metals (Pb, Zn, Cu, Cr, Cd) were analyzed in a laboratory in accordance with standard methods, and were compared with the existing standard limits for fresh water quality. All water samples had EC and TDS values below minimum standard values. All temperature values were within the prescribed limits. All water samples had nutrient values above the standard limits, except those collected from far upstream and far downstream of the facility. Measured values for Copper and Zinc were below the recommended disposal limits, while values for Lead, Chromium and Cadmium were all above the recommended limits. However, all measured parameters showed a substantial change as the water approached mid-stream, due to the effect of a decrease in distance from the landfill which implies more run-off and leachates into the river.

Key Words: Municipal Solid Waste, Environment, Water, Landfill, Contamination.

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Waste to Energy – Perceptions and Willingness to Use Faecal Sludge Derived Products: A Case Study of Selected Unplanned Settlements of Dar es Salaam, Tanzania

Isabela T. Mkude[1], Tolly Mbwette[1], Sara Gabrielsson[1, 2], Richard Kimwaga[1]*

ABSTRACT

Resource recovery from faecal sludge (FS) provides incentives for safe and adequate sanitation management. It could also generate economic and environmental benefits in unplanned settlements. Despite these potential benefits little is known about users' perceptions and willingness to use FS derived products. This paper presents results from an ongoing study aimed at evaluating community perception and Willingness to Use (WTU) FS derived products. A cross sectional survey conducted among 400 households in three unplanned settlements; Keko, Manzese and Kipawa in Dar es Salaam, Tanzania. A chi-square analysis ($\chi 2$) was used to examine the relationship between respondents' demographic characteristics and willingness to use the products. Results show that 66.6 % of respondents are willing to use FS briquettes and 58.50% biogas from FS. Higher level of education among respondents (87% with tertiary education) and the type of occupation are more likely to be willing to use biogas generated from FS ($p<0.05$). The survey also shows that those who have previous knowledge about resource recovery (78.5% biogas and 69.1% briquettes) are more willing to use the products. Those not willing to use FS derived products perceived disgust (45%), health risks (26%) or lack of knowledge and awareness of resource recovery (15%) as major reasons behind their reluctance. Similarly, product smell (7%) and quality (4%) were other reasons for unwillingness to use FS derived products. It is therefore concluded that to get people to adopt and use FS derived products community awareness campaigns with participatory components are necessary. This paper provides an overview of existing perceptions on the use of FS products. Further research is recommended to evaluate the impact on the use of these products in action. Demonstrations and promotions of briquettes or biogas from FS to users is necessary to dispel the myths around safety, smell and quality of such products and to inform people of their multiple benefits. Communities ought to be involved during the action research, in participatory trials to sensitize all stakeholders from users to consum¬ers, coupled with promotion and education activities. Through household survey, this research explores and presents perceptions and willingness of communities in unplanned settlements in Dar es Salaam to use products produced by faecal sludge.

Key Words: faecal sludge; willingness to use; energy; resources recovery, biogas

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Potential Use of High Rate Algae Ponds for Resource Recovery in Responding to Water, Food and Energy Futures demand in Tanzania: A Review

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ABSTRACT

The concerns over the use of high rate algal ponds (HRAPs) for the treatment of wastewater have raised interest and caught global attention in recent years (Pittman et al., 2011). This has been largely contributed by the potentials and opportunities to re-use products from wastewater. Wastewater generation is increasing rapidly, especially in the global south due to high rates of urbanization, population growth and economic development. In urban areas of Tanzania, notably Dar es Salaam City, management of both faecal sludge and wastewater is posing a lot of challenges. Wastewater treatment tehnologies such as wastewater stabilization ponds - WSPs were not designed for optimisation of resource recovery. This paper reviews the upgrading potential of existing WSPs to High Rate Algal Ponds (HRAPs) for resource recovery from products of wastewater for both biofuel, plant nutrient and irrigation purposes. The review employed as critical review where by more than 100 published journal articles have been reviewed. They were on nutrients recovered by algal biomass for food and feeding, energy for bio-fuel as well as reclaimed water for irrigation purpose. Out of 110 papers reviewed, 76 papers were found to be directly related to the study focus, 55 journal articles (From 2008-2018) were found to determine the coverage of the HRAP opportunities focusing on nutrients, energy and water whereby 32 papers were for Energy (biofuels), 13 Nutrients (Food and Feed), and 10 papers for water for irrigation. The review indicates that the potential for resource recovery from HRAPs are high in terms of energy and nutrients recovered through algae biomass, particularly for biofuel and animal feed production. Less attention has been made on studying the re-use potential of wastewater for irrigation purposes.

Key Words: High rate algal pond, Wastewater, Wastewater Treatment, Microalgae, Resource Recovery.

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Sub-Theme 7. Mathematics in Higher Learning Institutions

On Hilbert Functions of Points in Projective Space and Structure of Graded Modules

Damas Karmel Mgani[1]

ABSTRACT

In this paper, we investigate the relationship between the Hilbert functions and properties of the graded modules. To attain this, we construct the graded modules from the sets of points in projective Pnk . We use a computer software package for algebraic computations Macaulay2 to study the Hilbert functions and the associated properties of the graded modules. Thereafter, we provide theoretical proofs of the results obtained from Macaulay2 and _finally, we give illustrative examples to justify some of our results.

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Rank Reversal and TOPSIS Method with Fuzzy Maximal Similarity Measure

David Koloseni[1]

ABSTRACT

In this paper, an improved TOPSIS method is presented. The data in the decision matrix are pre-processed/normalized using a new method, and it employs a fuzzy maximal similarity measure to find how similar is an alternative to the absolute positive ideal solution or absolute negative ideal solution. The proposed method solved the rank reversal problem and took care of the negative criteria values. Finally, based on the illustrative example the results show that the proposed method is valid, stable and easy to implement.

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Sub-Theme 8: Research Management

Academic Integrity: the Imperative of Probity in African Development Research

Helen Lauer[1]

ABSTRACT

The global arena is rife with profit-driven misrepresentations and misinterpretations of Africans' needs (economic, medical, agricultural, commercial) in the guise of scientific consensus that sustain the bizarre yet incorrigible conviction that Africans require foreign expertise to direct research agendas and to move development policy in a sustainable direction. This is why academic integrity is so important to uphold particularly as individual researchers and knowledge producers representing academic excellence and proximity with facts on the ground, through expertise and proximity to indigenous knowledge custodians in this part of the world. In the research sciences integrity entails sustaining the confidence to speak facts to fiction, to resist the overwhelming power of knowledge monopolies, where one's access to research funding and potential career opportunities rest on one's capitulating to profit-driven research agendas. This begins by correcting the widespread ignorance that passes as received knowledge and theoretical advice sustained by consensus in the global arena about Africans and the interpretation of long term implications of global capital expansion and resource extraction on the Two Thirds World. But the opportunity to forward such corrections will not be offered; it has to be seized, demanded, and fought for. That is a struggle that requires courage and tenacity, it requires defiance and commitment and professional risk-taking.

Key Words: scientific consensus, epistemic justice, academic integrity, plagiarism, profit-driven research

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University Research Agenda for Inclusive Socio-Economic Development: 2016/19 to 2028/29

Bavo Nyichomba[1], Sylvester L. Lyantagaye[2], Paul Onyango[3], Theodora Mwenegoha[4], Dav Jani[5],

ABSTRACT

The University of Dar es Salaam research agenda intended to provide an enabling environment as well as resources for research and knowledge creation that promotes strategic development of priority research areas, not only through institutional promotion and facilitation of multidisciplinary research teams and human capital (or 'human resources'), but also through building a necessary research infrastructure and support for cutting-edge research and development for a dynamic and responsive industrial economy for Tanzania in the foreseeable future.

The research agenda is expected to serve as a management tooling ensuring selection and articulation of identified research needs and priorities (research clusters) in order to enable the University make informed management choices and decisions in terms of allocation of resources that would produce relevant research results. It will also help guide the thinking and choices of current and future researchers within the University on the kind of area or theme within which to anchor their research effort and skills to solve societal problems.

Key Words: Research Agenda, Clusters, Multi-disciplinary

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Reflections on Research Opportunities and Funding Strategies

Pius Z. Yanda[1]

ABSTRACT

Research is the engine of development. It is research findings that informs action in addressing societal problems. Such findings to also inform policy. In the scientific sphere, research advances knowledge. Identification and prioritization of research areas can be done through involvement of the public at different levels. In most cases research priorities are pre-determined by the research funder or users through various ways. However, such research priorities are broad in nature. It is the responsibility of the research teams to identify appropriate research problem. Research problem should be relevant to the field and supported by a number of recent peer-reviewed studies in the field. Team building is a key for research proposal development. Team members should be those who have relevant fields of expertise required and who can work together. A number of calls demand collaboration. Developing collaboration require enough time for individual researcher to build confidence among each other. Funding opportunities can be obtained either through open calls or invitation by granting organizations. When a proposal is submitted, one should expect either acceptance or rejection. However, being rejected doesn't mean your idea is completely un-fundable.

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Research Innovation and Intellectual Property towards Industrial Development

Theodora Mwenegoha[1]

ABSTRACT

The importance of Intellectual Property and research innovation in fostering industrialization cannot be overstated. The two are not only relevant for industrial growth but economic growth of any country. Moreover, Intellectual Property rights play a critical role in research innovation. Effective engagement of different tools of the IP system will result into growth of research innovation and economic gain; consequently, more economic activities and creation of industries. It is important, therefore, to revisit the major roles Intellectual Property and research innovation play in this journey and reflect on what ought to be done by researchers and the institution at large so as to further foster industrial development.

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Sub-Theme 9: Smart Grid for Inclusive Industrial Development

Applications Coordination Platform for Fault Detection and Clearance in Electrical Secondary Distribution Network

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ABSTRACT

There are economic and environmental concerns about the existing electric power grid systems that call for Smart grid architectures to replace them. Smart grid offers integration of renewable energy, load monitoring and control as well as generation and consumption management. Smart grid heavily relies on the use of Information and Communication Technologies (ICT) for intelligence in offering these services. Due its size, geographical coverage and complexity, Smart grid architectures need a number of sensors and Internet of Things (IoT) devices that produce massive amount of data. Cloud computing has been a dominating technology for smart grid applications because of its ability to provide on-demand computing services. However, cloud computing has challenges related to latency, location restrictions and mobility support. Fog computing has been conceptualized as an extension to cloud computing to address these issues. Fog computing allow processing to be at edges, closer to the source of data through fog node. Fog nodes have less computing resources compared to cloud. Therefore, more demanding applications are moved between fog nodes and clouds depending on the processing requirements. The migration of applications is facilitated by virtualization technologies, particularly the use of virtual machines (VM).

In this paper, the interest is to investigate how applications running in cloudlets or fog nodes can migrate dynamically/adaptively according to some specified criteria of quality levels. The focus is to identify how migration can be performed without affecting the minimum performance required and energy requirements. Furthermore, identifying triggering mechanisms to be integrated in deciding whether to migrate or not is another challenge that needs to be addressed. Decision making models based on objective function of choice for application/service migration has to be specified. The decision-making process may base on location, mobility of users, number of users, traffic load reduction, storage capacity, network capacity, users' behavior, energy conservation, service replacement, heterogeneity, etc. Use case for a fog system to deal with fault detection and monitoring in electrical secondary distribution network is demonstrated.

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Integration of Distributed Energy Resources for enhancing Service Restoration and Fault Clearance in Electrical Secondary Distribution Network

Shamte J Kawambwa , Dr. N.Y Hamisi , Dr. P. Mafole and Prof. H. Kundaeli

ABSTRACT

In many developing countries, little has been done on protection, fault monitoring and control systems in electric Secondary Distribution Network (SDN) resulting into cascaded faults, prolonged outages and long fault clearance time. The remedy carried out, such as load balancing between phases, load shedding and shifting load to the nearby substations may be not efficient, due to lack of alternative power sources, increasing demand of electric power, and the size and complexity of SDN. Enhancing service restoration and minimizing outages and fault clearance time can be achieved by integrating Distributed Energy Resources (DERs) into the electric SDN. In the current set-up, Tanzania's electric grid does not have a platform to support integration of DERs into SDN. Moreover, the major challenge of DERs integration into SDN has been voltage fluctuations and the bi-directional power flows due to variable power injections which interfere with the operation of conventional power control devices and deteriorate the power quality.

In this paper, suitable techniques for integrating DERs into SDN are surveyed by using documents analysis method. Thereafter, appropriate DERs integration technique convenient for Tanzania electric power utility to enhance service restoration and faults clearance is proposed through the Challenge Driven Education (CDE) approach. The focus is to identify how DERs integration can be performed without affecting the SDN power quality requirements. This work involves modelling SDN, designing DERs power injection mechanisms, simulating service restoration process using DERs, simulating fault clearance using DERs and measurement of power quality parameters. Several faults like over-voltage, under-voltage and overloading are considered. Further, the result of this study will provide a significant baseline for deploying the DERs over electric power SDN in developing countries, thus creating the business opportunity for small DERs owners.

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Do IoT Devices Provide a New Attack Surface in Smart Grid Communication Networks? ; Opportunities and Challenges

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ABSTRACT

A smart grid uses advanced Information and Communication Technologies (ICT) to enhance the legacy an electrical system, so as to enable high quality services like demand response, automatic metering infrastructure (AMI), remote sensing, remote control, distributed energy resources and two way communications between utility company and customers. Communication networks play a key important role by interconnects all other smart grid components. However, there is a huge trend of using Internet of Things (IoT) technologies to support smart grid services and operations. This study reviews and presents opportunities provided by IoT technologies in smart grid developments, as well as the security challenges which may be imposed by IoT technologies in a given smart grid.

Key Words: Smart grid, Internet of Things, Security, Communication Network, Secondary Distribution Network

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Internet of Things (IoT) Based Optimal Sensor Network for Automatic Faults Detection and Clearance in Electrical Secondary Distribution Network: The case of TANESCO

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ABSTRACT

Ineffective faults clearance processes have been a major cause of inefficient power supply in most developing countries including Tanzania. Defects and faults in electrical secondary distribution networks are currently reported mainly by customers and through visual inspection (physical) by utility personnel. This makes the entire process from faults detection, reporting to faults clearance, to be time consuming and costly. The delay is mainly contributed by excessive time taken to report faults through phones, inefficient troubleshooting techniques and inadequate tools to identify and classify faults. This study focuses on the proposing the optimal sensor network based on the IoT infrastructure. IoT being one of the most trending technologies around the global with expectations to reach 14-20 billion number of connected nodes, has been considered to be the preferable infrastructure for this study. The optimal sensor networks includes the proposed best and state of the art sensors, best placement mechanisms that will allow the use of minimum possible sensors to monitor the network and best deployment mechanisms that will consider the future network expansion. This study uses the challenge driven education approach and group work approach. Stakeholders were involved throughout the process from main challenge identifications to solution development. The involved stakeholders include TANESCO, Ministry of Energy and researcher from University of Dar es Salaam. The main challenge identified is "inefficient power system faults prevention and clearance". The achievement of this study together with other studies in a group shall contribute to the successful achievement on addressing the identified challenge.

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Hybrid Communication Architecture for Enhancing Automatic Faults Detection and Clearance in Secondary Distribution Power Grid: The case of TANESCO

Godfrey W. Chugulu , Dr P. Mafole , Dr. S. Lujara and Dr. F. Simba

ABSTRACT

A significant work has been done by power utility companies in Tanzania and worldwide to implement automated protection and control in generation, transmission and primary distribution parts of the grid in order to guarantee the quality of service to the customers. However, for secondary distribution parts of the grid, no proper automation has been put in place. As a result defects and faults in the secondary distribution power grid are being reported mainly by customers and through visual inspection by utility company personnel. This makes the entire process from faults reporting to faults clearance to be time consuming and costly. Automation in fault detection and clearance is facilitated by the presence of a reasonably dimensioned communication architecture so as to allow inputs from sensors to be conveyed to the control elements in the smart grid which will generate control messages for transmission to various points in the smart grid resulting in appropriate actions. In the current setup, Tanzania's grid does not have any communication architecture to support two-way communication between secondary distribution devices and control centres. In this paper, suitable communication technologies and architectures are discussed and hybrid communication architecture with appropriate technologies convenient for Tanzania Electric Power Utility for facilitating automatic detection and faults clearance is proposed. A pilot architecture (proof of concept) was implemented at the College of Information and Communication Technologies (CoICT), at the University of Dar es Salaam. The results obtained from the prototype were satisfactory and are presented in this paper. This research followed the Challenge Driven Education approach which advocates involvement of stakeholders in developing suitable and applicable practical solutions. In this research, stakeholders were TANESCO engineers, Representatives from the Ministry of Energy and other researchers from CoICT. They all participated in problem identifications, requirements gathering and solution validations.

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Wireless Access Network Design Framework For Secondary Distribution Power Grid for Automatic Fault Detection and Clearance: The Case of TANESCO

Yona Andegelile , Dr M.M Kissaka and Prof N.H Mvungi

ABSTRACT

An integrated high performance, reliable, scalable, and secure communications network are critical for the operations, automation and of next-generation electricity generation, transmission, and distribution grid systems. Much of the work has been done to standardize communication networks which can facilitate operations automation in the electric Generation, Transmission and Primary Distribution parts of the grid. A reliable infrastructure has been implemented focusing on facilitating protection and control automation in these domains. Due to the complexity of secondary distribution power grids, use of wireless networks has been proven to be the optimal solution for the domain. However, there has not been a Wireless Access Network design a framework which takes into consideration developing countries where most of the areas are not surveyed. This paper investigates in detail wireless access communication network requirements suitable for secondary distribution power grid, then it investigates communication network technologies option which will suit the complexity of distribution networks. Lastly it provides a design framework for the wireless access network that will supports today's secondary distribution grid operations automations requirements, such as continuous monitoring and data acquisition, field crew communication, voice and data communication and new applications necessitated by the introduction of smart metering and home area networking.

The work followed the Challenge Driven Education (CDE) model whereby stakeholders were involved during requirement gathering, and solution formulation in order to capture actual challenges on the ground and come up with an optimal solution which can be adopted in the industry. The involved stakeholders were from the Ministry of Energy and Minerals, experts from Tanzania Electric Supply (TANESCO) and other researchers in electric power grids.

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Implementation Requirements for Enhanced Fault Localization and Service Restoration Framework for Tanzanian Electrical Secondary Distribution Network

Rukia Mwifunyi[1], *Dr M.M Kissaka*[2] *and Prof N.H Mvungi*[3]

ABSTRACT

Increasing demand of electric power, the size and complexity of the power distribution systems are also increasing rapidly resulting to the increase in the likelihood of occurrence of fault and size of the area affected by faults. In Tanzanian electrical secondary distribution networks, the process of tracing, isolating and restoring services to customers after the occurrence of fault is done manually leading to the increased time for the fault clearance which leads to the unexpected losses to the customers and utility. Different approaches for Fault Localization and Service Restoration (FLSR) have been proposed and deployed in transmission and distribution power networks with very few focusing on the secondary distribution. The existing researches on secondary distribution networks rely on the centralized approach which is not efficient due to network complexity. Moreover, existing studies assume deterministic load demand and distributed generation capacities which is far from realistic. This work established the design requirements for enhanced fault localization and service restoration of the secondary distribution network considering stochastic nature of load demand and distributed generation based control approach. The design requirements have been identified through the challenge driven approach in which stakeholders have been involved through the stakeholder's workshops and interviews. The future work will be development and testing of the enhanced FLSR algorithm based on the identified requirements.

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Sub-Theme 10: Tourism for Inclusive Industrial Development

The Assessment of Corporate Sustainability Practices in the Hospitality Industry: An Empirical Study of Tourist Hotels in Tanzania

Msafiri Njorogea , Wineaster Andersonb, Lena Mossbergc, Tommy Anderssonc

ABSTRACT

Based on thematic analysis of in-depth- interviews from 20 tourist hotels and subsequent factor analyses on the survey of 346 tourist hotels in Tanzania, this study investigates the nature and extent of hotels' corporate sustainability practices in the hospitality industry in Tanzania. It is revealed that, hotels' corporate sustainability in Tanzania constitutes Economic Endurance, Legality and Social Concern with second order factor loadings of 0.89, 0.53, and 0.70 respectively. Consistent with Carroll's model of corporate performance, tourist hotels in Tanzania attach more weight on the economic aspects of sustainability than social and legal concerns. On the contrary much emphasis is placed on social aspects than legal responsibilities. Moreover, results indicate that tourist hotels in Tanzania make strong associations between ethical and discretionary (philanthropic) components and consider them as inseparable social responsibilities to conform with. The deviation in results is attributable to contextual differences both economically, socially and culturally between developing and developed countries' contexts. In fact, empirical findings in this study provide a realistic portrayal of corporate sustainability of hotels in the contexts of developing countries and thus offering a useful academic insights and managerial guidance regarding sustainability concerns of hotels within hospitality industry in developing economies like Tanzania.

Key Words: corporate sustainability, tourist hotels, Carroll's model, economic, legal, ethical, discretionary

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Conceptualization of Corporate Sustainability by Tourism Firms in Tanzania

Said Juma Suluo[1] & Wineaster Anderson[2]

ABSTRACT

This study investigates the conceptualization of corporate sustainability among tourism firms in Tanzania. Data were collected through review of tour operators and accommodation firms' websites and analyzed thematically. The findings reveal that corporate sustainability is conceptualized, amongst tour operators and accommodation firms in Tanzania, to refer to initiatives undertaken by firms to address social, economic, and environmental challenges facing the society within which the firms operate. However, while this conceptualization provides a common understanding of the term, it is not useful in guiding its practical application as anything done by firms to address the societal challenges fits in the description. It is thus difficult to ascertain when and how is a firm sustainable. The results imply that corporate sustainability in the tourism industry is in its infancy. While firms may know what sorts of actions are considered sustainable, they hardly know when and how they may become sustainable. Introduction of corporate sustainability guidelines may be useful in enhancing the practical application of the concept.

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Examining the nature and modes of Interaction for Service Innovation: A Case of Tourism firms in Tanzania

Theresia Busagara

ABSTRACT

Interactions are among valuable intangible resources, which when used technically can discover complex customer needs and enhance innovation. This study aimed at examining the nature and modes of interactions on innovation among tourism firms in Tanzania. The study adapted a descriptive-interpretative qualitative research method through a case study approach. Data was gathered by in-depth interviews and direct observation method from managers and employees of several tour operating firms in Arusha-Tanzania. The findings revealed numerous interactions which are directly used by tourism service providers in identifying complex customer needs. Both passive and active interactions play a huge role in identifying customer needs during and before services. Further, active interactions account for more information towards service innovation. In addition, several modes of interactions were identified, such as meeting with customers, conducting exit surveys; informal arrangement to discuss matters related to service experiences and use of social media/online platforms for feedback. The study provides insight to the empirical contribution that interactions are better tools for discovering complex customer needs as they indirectly open up information through mutual understanding between customers and service providers. Thus managers should build on interactions for information sources and have ground-work for successful innovation. This paper contributes to service innovation and service dominant logic literatures by amplifying some of the modes of interactions that facilitate the exchange process of information in creating firm value through innovation.

Key Words: Interactions, Service Innovation, Tourism firms

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My Festival, their Festival': Tensions and Perceptions of Local Residents

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ABSTRACT

The purpose of this paper is exploring local residents' perception of different festivals in Zanzibar Island with the aim of comparing them on different sustainability aspects. The study used qualitative methods following an ethnographic approach and comparative case studies that made use of in-depth interviews, participant observation, and focus groups as data collection strategies, a grounded theory relating festival inputs, management, and festival outcomes emerged. The findings indicate two types of festivals, commercial and non-commercial to emerge from the data that can be compared on three major dimensions including initiators, management processes, and festival outcomes that can be related to form a theory. The grounded theory that emerged from the data provides a framework on the initiation and management of festivals in the context of a developing country like Tanzania with diverse cultures and festival stakeholders. The framework allows festival organizers to reduce the possible tensions among different stakeholders with emphasis on local residents. The synthesis and sense-making of the results indicate the different theories can be applied to explain the festival workings with some operating at macro and others at micro-levels.

Key Words: festival, ownership, involvement, Zanzibar Island

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Sub-Theme 11: Water Resource Management for Inclusive Industrial Development

Different Agricultural Practices which Affect Soil Carbon, Nitrogen and Phosphorous in Kilombero –Tanzania

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ABSTRACT

Changing natural and semi-natural vegetation for agriculture is currently the most significant land use change at global scale. This alteration leads to changes in soil nutrients and increased CO2 emissions. However, knowledge on changes of nutrient under various faming management is still limited, especially for small scale farming systems. This study evaluates deffects of different farming systems on soil organic carbon (SOC), total nitrogen (TN) and total phosphorous (TP) in subsistence farming in Kilombero, Tanzania. We applied an in-situ experimental setup, comparing maize and rice farming with and without irrigation and difference in fertilizers, with replicated soil sampling at five subsequent soil depths (0- 60 cm). The results show that irrigation had positive effect on concentrations of SOC and TN, while fertilization had positive effect on TN. Higher concentration of TN were found in maize field soils compered to rice fields. The vertical profile showed that irrigation and fertilization had positive effects on the concentrations of SOC and TN on top soil layers, and interaction of irrigation and fertilization extend the effect to deep soil layers. Our results show that moderate irrigation and fertilization can help to improve carbon storage and nutrient availability (TN) in small-scale farming soils.

Key Words: Fertilization, Irrigation, Agricultural management, Soil organic carbon, Soil nutrients.

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Community Participation Ignored; Water Sources Endangered: Lessons from Chanika Village in Tanga Region, Tanzania

Athanas Ngalawa and Haji Mwameta

ABSTRACT

This paper seeks to contribute to a re-conceptualized role of community members in sustainable water sources management in Tanzania. It shows how water sources can benefit from the organically developed community innovations and creativity to support sustainable water sources management. Tanzania community has lived through colonial domination which encouraged them to follow the frequency of colonial social, economic, political and cultural wishes hence community members were not squarely made to be accountable for their statuses, including poverty indicated by limited access to good quality water. Principles, rules and regulations for water sources management were brought to people and thus were regarded as alien as the colonial powers themselves. After independence, efforts were made to address and redress the scene, but the colonial hangover still makes it difficult to attain effective community engagement in water sources management. The paper is informed by a study conducted in Chanika village in Handeni District whereby 35 respondents were selected and interviewed to obtain qualitative data. The information gathered was triangulated through Focus Group Discussion, observation, and documentary review. Interview questions, checklists, and observation kit were used. Perspectives of community members on the subject matter were qualitatively analyzed using community capabilities framework (CCF) adopted from Emery & Flora (2006). The paper argues that the level of community participation in decision making process in planning and formulation of institutions and organizations concerning water sources management was very low, and this informed ineffective implementation of rules, principles, and regulations concerning the same. The paper recommends that local community members who are the main stakeholders must be empowered to get involved in all steps of water projects development in order to hold them accountable for effective water sources management.

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Agricultural Dynamics and Social Differentiation in the Context of Irrigation Investments in Kilombero Valley

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ABSTRACT

While the current policies in agriculture are focused on poverty reduction through pro-poor growth and inclusion of smallholders in the market, this paper highlights the socio-economic diversity of smallholders and different paths and trajectories that smallholders are taking. The aim is to analyze how the socio-economic diversity of smallholders is associated with processes of class formation through accumulation from below processes in both irrigated and non-irrigated landscapes in Kilombero. Irrigation and other mechanism of accumulation are studied in order to understand their role in social differentiation. This study reveals that there are different trajectories that are taken by households in different socio-economic groups.The findings of this study suggest that social differentiation processes are prevailing and could impact on current poverty reduction policies aimed at inclusive growth. Policy efforts in irrigation should therefore be focused on efforts to support the poorer households with resources and knowledge necessary for cultivation in areas under irrigation so as to ensure inclusion and sustainability of these irrigation investments.

Keywords: Social differentiation, wealth ranking, irrigation and accumulation
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Estimating Aquifer Transmissivity Using the Recession-Curve-Displacement Method in Tanzania's Kilombero Valley

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ABSTRACT

Information on aquifer processes and characteristics across scales has long been a cornerstone for understanding water resources. However, point measurements are often limited in extent and representativeness. Techniques that increase the support scale (footprint) of measurements or leverage existing observations in novel ways can thus be useful. In this study, we used a recession-curve-displacement method to estimate regional-scale aquifer transmissivity (T) from stream flow records across the Kilombero Valley of Tanzania. We compare these estimates to local-scale estimates made from pumping tests across the Kilombero Valley. The median T from the pumping tests was 0.18 m2/min. This was quite similar to the median T estimated from the recession-curve-displacement method applied during the wet season for the entire basin (0.14 m2/min) and for one of the two sub-basins tested (0.16 m2/min). On the basis of our findings, there appears to be reasonable potential to inform water resource management and hydrologic model development through stream flow-derived transmissivity estimates, which is promising for data-limited environments facing rapid development, such as the Kilombero Valley.

Key Words: aquifer transmissivity; stream flow-derived transmissivity; recession-curve-displacement method; recharge event

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