Rethinking our Landscapes

ICCCER-2024

Book of Abstracts

The International Conference on Climate Change and Ecosystem Restoration

Eldoret City, Kenya

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The International Conference on Climate Change and Ecosystem Restoration

Moi University & The Restoration Alliance

Book of Abstracts

Editorial Board

Contents

Welcome

Committees

Thematic Chairs

1. Restoration of Ecosystems : **Dr. Selly Kimosop**
2. Emerging Trends in STEAM: **Prof. Dr. Fredrick Nyamwala**
3. Ecosystem Biodiversity and Natural Resource Management **Dr. Rose Ramkat**
4. Cross Cutting Themes: **Dr. Charles Rono**

Logistics Committee

1. **Dr. Sarah Cherono**
2. **Dorothy Jerono**

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2. **Naomi Nkonge**
3. **Noah Kiprop**

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1. **Dr. Njira Pili**
2. **Dr. Edna Milgo**
3. **Dr. Charles Mutai**
4. **Dr. Sarah Cherono**

Invited Plenary Lectures

Plenary 1

Panelists and panel discussion points

Ministry of Environment, climate change and Forestry

Discussion point - Mitigating the effects of climate change

Objective - Discuss the role of government and the extent to which government policies support, align to the mitigation of the effects of climate change

Private sector player

Discussion point - Corporate responsibility and climate action

The private sector players are key players in mitigating the effects of climate change, through financing and other CSR ventures.

County Government

Discussion point - Restoration of landscapes

Objective - Role of communities and CSOs

Guests - Invited university

Discussion point - Climate change and public health

Objective - The intersection of climate change and public health

Practitioners

Discussion point - Community participation in ecosystem conservation

objective - Case study

Plenary 2

Panelists and panel discussion points

Climate Financiers

Discussion point - Climate change financing

Objective - Discuss the role of climate financiers in mitigation of the effects of climate change

Stakeholder participants

Discussion point - Forest Conservation Actions in Relation to Mitigation of Climate Change

Objective - Discuss forests conservation efforts as a way of mitigating the effects climate change

County Government

Discussion point - The role of county governments in climate change

Objective - Discuss devolution, has it helped? What next

Practitioners

Discussion point - Practitioners, NGOs and climate change advocacy

Objective - The role of practitioners, NGOs in enabling local communities to fight the effects of climate change

Special Sessions

Wednesday 30 October 2024

Session 1: Dr. Rose Ramkat

Welcoming remarks from Moi University (MU)

Remarks - County government

Remarks - National government

Remarks - Chief guest

Keynote speech 1

Topic: Ecosystem Conservation and Climate Change

Keynote: Policy frameworks and implementation challenges

Session 2: Prof Fredrick Nyamwala

Presentations and posters

Thursday 31 October, 2024

Session 1: Dr. Selly Kimosop

Guest Speech

Keynote speech 2

Topic: Emerging developments in STEAM

Presentations and posters

Presentations and posters

Session 2: Dr. Njira Njira

Presentations and posters

Session 3: Dr. Charles Rono

Presentations and posters

Way forward

Main points from the conference

Closing Remarks

Friday 1 November, 2024

Session 1: Dorothy Jerono, Naomi Nkonge

Excursion: The Great Rift Valley Experience

Abstracts

Cultural Property Rights and its Implications on Land Ownership among Luo Women of Kenya

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Land ownership and inheritance practices are significant in Kenya, especially among the Luo community. Despite legal advancements, women still struggle to inherit land due to cultural norms. This perpetuates gender inequality and poverty. The study aims to explore how inheritance practices impact Luo women 's land ownership and well-being. It focuses on cultural norms, legal frameworks, and strategies for gender equality in land inheritance. The research uses feminist legal theory and social norms theory, employing mixed methods to gather data. The results from the study indicates that lack of equal property rights for women contributes to poverty and social exclusion. Patriarchal inheritance practices persist, marginalizing women in land ownership. Socio-economic dependencies and limited legal awareness reinforce these practices. The study indicates that there is a critical need for integrated approaches that respects cultural context while ensuring compliance with gender-equal inheritance laws. Recommendations include supporting pro-poor policies, encouraging written wills, and promoting awareness of land rights through education

Keywords: Land ownership · inequality · inheritance

Mapping the Tenets of Inclusion and Grassroots Struggles

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Midlands State University (Zimbabwe)

Discord and incoherent social contract between those in the rural areas, authorities and key stakeholders in climate action initiatives in Zimbabwe. Climate Violence (CV) which denotes the absence of peace, as the society encumbered by the violence of wildfires, floods, sea level, pollution, extreme weather patterns, worsened incidences of diseases, extractive, and sharp food and water insecurity. Rural communities in Zimbabwe are grappling with strategizing, adapting and comprehensively responding to the impacts of climate emanating from the existence of weak social contract between them and key action stakeholders in climate action initiatives. Through, participatory mapping processes it was established that rural communities are not only falling apart, but behind due to lack and scarcity of information in regard to climate education, climate finance, carbon credit frameworks, effective climate change adaptive and mitigation strategies.

Keywords: Climate action· Climate education · Rural Communities

Circular Economy And Sustainability - Harnessing Alternative Approaches To Managing Domestic Solid Waste

Kuteesa Stephen

Kampala Capital City Authority of Uganda (Uganda)

The increasing volume of solid waste coupled with poor, climate unfriendly disposal methods by communities such as indiscriminate open burning and littering, is a critical environmental dilemma. Major global cities, Case study example, Kampala Capital City Authority of Uganda, acknowledges that the amount of Solid waste generated overwhelms its capacity to collect and dispose given its enormous collection costs. Out of an estimated $1,200 - 1,500$ tons of garbage generated per day, only $400 - 500$ tones are collected giving a collection efficiency of only 40%. This implies that 60% of solid waste generated daily is not properly collected and disposed hence, resulting into indiscriminate disposal methods by the public. Rudimentary burning of Solid Waste is a widely practiced method of disposing off right from household level to general community centres like markets, trading centres, schools, public recreation centres among others. This is attributed to the fact that Waste management in urban communities is hampered by multiple land tenure system with many tenants not having a right to the land and therefore not able to manage waste domestically. The emissions from burning such solid waste does not only directly impact negatively on the general public health, agriculture, water and economic security of the affected communities but also, impacts negatively on the climate hence harming the environment. Centre for Peace and Conflict Mitigation CEPCOM, Uganda employs strategic innovative pathways leading to prevention and elimination of indiscriminate domestic solid waste disposal at all scales, households to city wide. By fronting the approach of community participation and involvement, the focus is put on demobilising irresponsible solid waste disposal methods by communities through promoting Circular Economy Priorities of Recover, Reuse and Recycle. The multiblended strategy is aimed at strengthening local manufacturing through Innovation and Creativity, Capacity Building and Skilling, Job creation, as well as, advocacy for Policy inclusion on unconventional solid waste disposal methods by Local Community Councils, District Local Governments, Municipal Councils and National Government Agencies. The Transformation Objective is to harnesses a symbiotic relationship between the environment and communities. This ensures increased volumes of solid waste recovered and recycled thus providing a sustainable alternative to the unconventional disposal methods alongside accruing negative consequences. Key success indicators of this strategic pathway are registered in the form of Sustained increase in volumes of solid waste collected, creatively, innovatively reused, and or recycled by communities, Increase in the number of individual community members accessing green jobs in solid waste collection, creative innovation for reuse and recycle, Development and adoption of policies, guidelines, by-laws and procedures on elimination of unconventional solid waste disposal methods by Local Community Councils, Municipal Councils, Urban Councils, District Local Governments and

National Government Agencies, Improved level of mindset change on irresponsible solid waste disposal methods and adoption of creative innovative alternatives by communities.

Keywords: Keyword 1 · Keyword 2 · Keyword 3

Breve Presentation De Notre Entreprise Agricole

Moise Bashi

Cadre d'Actions Techniques Agricoles (Democratic Republic of Congo)

In a world facing growing environmental and economic challenges, agriculture plays a crucial role in preserving natural resources and promoting sustainable development. In the Democratic Republic of Congo, Cadre d'Actions Techniques Agricoles is committed to promoting responsible agriculture that combines productivity with environmental respect. Founded in 2022, our company specializes in grain production, livestock farming, and market gardening. We implement eco-friendly agricultural practices and strive to develop strong local supply chains to ensure a prosperous future for farmers and rural communities. This document presents our mission, commitments, and vision for sustainable and innovative agriculture.

Keywords: Sustainable agriculture · Ecological practices · Rural development

The Role of Biotechnology in Enhancing Crop Resilience for Small-Scale Farmers in Kenya

James Ndolo

Greenways Africa (Kenya)

Small-scale farmers in Kenya are particularly vulnerable to the adverse effects of climate change, which threatens food security and rural livelihoods. Unpredictable weather patterns, prolonged droughts, and the increased frequency of pests and diseases have led to significant declines in crop yields, impacting the economic stability of these farmers. Biotechnology offers innovative solutions to improve crop resilience and adapt to these challenges. This paper examines the role of biotechnology in enhancing crop resilience for small-scale farmers in Kenya, focusing on genetic engineering, molecular breeding, and bio-pesticides. Genetic engineering has enabled the development of crop varieties with enhanced resistance to environmental stresses such as drought, heat, and pests. For instance, genetically modified (GM) maize and cassava that are resistant to pests and drought have shown promising results in trials, potentially improving yields for small-scale farmers. Molecular breeding techniques, including marker-assisted selection, facilitate the rapid identification and incorporation of beneficial traits, such as disease resistance and drought tolerance, into crop varieties, which is crucial for developing resilient crops suited to local conditions. Bio pesticides offer an eco-friendly alternative to chemical pesticides, targeting specific pests without harming beneficial insects or the environment. Their use can reduce the pest pressure on crops, particularly in areas where chemical pesticides are less accessible or affordable for small-scale farmers. However, the adoption of biotechnology among small-scale farmers in Kenya faces several challenges, including limited awareness, regulatory barriers, and concerns about the safety and ethics of genetically modified organisms (GMO's).

Keywords: Small-scale farmers · Crop resilience · Agricultural biotechnology

The Use of Climate-Smart Agriculture to Increase Food Production Among Small-Scale Farmers in Kenya's Arid and Semi-Arid Lands (ASALs)

James Ndolo

Greenways Africa (Kenya)

Climate-smart agriculture (CSA) is an integrated approach that aims to increase food production, enhance resilience to climate change, and reduce greenhouse gas emissions. This strategy is particularly important for small-scale farmers in Kenya's arid and semi-arid lands (ASALs), where unpredictable weather patterns, prolonged droughts, and erratic rainfall significantly affect agricultural productivity. These regions face unique challenges due to their harsh climate, limited water resources, and degraded soils, which exacerbate food insecurity and poverty. This paper explores the role of climate-smart agriculture in increasing food production among small-scale farmers in Kenya's ASALs, focusing on sustainable land management, water conservation, and crop diversification. Key CSA practices, such as conservation agriculture, agroforestry, and water harvesting, are essential for building resilient farming systems in ASALs. Conservation agriculture, which includes minimum soil disturbance, permanent soil cover, and crop rotation, helps improve soil fertility and water retention, thereby enhancing crop yields. Agroforestry integrates trees into agricultural landscapes, providing multiple benefits, such as improved soil structure, increased biodiversity, and additional sources of income through products like fruit, fodder, and fuelwood. Water harvesting techniques, such as constructing terraces and micro-dams, capture and store rainwater, providing a critical resource for irrigation during dry periods. Crop diversification, including the adoption of drought-tolerant and early-maturing crop varieties, is another important CSA strategy for ASALs. These crops are better suited to the region's challenging climatic conditions and can improve food security and farmers' incomes.

Keywords: Climate-smart agriculture · Arid and semi-arid lands (ASALs) · Sustainable farming practices

Restoring Ecosystems Through Re-wilding in Kenya: Strategies and Challenges

James Ndolo

Greenways Africa (Kenya)

Re-wilding is emerging as a transformative approach to ecosystem restoration in Kenya, focusing on reintroducing native species, restoring natural processes, and enhancing biodiversity. This strategy aims to combat the effects of habitat loss, climate change, and human encroachment, which have led to significant declines in wildlife populations and ecosystem functions. By reintroducing key species, such as large herbivores and predators, re-wilding seeks to re-establish ecological dynamics and promote natural regeneration processes, thus creating self-sustaining ecosystems. Several strategies are being employed in Kenya to achieve successful re-wilding, including habitat restoration, species reintroduction, community involvement, and innovative funding mechanisms. Habitat restoration involves rehabilitating degraded landscapes through the planting of native vegetation and removal of invasive species, which provides the foundation for wildlife recovery. Species reintroduction focuses on the careful selection and reintroduction of extirpated species to re-establish functional ecosystems. Engaging local communities is crucial for re-wilding success, ensuring sustainable coexistence between humans and wildlife through education, economic incentives, and participatory governance. Innovative funding mechanisms, such as carbon credits and ecotourism, are vital for sustaining re-wilding projects. However, re-wilding in Kenya faces significant challenges, including human-wildlife conflicts, socio-economic constraints, and political instability. Human-wildlife conflicts often arise from competition over land and resources, threatening both wildlife populations and human livelihoods. Socio-economic constraints, such as poverty and lack of infrastructure, can impede the successful implementation of re-wilding initiatives. Furthermore, political instability and weak governance structures in certain regions complicate efforts to establish and maintain protected areas. Despite these challenges, re-wilding offers a promising path toward restoring Kenya's ecosystems and preserving its unique biodiversity.

Keywords: Re-wilding · Ecosystem Restoration · Biodiversity

Review paper on Dormancy Breaking Methods in Jute Mallow (Corchorus Sp.) Seeds.

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Jute mallow (Corchorus sp.) is an important African leafy vegetable in Kenya. It is highly nutritious and has commercial importance. Jute mallow seeds exhibit dormancy, reducing the number of germinating seeds and adversely affecting field performance. Limited research has been done on appropriate dormancy-breaking methods for jute mallow. In this study efficacy of various methods to break dormancy in jute mallow seeds was tested. Jute mallow seeds were subjected to the following methods; mechanical scarification, soaking in cold water for 24 hours, in hot water for 5 minutes, and in 1% potassium nitrate for 1 minute, leaching and applying wood ash paste on the seeds. A control experiment was also set up where the seeds were not subjected to any treatment. Four hundred seeds in 4 replicates of 100 seeds were set in Petri dishes lined with moist filter paper substratum for each method. The petri dishes were then put in a growth chamber set at a temperature of 23.5 C and 70% relative humidity. The number of seeds that germinated for each method was recorded daily for 14 days. Data obtained was initially analyzed by determining percent number of seeds that germinated and the percentage germination for dormancy breaking methods and the control. Analysis of variance (ANOVA) and Scheffe's multiple comparison procedure methods were used to identify which methods significantly differed from the control. The most effective treatment was mechanical scarification, followed by leaching and soaking in hot water. The rest of the methods did not significantly differ from the control. This study therefore recommended smallholder farmers to use mechanical scarification to break dormancy in jute mallow seeds before sowing.

Keywords: Jute mallow (Corchorus sp.)· African Leafy Vegetable

Restoring Ecological Integrity - Wetland Rehabilitation Efforts in Kenya

James Ndolo

Greenways Africa (Kenya)

Wetland rehabilitation in Kenya is a critical environmental initiative aimed at restoring the ecological integrity and functionality of these vital ecosystems. Wetlands in Kenya, which include marshes, swamps, bogs, and riverine systems, are essential for biodiversity conservation, water purification, flood control, and supporting the livelihoods of local communities. However, over the past few decades, Kenyan wetlands have faced significant degradation due to anthropogenic activities such as agriculture expansion, pollution, urban development, and climate change. Efforts to rehabilitate wetlands in Kenya involve a multi-faceted approach that includes reforestation, re-vegetation, soil stabilization, water management, and community engagement. Reforestation and re-vegetation initiatives focus on planting indigenous species to restore natural vegetation cover, which is crucial for maintaining hydrological cycles and providing habitat for wildlife. Soil stabilization techniques, such as contour planting and terracing, are employed to prevent erosion and sedimentation, which can further degrade wetland environments. Water management practices are also crucial in wetland rehabilitation, ensuring that natural water flows are maintained or restored to support the diverse flora and fauna dependent on these ecosystems. These practices include the creation of buffer zones, restoration of natural watercourses, and sustainable agricultural practices that minimize water extraction and pollution. Community engagement is fundamental to the success of wetland rehabilitation projects. Local communities are involved in the planning and implementation of rehabilitation activities, fostering a sense of ownership and stewardship over wetland resources.

Keywords: Wetland Restoration · Biodiversity Conservation · Community Engagement

Building Climate Resilience in Kenya - The Role of Community-Led Adaptation and Agricultural Reforms

James Ndolo

Greenways Africa (Kenya)

Wetland rehabilitation in Kenya is a critical environmental initiative aimed at restoring the ecological integrity and functionality of these vital ecosystems. Wetlands in Kenya, which include marshes, swamps, bogs, and riverine systems, are essential for biodiversity conservation, water purification, flood control, and supporting the livelihoods of local communities. However, over the past few decades, Kenyan wetlands have faced significant degradation due to anthropogenic activities such as agriculture expansion, pollution, urban development, and climate change. Efforts to rehabilitate wetlands in Kenya involve a multi-faceted approach that includes reforestation, re-vegetation, soil stabilization, water management, and community engagement. Reforestation and re-vegetation initiatives focus on planting indigenous species to restore natural vegetation cover, which is crucial for maintaining hydrological cycles and providing habitat for wildlife. Soil stabilization techniques, such as contour planting and terracing, are employed to prevent erosion and sedimentation, which can further degrade wetland environments. Water management practices are also crucial in wetland rehabilitation, ensuring that natural water flows are maintained or restored to support the diverse flora and fauna dependent on these ecosystems. These practices include the creation of buffer zones, restoration of natural watercourses, and sustainable agricultural practices that minimize water extraction and pollution. Community engagement is fundamental to the success of wetland rehabilitation projects. Local communities are involved in the planning and implementation of rehabilitation activities, fostering a sense of ownership and stewardship over wetland resources.

Keywords: Climate resilience · Community adaptation · Sustainable agriculture

Evaluating the Effectiveness of Community-Based Conservation Initiatives in Protecting Biodiversity in the Kakamega Tropical Rainforest

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Community based conservation initiatives play a crucial role in preserving biodiversity, particularly in biodiversity rich yet vulnerable regions such as the Kakamega Tropical Rainforest in Kenya. This study evaluates the effectiveness of these initiatives by examining their impact on biodiversity conservation, community engagement, and sustainable management practices. The Kakamega Rainforest, one of the last remnants of tropical rainforest in East Africa, faces significant threats from deforestation, illegal logging, and encroachment. Community based programs aim to address these challenges by integrating local knowledge and practices into conservation strategies, promoting sustainable resource use, and enhancing local stewardship of natural resources. Our evaluation employs a mixed-methods approach, combining quantitative assessments of biodiversity metrics with qualitative analyses of community perceptions and involvement. Data were collected through field surveys, interviews with local stakeholders, and review of conservation program reports. Preliminary findings indicate that community-based initiatives have led to increased local participation in conservation activities and improved awareness of biodiversity issues. Notable successes include the establishment of community managed forest areas and the implementation of sustainable agroforestry practices, which have contributed to the preservation of key species and habitats. However, challenges persist, including insufficient funding, limited capacity for enforcement, and ongoing socio economic pressures that undermine conservation efforts. The study highlights the importance of fostering stronger partnerships between local communities, governmental bodies, and non-governmental organizations to enhance the sustainability and impact of conservation programs. By addressing these challenges and leveraging community strengths, conservation initiatives in Kakamega can potentially serve as a model for similar efforts in other biodiversity hotspots. The findings underscore the need for adaptive management approaches that balance ecological objectives with community needs to achieve long-term biodiversity protection.

Keywords: Community Based Conservation · Biodiversity Protection · Kakamega Rainforest

Assessment of the impact of landscape restoration to Social economic improvement of communities under TerraFund for afr100 interventions, case study, Boneza Landscape

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Land degradation is a pressing environmental issue across sub-Saharan Africa, and efforts to rehabilitate degraded landscapes through Forest Landscape Restoration (FLR) have met with varying degrees of success. This study seeks to fill the gap in evidence regarding FLR outcomes by evaluating its impact on socio-economic improvements in communities within the TerraFund for AFR100 interventions in the Boneza Landscape region of Rwanda. Using focus group discussions (FGDs), household surveys, key informant interviews (KIIs), and field observations, the research aims to assess how FLR projects in the Lake Kivu and Rusizi River Basin areas affect community livelihoods. We anticipate that FLR will enhance access to vital resources such as employment, food, education, and healthcare, thereby supporting overall community well-being. To maximize benefits, we suggest integrating socio-economic and political data more effectively into FLR planning and implementation, enhancing informational resources, and developing comprehensive monitoring and evaluation protocols to measure both direct and indirect impacts of FLR initiatives.

Keywords: Forest Landscape restoration · Sustainable livelihoods · Policy attention · Lake Kivu and Rusizi River Basin · Boneza Landscape

Influence of Accessibility On Tourism Sustainability In Selected Sites of Nandi County - Kenya

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University of Eldoret (Kenya)

Accessibility is a critical factor in sustainable tourism due to its significant contribution to tourism development. This factor influences the number of tourist visits, which significantly impacts tourism growth in tourist destinations. This study aims to determine the influence of accessibility on tourism sustainability in selected tourism sites in Nandi County, Kenya. Primary data was collected from 239 tourists interviewed at various sites in Nandi County. A Stratified sampling technique was used to cluster the tourist sites, and simple random sampling was employed to select the correspondents. Data was analyzed using both descriptive and inferential statistics, including percentages, frequencies, means, standard deviations and regression analysis. The Statistical Package for Social Science (SPSS) version 21 facilitated data analysis. The findings revealed that accessibility ($\beta = .695, p < 0.05$) had significant and positive effect on tourism sustainability. The study concluded that accessibility enhances tourism sustainability and recommended improvements to access roads and signage to further boost accessibility.

Keywords: Tourism Kenya · Sustainability · Nandi County

Determination of Proximate Extract Yield, Phytochemical, Nutritional and Mineral Profiles of Ocimum Gratissimum L and Rhoicissus Tridentata L F Antiplasmodial Plants

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University of Eldoret (Kenya) and Kenya Medical Research Institute (Kenya)

Malaria is a global health crisis. Drug resistance underscores the urgency of developing new antimalarial treatments. Currently, medicinal plants are being explored for potential solutions, offering hope in the fight against this deadly disease. This study examines the medicinal potential of Ocimum gratissimum and Rhoicissus tridentata through comprehensive analyses of their phytochemical, nutritional, and mineral profiles, aiming to assess their potential for malaria treatment. The O. gratissimum and R. tridentate extracts were subjected to qualitative and quantitative phytochemical screening for the identification ofÂă metabolites. Phytochemical screening identified a range of bioactive compounds, including alkaloids, flavonoids, Quinone's, phenols, and carotenoids in both plants. Quantitative analysis revealed that O. gratissimum roots had the highest alkaloid content ($6.2 \pm 0.1 mg/g$) compared to its leaves ($5.7 \pm 0.0 mg/g$), while R. tridentata leaves exhibited higher alkaloid levels ($3.9 \pm 0.1 mg/g$) than its roots ($1.3 \pm 0.0 mg/g$). Carotenoid concentrations were notably higher in R. tridentata roots ($6.8 \pm 0.2 mg/g$) compared to O. gratissimum roots ($0.7 \pm 0.1 mg/g$). Methanol proved to be the most effective solvent, achieving extraction yields of 28.3% from O. gratissimum leaves and 26.5% from R. tridentata roots, surpassing hexane and dichloromethane in efficacy. Nutritional analysis showed that O. gratissimum roots had the highest moisture content (45%), while R. tridentata leaves had the highest ash content (25%). Protein content was highest in O. gratissimum leaves (35%) and R. tridentata roots (30%), whereas carbohydrates were more abundant in R. tridentata roots (35%) than in its leaves (25%). Mineral analysis revealed that O. gratissimum roots were rich in iron, zinc, and manganese, while its leaves had higher potassium and magnesium. In contrast, R. tridentata leaves were higher in sodium, zinc, iron, copper, and manganese, with potassium and magnesium more concentrated in its roots. These results provide validity to the traditional medicinal usage of these plants by herbalists and traditional medicine men. These results equally highlight the significant therapeutic potential of both plants for malaria treatment. There is need for further research to isolate and characterize specific bioactive compounds for enhanced efficacy.

Keywords: Proximate Extract Yield · Phytochemical · Nutritional · Mineral Profiles · Nutritional · Antiplasmodial

Sustainable Conservation and Multiplication of East African Sandalwood for Ecosystem Restoration and Livelihood Improvement

David Kiruhi

Nettle World (Kenya) and Kenya Forestry Research Institute (Kenya)

East African Sandalwood (Osyris lanceolata), a highly valued and endangered species, at risk of extinction due to unsustainable harvesting practices. In response, Nettle World, a community-driven initiative, dedicated to the conservation, domestication, and multiplication of this precious tree. We aim to sustainably utilize East African Sandalwood to address pressing issues such as ecosystem degradation, poverty, malnutrition, and conflicts within local communities. Collaborating with the Kenya Forestry Research Institute (KEFRI), Nettle World combines community engagement with scientific research to enhance conservation efforts. Since starting in 2013 with just 54 seedlings, we have successfully propagated over 250,000 Sandalwood seedlings alongside other indigenous and fruit-bearing trees. To date, more than 180,000 seedlings have been planted on community farms, and we currently manage over 50,000 mature Sandalwood trees serving as mother stocks in member farms. Our initiative also includes three Sandalwood nurseries on community farms, generating economic benefits through seedling sales, seed collection, and the improvement of ecosystem services. This approach not only enhances livelihoods but also fosters peace and social cohesion within the community. East African Sandalwood is highly resilient, capable of thriving in harsh climatic conditions, making it ideal for combating desertification. Its unique requirement for a host plant encourages biodiversity, as planting Sandalwood also promotes the growth of companion species, thereby increasing tree cover. As a valuable agroforestry species, it can be intercropped with other trees and food crops, providing farmers with an attractive alternative source of income.In conclusion, promoting the cultivation of East African Sandalwood offers an innovative approach to sustainable environmental restoration and socio-economic development, encouraging more farmers to adopt this remarkable species.

Keywords: East African Sandalwood · Osyris lanceolata · Conservation· Agroforestry · Ecosystem restoration · Sustainable livelihoods

Morphological Genotypes of Jute Mallow (Corchorus Olitorius) Germplasm

Gichana Maxmiller· Claire MÃľdard

University of Eldoret (Kenya) and French Institute for Sustainable Development (IRD) (France)

Jute mallow (Corchorus olitorius) is an important African leafy vegetable in Kenya including North Rift region. It is highly nutritious and source of revenue for the farmers producing it and traders who produce and sell the produce. The plant has medicinal value as well as other advantages like being resistant to pests, diseases and can tolerate and establish in poor soils. The challenge of unavailability of improved cultivars for planting has hampered farmers increasing crop productivity leading to underutilization of the vegetable. One of the ways of solving such hindrances is by doing genetic enhancement which needs assessment of morphological diversity. The objective of research was to do morphological characterization of Jute mallow. The seed germplasm was collected from five counties in Kenya and seed sample planted at green house and morphological traits picked. The descriptors used for morphological identity include colour of stem, flower, leaf, seed, shape of leaf, as well as height of plant. Leaf length and width, pod numbers and number of seeds. Analysis of variance (ANOVA) was done and means separated using least significant difference (LSD). Statistical package used was Genstat version 12. The outcome showed two morphotypes based on colour and two based on plant height as morphotype 1 and 2 green short and green tall respectively and morphotype 3 and 4 (brown short and brown tall). It was concluded that the Jute mallow germplasm has varied morphotypes and recommended for breeders to do purification on germplasm to come up with high yielding morphotypes for farmers use at production process.

Keywords: Jute mallow · African leafy vegetables · Kenya

Assessing the Impact of Climate Change on Ecosystem Services - A Case Study of Loiyangalani Oasis in Turkana

Maximilla Adhiambo Wafula

Ecoprenuer for Climate Change (Kenya)

Climate change poses significant risks to ecosystem services, particularly in vulnerable regions such as the Turkana Oasis in Kenya. This study assesses the impact of climate change on ecosystem services at Loiyangalani Oasis, a crucial water source and ecological refuge in the arid Turkana region. Loiyangalani Oasis provides essential services including water regulation, habitat provision, and support for local livelihoods, making it an important focal point for understanding climate impacts in arid environments. The research employs a multi-disciplinary approach, incorporating climate data analysis, field surveys, and stakeholder interviews to evaluate changes in ecosystem services over time. Temperature and precipitation trends are analyzed to identify shifts in climate patterns, while ecological surveys assess the health and functionality of key services such as water availability, vegetation cover, and biodiversity. Interviews with local communities provide insights into perceived impacts on livelihoods and traditional knowledge regarding ecosystem changes. Findings indicate that climate change is significantly affecting ecosystem services at Loiyangalani Oasis. Increased temperatures and altered precipitation patterns have led to reduced water levels, altered plant species composition, and increased frequency of droughts. These changes negatively impact local biodiversity, reduce the oasis's capacity to support wildlife, and threaten the water supply crucial for both human and ecological needs. The study highlights the need for adaptive management strategies to mitigate the effects of climate change on ecosystem services. Recommendations include strengthening water management practices, restoring degraded areas, and enhancing community resilience through adaptive measures.

Keywords: Climate Change · Ecosystem Services · Loiyangalani Oasis

The Role of Urban Green Spaces in Enhancing Urban Biodiversity and Ecosystem Health - An Analysis of Lodwar Town

Maximilla Adhiambo Wafula

Ecoprenuer for Climate Change (Kenya)

Urban green spaces are increasingly recognized for their role in enhancing biodiversity and promoting ecosystem health within cities. This study examines the impact of urban green spaces on biodiversity and ecosystem health in Lodwar Town, a rapidly growing urban area in Kenya's arid northern region. As urbanization accelerates, the preservation and strategic development of green spaces have become critical for maintaining ecological balance and improving residents' quality of life.The research employs a combination of ecological surveys, spatial analysis, and community interviews to assess the effectiveness of existing green spaces in supporting urban biodiversity and contributing to ecosystem health. Data collected include species diversity indices, habitat quality assessments, and resident perceptions of green space benefits. Findings reveal that green spaces in Lodwar, such as parks, community gardens, and riparian zones, provide essential habitats for a variety of plant and animal species, contributing to an overall increase in urban biodiversity. These spaces also support ecosystem functions such as air purification, temperature regulation, and stormwater management, which are vital in mitigating the impacts of urban heat islands and enhancing environmental quality.Despite these benefits, challenges remain in maximizing the potential of urban green spaces. Issues such as inadequate maintenance, limited access, and competing land use pressures hinder the effectiveness of these areas. The study highlights the need for improved planning and management strategies, including community involvement in green space development and maintenance, to ensure that these areas continue to support biodiversity and ecosystem health.

Keywords: Urban Green Spaces · Biodiversity · Ecosystem Health

Engagement of local actors in landscape restoration - A case study of financing, advocacy, and inclusion in the Great Rift Valley

Jim Israel Mwanda · Walter Arose · Vera Ondere

Janem Limited (Tanzania) and Beekline Conservants NGO Machakos (Kenya) and Women Kenya Network - Nairobi (Kenya)

Restoration of landscapes in the Great Rift Valley is not only important for preserving the environment, but also for improving the social fabric and the proactive capacities of the communities in the area. It explores how local stakeholders especially community-based organizations, women groups and youth have participated in the restoration process in the region. One of the most ambitious efforts of restoration has been targeting dry and semi dry parts of the Great rift valley as the local stake holders can mobilize themselves towards looking for interventions to rejuvenate the barren land. Over the last few years, the scaling up of restoration activities has been made easier through the use of community driven financing mechanisms such as micro loans, specific business revolving funds and joint ventures with local enterprises. While undertaking the restoration activities, these initiatives have also made communities to gain economically as there are employment opportunities and improved farm production. Apart from funding, there were also campaigns, lobbying and advocacy that helped to engage other actors at the local level. Women and indigenous people benefitted from mobilizing grassroots support and became active contributors. This integrating strategy has enhanced not only the efficiency in carrying out restoration activities but has also made it possible for people to experience the benefits of the activities across communities. These collective efforts have also resulted in the enhancement of soil fertility, improved water conservation and a rise in biodiversity in the region. The case study shows that addressing local constituencies by means of appropriate financing, targeted messaging, and incorporating relevant participation yields better treatment of landscapes. The transaction which has been successful in the Great Rift Valley is a good example of how regions can strive towards conserving the environment, engaging in economic activities and being inclusive of all members of society.

Keywords: Restoration · Advocacy · Awareness · Landscapes

The Role of Vegetation Health and Nature Based Solutions in Mitigating Climate Change in River Isiukhu Basin

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Assessment of how well Nature based Solutions (NbS) can offset climate change is vital for mitigation and adaptation planning, but has rarely been done. Therefore, this study aimed to assess the role of NbS and vegetation health in mitigating the effects of climate change in River Isiukhu basin using Normalized Difference Vegetation Index (NDVI) and Normalized Difference Bare Soil Index (NDBSI). NDVI and NDBSI were derived from Google Earth Engine and ArcGIS Pro 3.2. Precipitation and temperature data was collected from Climate Hazards Group InfraRed Precipitation with Station dataÂă(CHIRPS) and TERRACLIMATE respectively. The relationship between remote sensing indices (NDBSI/NDVI) and temperature/precipitation were explored using Pearson correlation. Three major NbS projects were noted in the region. NDVI increased by 35% between 1990 to 2023. The increases were noted between 1990-2013 while declines were noted between 2013-2023. NDBSI decreased between 1990-2013 and increased between 2013-2023. In terms of climate variability, the overall precipitation increased by 22.7%(427.3 mm) between 1990 -2023. The mean temperature increased by 7.43%($1.5°C$) between 1990-2023. There was a positive relationship between precipitation and NDVI (r = 0.5549) and a negative correlation between precipitation and NDBSI (r = -0.139). Temperature was both positively correlated with NDVI (r = 0.8237) and NDBSI (r = 0.1916). Therefore, vegetation health and cover greatly controlled the climatic conditions of River Isiukhu basin. This study prioritises the adoption of NbS for climate change mitigation in River Isiukhu Basin. The study findings can be used as a reference for measuring the effectiveness of NbS in mitigating climate change in Kenya, regionally and the world.

Keywords: Nature based solution · Normalized Difference Bare Soil Index · Climate Change · Normalized Difference Vegetation Index · Degradation

Enhancing Rural Water Resilience - The Role of Stormwater Harvesting in a Changing Climate, The case of Kapseret Sub-county, Kenya

Biwott Gladys C · Janet Korir

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Climate change has escalated the frequency and severity of extreme weather events, including floods and droughts. These present considerable challenges to water security, particularly in rural areas these areas generally lag behind in development. In these regions, traditional water supply systems are often limited, making alternative strategies for enhancing water availability crucial. Stormwater harvesting (SWH) emerges as a promising approach to address these challenges by capturing and utilizing runoff from precipitation events. This proposal explores the potential of stormwater harvesting to enhance water security in rural areas amidst the growing impacts of climate change. The study aims to assess the effectiveness of existing stormwater management strategies, identify challenges to SWH in rural environments , and provide recommendations for sustainable SWH in rural areas to enhance water security. The research will utilize a mixed-methods approach, including a comprehensive review of existing literature, field surveys to assess current SWH practices, and interviews with local stakeholders. The focus will be on understanding how SWH can improve water availability, mitigate the impacts of climate variability, and support agricultural and domestic water needs. Expected outcomes include a detailed assessment of the benefits and limitations of existing SWH strategies in rural areas, practical approaches of overcoming implementation barriers, and strategies for integrating SWH into existing water management frameworks. The findings will contribute to developing more resilient and sustainable water management solutions that enhance water security for rural populations in the face of climate change.

Keywords: Water security · stormwater harvesting · resilience · climate change · rural areas

Effects of Seed Storage, Moisture Content and Temperature on Seed Viability and Vigor of Spider Plant (Cleome gynandra L.)

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African leafy vegetables play an important role in the diet of Kenyan population. These vegetables mainly propagated by women are affordable, available with medicinal content and varied taste thus exists as cultivated or semi-cultivated crop with ecological, social and cultural values. Spider plant (Cleome gynandra L.), also called cat's whiskers is an erect annual herbaceous plant, belonging to the family Capparaceae and genus Cleome which grows up to a height of 60 cm. It's an important source of micronutrients including minerals, vitamins (A, B and C), proteins and dietary fibers hence known for medicinal purpose. Study was conducted in 2022 at the department of seed crop and horticulture science, University of Eldoret in seed science laboratory with the help of supervisor, international renowned researcher and lab technicians using ISTA Protocol on seed germination test and viability (tetrazoliun chloride test) in three seed lots to determine the seed quality. Using forceps, 50 seeds were counted and placed on glass petri dish then sterilized with $10-1$ water/bleach solution for 5 min and rinsed with distilled water. Effect of five seed moisture contents ($5, 7, 8, 10$ and 12% on fresh weight basis), three storage temperature (ambient, $15°C$ and $-20°C$) and eight storage periods (0, 3, 6, 9, 12, 18, 24 and 36 months) on seed longevity revealed critical moisture content required in seeds for retaining germination after storage of seeds up to 36 months of seeds for ambient storage condition of Cleome gynandra L. was 5%, which increased to 7% in $15°C$ and 12% at $-20°C$ storage temperature. The seeds exhibit orthodox storage behavior and are ideal to conserve in seed/gene banks. In conclusion, study results showed Cleome gynandra L. seeds reduced with increasing storage time and no germination took place after 7 days after seed sowing.

Keywords: Spider plant (Cleome gynandra L.) · Germination Test · Seeds · Storage · Tetrazoliun Chloride Test

Evaluation of Food And Energy Security Status In Keiyo North, Kenya

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Education sector is at the center of any nation economic, social, and political progress. It forms a primary source of skilled labor force, invention and innovation. The Kenyan government understands the importance of education system hence increasing the number of high learning institutions, and development of policies that aid in streamlining the system. It is government wish to have quality professional who can provide sound and robust solutions to emerging and ever- changing societal challenges. Unfortunately, for the past decade the government have not yet reached fruition and most institutions are producing graduates who have no capacity, skills and knowledge in providing evidence-based solutions. The situation has aggravated unemployment rates as the graduate seem not to meet employer's requirement and hence labelled as âĂIJHalf bakedâĂİ. The government on its endeavor to arrest the situation is hindered by the inadequate resources and human resources allocated to higher learning institutions. Hence forcing the university to come up with strategies to impart modern skills to their students. University of Eldoret is currently boasting of its field course strategy which for the past three years has seen the students receive mentorship and skills that are responsible for quality professionals. In 2021 undertook a field course training aimed at societal challenges i.e. food and energy security and within their research and disciplines were able to diagnose specific challenges and the variable comprising it. Working in multidisciplinary to develop workable solutions to the identified challenges. Questionnaires were used to capture socio- economic data, soil fertility and biodiversity field assessment methods to collect data on tree species diversity, energy source diversity and soil fertility. The data collected were subjected to IBM SPSS version 20 and EXCEL 2016 spread sheet for analysis hence identified declining soil fertility, inappropriate agronomic practices, poverty and illiteracy as the main factors impeding Keiyo North from achieving their food and energy security. Climate change sensitization, efficient cropping systems and adoption of technologies and high value crops that are resilient to drought were among the main recommendations

Keywords: Food · Energy · Keiyo North · Kenya · Climate change

Allelopathic Potential of Achyranthes aspera and Tagetes minuta Leaf extracts on Seed Germination of Maize, Millet, Rice and Sorghum

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Achyranthes aspera is a weed of the family Amaranthaceae and grows to about 2 meters high. Tagetes minuta is a weed of the family Asteraceae that grows to a height of 1-2 meters. The two plants are major weeds of cultivated crops. They have been documented to possess allelopathic activities. Losses due to weeds have been estimated to be more than those caused by pests and diseases. It is for this reason this study was carried out to determine the allelopathic potential of Achyranthes aspera and Tagetes minuta crude leaf extracts on seed germination of maize, millet, rice and sorghum. Leaves were collected from farm fields, shade dried followed by extraction using water and ethanol. Five surface sterilized seeds were placed in each petri dish. Thirty (30) millilitres of extracts was used with distilled water set as positive control. This was laid out in a completely randomized design with three replications at $25 \pm 2°C$. The emerged plumule and radicle lengths were recorded after seven days and germination percentages calculated. The extracts exhibited significant inhibitory effect on plumule and radicle lengths of maize, millet, rice and sorghum (pâĽď0.05). Millet had the highest germination percentage of 89.44% while rice had the lowest at 67.78%. Generally, the extracts interfered with the germination and growth of these plants. Therefore, when A. aspera and T. minuta are present in farm fields, there is a substantial probability that maize, millet, rice, and sorghum will grow poorly. This could significantly lower yields, ultimately leading to food insecurity.

Keywords: Allelopathy · allelochemicals · Weeds · Achyranthes aspera · Tagetes minuta· ANOVA

Addressing widespread biases on phytoplankton research within the tropics

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Climate change and pollution comprise two of the most important sources of anthropogenic stress in many estuarine ecosystems. In tropical ecosystems, the impacts of climate change on coastal productivity and food-web structures are poorly understood. This study examined the response of the model diatom Thalassiosira weissflogii to the combination of climate change and pollution stressors. stressors. The cultures were set up in the wet lab at the University of Cape Coast, Ghana, and acclimatized for three months under aquatic conditions like those observed in coastal ecosystems along the Gulf of Guinea. The acclimatized diatoms were exposed to varying degrees of climate stressors (temperature, pH, and acidification) in combination with different concentrations of pyrene and cadmium mixtures. Their response was determined by assessing the functional attributes that mediate productivity in aquatic ecosystems i.e., growth rate, chlorophyll-a, and dry biomass. The combination of climate change and pollution stressors resulted in reduced growth rates, chlorophyll-a ($\mu\ g/L$), and dry biomass concentrations ($\mu\ g/L$) when compared to the control treatments. The greatest reductions in these functional attributes were recorded in the treatments with the highest concentrations of pyrene and cadmium mixtures ($1000\mu\ g/L$) i.e., Treatments with 15 PSU salinity and $1000\mu\ g/L$ of cadmium and pyrene mixtures recorded the highest reduction in cell densities (50.47%). Notably, exposure to higher degrees of stressors increased the chlorophyll-a and biomass concentrations per cell when compared to cumulative concentrations per volume. These observations emphasize the need to evaluate diatom response to stressors beyond just the loss of cells, and more towards processes that occur within the cell. The findings of this study are particularly significant in providing species-specific parameters for modelling the impacts of global change in coastal ecosystems, particularly in tropical ecosystems.

Keywords: Africa · aquatic productivity · climate change · phytoplankton research· research biases · tropical ecosystems

Assessment of stocking, productivity, and aboveground biomass of tree species used as fuelwood in Rwanda's agricultural landscapes

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Tree-based systems (TBS) in the agricultural landscape of Rwanda do supply considerable amounts of fuelwood to the local communities. However, there needs to be more information on the available stocking, aboveground biomass (AGB), and productivity of the trees used for fuelwood. The study aims to assess the common tree species used for fuelwood and quantify the biomass stock across various TBS in the agricultural landscape. The study used a systematic sampling design, establishing 130 band transects, each measuring 2 km x 5 m. The transects were systematically distributed across the Bugesera and Musanze Districts, representing low and high-altitude regions. In Bugesera District, the common tree species for fuelwood use were Grevillea robusta, Eucalyptus spp., Senna spectabilis, and Markhamia lutea. The results indicated that the mean stem density and AGB of Eucalyptus spp. and S.spectabilis were substantially higher than other species. Across all TBS categories, trees covered an average stem density of 50 stems/ha and an AGB of 2.07 t/ha. The stem density and AGB were substantially higher in boundary plantings and mixed cropping than in other TBS. Most trees in all TBS categories had a DBH ranging from 1-5 cm, except for the woodlot, where trees had a DBH ranging between 5.1-10 cm. In Musanze District, the common tree species for fuelwood use were G.robusta, Eucalyptus spp., Alnus acuminata, and M.lutea. The mean stem density, standing AGB, and productivity of Eucalyptus spp. were substantially higher than those of the other species. Across all TBS, trees covered an average stem density of 109 stems/ha and AGB of 5.38t/ha. The number of stems and AGB were substantially higher in boundary plantings and woodlots than in mixed cropping, live fences, and home gardens. Furthermore, the results on fuelwood supply indicated that S.spectabilis in Bugesera and Eucalyptus spp. in Musanze have a higher potential to produce higher biomass in short rotation.

Keywords: Agroforestry · fuelwood · cooking · stem density · biomass

Integration of IoT and AI Technologies Toward's Climate Change and Ecosystem Restoration

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Climate change and ecosystem degradation are pressing environmental challenges in the 21st century, resulting from both natural and human activities. As global temperatures rise and natural habitats face increasing threats, innovative solutions like the Internet of Things (IoT) and Artificial Intelligence (AI) offer promising mitigation strategies. This study examines IoT and AI applications in climate change mitigation and adaptation, ecosystem restoration, and conservation. In climate change mitigation, the research explores how these technologies improve energy efficiency in buildings, optimize renewable energy integration, and guide sustainable transportation. For adaptation, it highlights their contributions to early warning systems for natural disasters and urban resilience. In ecosystem restoration and conservation, the study examines applications in biodiversity monitoring, habitat management, and invasive species control. The integration of these technologies enables more precise, data-driven approaches towards climate change mitigation, facilitating ecosystem restoration and endangered species protection. Findings demonstrate that IoT and AI significantly improve energy efficiency and renewable energy integration, enhance early warning systems and urban resilience, and enable more accurate monitoring of biodiversity and habitats. Despite their significant potential, challenges remain in energy consumption, data management, and privacy concerns. By addressing these issues and identifying future research directions, the study provides a way forward for stakeholders to harness these technologies for a sustainable future.

Keywords: Climate Change · Internet of things · Artificial intelligence · Mitigation · Ecosystem restoration · Conservation

Sustainable Urban Agriculture and Climate Change Initiatives in the Great Rift Valley - Challenges and Policy Implications

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Over the past decade, rapid urbanization in Kenya's Great Rift Valley has placed immense pressure on natural resources, intensifying climate vulnerabilities. Sustainable urban agriculture (SUA) has emerged as a viable strategy to address food security challenges and mitigate the effects of climate change. The region faces erratic rainfall, prolonged droughts, and soil degradation, which negatively impact food production. SUA, if integrated into urban planning and climate action plans, could improve food security, reduce carbon footprints, and enhance green spaces. Urban farmers would benefit from climate-smart technologies, knowledge, and support from local governments. Kenya's policy response includes the Climate Change Act (2016) and the Urban Areas and Cities Act (2011), aimed at fostering sustainable practices and urban resilience. County governments have also implemented local frameworks to support urban farming. However, these policies have weaknesses, such as limited resource allocation, insufficient stakeholder engagement, and poor grassroots implementation. Additionally, they fall short of explicitly addressing urban agriculture as a tool for climate resilience. Challenges facing sustainable urban agriculture include inadequate infrastructure, lack of technical knowledge, and weak enforcement of climate policies. There are also gaps in research, funding, and capacity building for urban farmers. If these issues are not addressed, the region risks worsening food insecurity, unemployment, and environmental degradation, further weakening its resilience to climate change. Key policy recommendations include enhancing collaboration between governments, academia, and communities, investing in climate-smart technologies, strengthening legal enforcement, and incentivizing sustainable practices. Academia should focus on researching adaptive strategies and extending knowledge to farmers, ensuring SUA contributes to food security and climate resilience in the Great Rift Valley.

Keywords: Sustainable Urban Agriculture · Climate Change · Food Security · Great Rift Valley

Gender Roles Shifts and Family Cohesion amidst Climate Change in Wajir West Sub County, Kenya

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Climate change has significantly altered gender roles and disrupted family cohesion in Wajir West Sub-County, Kenya. This study explores how environmental stressors such as droughts and floods have forced women to assume traditionally male responsibilities, and how these shifts affect various aspects of family cohesion. The Gender and Development (GAD) framework guided the qualitative research, which involved 16 women from 16 families, purposively sampled for in-depth interviews and focus group discussions (FGDs). Data were analyzed using NVivo software, with strict adherence to ethical protocols, including informed consent and confidentiality. The findings indicate that climate change has strained family cohesion in several key areas. Emotional support within families has weakened, as women, now burdened with increased responsibilities such as securing food, water, and firewood, have less time to nurture familial relationships. Communication between spouses has deteriorated, with many men absent or disengaged, leading to misunderstandings and unresolved conflicts. The parent-child bond has also been affected, as children are often required to assist in household tasks, limiting opportunities for education and leisure activities. Decision-making within households has shifted, with women taking on leadership roles, which has created tensions in marital relationships where traditional power dynamics are challenged. Additionally, women report heightened levels of psychological stress as they attempt to balance caregiving duties with their new economic roles. Instances of gender-based violence (GBV) have risen, particularly when women fail to meet their partners' expectations. While women have formed community-based support networks to mitigate these challenges, these networks are insufficient to fully address the impact on family cohesion. The study concludes that gender-sensitive climate adaptation programs are essential to provide support for women and promote family stability amidst climate change.

Keywords: Climate change · Gender roles · Family cohesion · Wajir West · Kenya · Gender-based violence

Restoration and Climate Resilience in Traditional Authority Mwadzama, Nkhotakota District, Malawi

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This abstract explores the critical solution strategies for enhancing ecological restoration and climate resilience in Traditional Authority Mwadzama, Nkhotakota District, Malawi. The region faces significant environmental challenges, including deforestation, soil degradation, and water scarcity, exacerbated by climate change. The proposed solution integrates community-led restoration initiatives, sustainable land management practices, and climate adaptation strategies.ÂăKey components include empowering local communities through education and involvement in decision-making processes to ensure sustainable practices and conservation efforts through our JL green farm, implementing large-scale tree planting and forest management programs to restore degraded lands, enhance biodiversity, and improve soil and water conservation. JHZ enterprise is working with 2 youth networks on forest project which is consists of 15 youth clubs and 10,000 polythene tube, tree seeds disbursed for tree nurseries. Promoting agroforestry and conservation agriculture to increase soil fertility, reduce erosion, and adapt to changing climatic conditions. JHZ is promoting organic fertilizer manure selling and processing. The enterprise sold about 1000 bags to small holder farmers through outlet shops in the year 2023-2024 season. JHZ also promoting agroforestry at its JL green farms for conservation learning center for farmers. Developing rainwater harvesting systems and improving irrigation techniques to ensure reliable water sources for agriculture and domestic use. Introducing adaptive strategies such as drought-resistant crops and early warning systems to mitigate the impacts of climate variability. JHZ is also a leading enterprise in selling certified seeds. We had about 6,000 customers bought certified seed from our shop from last season. The solution emphasizes a holistic approach that combines traditional knowledge with modern techniques to foster ecological balance and build resilience against climate change. By addressing both environmental degradation and community needs, the project aims to create a sustainable future for Traditional Authority Mwadzama and whole Malawi nation.

Keywords: Community Engagement · Sustainable Agriculture · Climate Resilience · Mwadzama Nkhotakota

The effect of Coumarin additives on optoelectronic properties and power conversion efficiency of Formamidinium based-perovskite solar cells

Chepngetich N · Mumbi G · Kemboi B · Tuimising J · Yegon G.K · Chepkwony S · Koech R.K

Coumarin additive · perovskite film · power conversion efficiency · SCAPS-1D

Perovskite solar cell (PSC) is among the emerging photovoltaic technologies known for their high solar power conversion efficiency (PCE) and low manufacturing costs. However, their solution based processing leads to the formation of defects within the bulk of the perovskite layer and at its interfaces with the charge transport layers. These defects act as charge trapping centers and provide the degradation routes which not only reduces the PCE of perovskite solar cells but also leads to instability issues. Various defect passivation strategies have been developed but the use of additives appears to have gained preferences over the others. In this work, 1-D Solar cell capacitance simulator (SCAPS-1D) was employed to study the effects of Coumarin additive on the PCE of formamidinium-based PSC. Parametric studies were carried out on the Coumarin modified PSC device in order to identify routes for further improvement in the PCE. It was found that a further reduction in defect density, band gap and series resistance together with an increase in the charge carrier mobilities are important in achieving higher PCE. This study provides an insight into the role of additives in enhancing the PCE of PSC and the output serves as a reference to guide the design of effective experimental model PSC devices.

Keywords: Coumarin additive · perovskite film · power conversion efficiency · SCAPS-1D

Farmers Adaptation To Climate Change In Nakuru County, Kenya

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As a key sector in KenyaâĂŹs economy, agriculture is threatened by the changing climate over the years, which has negatively influenced productivity. Approximately 98% of agriculture in Kenya is rain-fed and depends entirely on the bimodal rainfall. This has led to wide recognition of farmer adaptation strategies as fundamental and necessary responses to the threat posed by the current and future climatic changes. The objectives of this study were to assess farmers' perceptions of current and future climate change, identify their current and future adaptation strategies, and determine the factors influencing their choice of these strategies. A total of 2 focus group discussions (FGDs) and 240 structured interviews within Subukia sub-County were carried out. The findings of this study reveal more extreme climate variability, with hot temperatures and strong sun posing stress to farmers in the study area. Early planting, livestock rearing, short-season crops, tree planting, irrigation, and off-farm activities were the main adaptation strategies of interest to the farmers. Further, group membership, remittances, irrigation, access to climate-related information, level of education, and main income source influenced choice of adaptation strategies to climate change. Additionally, land size owned and group membership influenced the number of current livelihood activities selected by the farmer. In conclusion, promoting group membership, improving access to climate information, expanding irrigation schemes, and encouraging tree planting are necessary to enhance farmers' resilience to climate change.

Keywords: Agriculture · climate change · adaptation strategies · Kenya

Assessing The Effectiveness of Nature-Based Solutions In Enhancing Resilience And Adaptation Among The Maasai Community of Emboreet Village, Simanjiro District, Manyara Region, Tanzania

Murigi Mwangi

Climate change, environmental degradation is at the centre of underdevelopment and challenges facing many communities across the globe. Due to increased environmental challenges the need for sustainable solutions to counter climate change and environmental challenges cannot be overlooked. Building environmental resilience among communities has made it essential to delve deeper into innovative strategies that not only capitalize on the natural world's inherent resilience but also actively involve and empower local communities to adapt and flourish in a sustainable manner. The Maasai community in Emboreet Village grapples with multifaceted challenges, including erratic weather patterns, declining natural resources, loss of grazing lands, food insecurity, limited access to clean water, inadequate healthcare facilities and educational opportunities. Inadequacy of conventional development interventions in addressing challenges exacerbating from environment affects the achievement of resilience and sustainable development in this community. This study analysed the effectiveness of nature-based solutions in adapting and enhancement of resilience among members of Emboreet community in Tanzania. Resilience theory and socio-economic systems theory informed the study. A concurrent mixed method research approach employing exploratory design was used. Household heads and residence of Emboreet for more than ten years formed the unit of analysis. Household questionnaire, key informant interviews, observation and focus group discussion were utilized in gathering data. The researchers employed descriptive statistical analysis, spatial analysis and thematic analysis to consolidate the data obtained. Preliminary results indicated that nature-based solutions were effective in addressing environmental degradation challenges among the Maasai in Emboreet Village. Integration of indigenous knowledge and practices and modern technologies in environmental conservation resulted into better adoption and resilience on sustainable environment in Emboreet Village in Tanzania.

Keywords: Sustainability · Environmental degradation · Indigenous knowledge systems · Resilience · Nature based solutions

Climate-Induced Migration and Its Impact on Family Dynamics in Wajir West Sub-County, Kenya

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Climate-induced migration is reshaping family dynamics in Wajir West Sub-County, Kenya, as men increasingly migrate in search of livelihoods, leaving women to manage households alone. This study investigates the socio-economic and psychological impacts of male migration on both women and their children. The research was guided by the Sustainable Livelihoods Framework (SLF) and utilized a qualitative design involving in-depth interviews and focus group discussions (FGDs) with 16 women from 16 households, purposively sampled. Data were analyzed using NVivo software, with strict adherence to ethical protocols, including informed consent and confidentiality. The findings reveal that male migration has placed significant economic and emotional burdens on women. Women are now solely responsible for household finances, securing food and water, and caring for children, resulting in role overload and psychological stress. Many women have engaged in informal economic activities despite limited resources and rising costs for essentials like food and firewood. The absence of male partners has also led to emotional isolation, with women lacking adequate support systems. Children's education has been disrupted, as many are forced to leave school to assist with household duties. Boys, in particular, are expected to fill the roles left vacant by their fathers, leading to early adult responsibilities and educational abandonment. Children are also experiencing emotional distress due to their fathers' absence and increased domestic tension. Instances of gender-based violence (GBV) have been reported, especially when men return sporadically with unrealistic demands. Community support groups, though present, are insufficient to mitigate the strain. The study calls for interventions offering economic support, mental health services, and protection from domestic violence, while ensuring educational continuity for children affected by migration.

Keywords: Climate change · Migration · Family dynamics · Gender roles · Wajir West · Gender-based violence

Overcoming Deforestation Challenges in Kenya - The Role of the Plantation Establishment and Livelihoods Improvement Scheme (PELIS)

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With a land area of $569,140 km^2$ and a population of 57.2 million, Kenya stands as a leading economy in East Africa. However, significant deforestation challenges persist, with an estimated 103,368 hectares of forest lost annually. To address this, Kenya has constitutionally prioritized forest conservation, targeting a forest cover of at least 10 percent and a tree cover of 30 percent by 2032. Previous restoration efforts, particularly in South Kinangop, faced significant setbacks. The traditional approach, based on active planting of trees with management costs incurred by the Kenya Forest Service (KFS), was hampered by frequent fires, uncontrolled grazing, and low survival rates of planted trees due to poor management practices. These challenges led to limited success in restoring the forest, as the approach failed to adequately address underlying issues of forest degradation. In response, the Plantation Establishment and Livelihoods Improvement Scheme (PELIS) has been identified as a more sustainable and effective model, particularly in regions like the Aberdares and Kaptagat landscapes. PELIS integrates sustainable forest management with community involvement, addressing deforestation while enhancing local livelihoods. This paper will explore the framework of PELIS, its successes, and the lessons learned from past failures to ensure better forest management and higher survival rates of reforestation efforts. By examining the evolution of restoration strategies, we will highlight PELIS as a scalable solution to Kenya's deforestation crisis, emphasizing the need for continued collaboration between local communities, the government, and environmental organizations to achieve the country's ambitious reforestation goals by 2032.

Keywords: Deforestation · restoration · Plantation Establishment · Livelihoods Improvement Scheme

From Wooded Savannah to Farmland and Settlement - Population Growth, Drought, Energy Needs and Cotton Price Incentives Driving Changes in Wacoro, Mali

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Wacoro municipality (Mali)

Land includes vegetation and water bodies and provides the basis for human livelihoods through primary production, food and freshwater supply, and multiple other ecosystem services. The last three decades have recorded frequent drought events as well as rapid population growth, which has often resulted in adverse land use and land cover change (LULCC) in the Sahel of Sub-Saharan Africa. In order to propose sustainable land management strategies, it is a prerequisite to investigate the rate of LULCC and its driving factors in specific locations. This study investigated the case of Wacoro municipality in Mali using a combined approach of remote sensing, Geographic Information Systems, and focus group discussions. Satellite images and local people's perceptions on LULCC and drivers were collected and analyzed for the years 1990, 2000, 2010, and 2020. We found that the study area faced a rapid decrease in wooded savannah that was degraded and converted to shrub savannah and later to farmland and settlement. Changes were directly or indirectly related to the rapid population growth, high cotton price (which encouraged cropland expansion), drought, firewood extraction, and charcoal production, which was exacerbated by poverty. We suggest promoting integrated land management strategies that consider current and future livelihood needs and preserve the environment for the benefits of future generations. New agricultural policies, such as cotton price incentives, should always be accompanied by an assessment of their potential environmental impacts and design of adequate mitigation measures.

Keywords: land use · land cover · drivers · Sahel

Cultivating Drought-Resistant Melia volkensii for Land Restoration in Kenya's Arid and Semi-Arid Regions

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Restoring degraded lands in Kenya's arid and semi-arid lands (ASALs) is critical to enhancing ecosystem services, improving livelihoods, and combating desertification. Melia volkensii, a drought-resistant tree species native to Eastern Africa, shows significant potential for land restoration in these regions. This study explores the cultivation of Melia volkensii as a sustainable strategy for rehabilitating degraded lands in Kenya's ASALs. Melia volkensii's ability to thrive in harsh conditions, characterized by low and erratic rainfall, poor soil fertility, and high temperatures, makes it an ideal candidate for restoration efforts. Its deep-rooting system enhances soil structure, reduces erosion, and improves water infiltration, thus promoting soil fertility and moisture retention. Furthermore, the tree provides numerous socio-economic benefits, including high-quality timber, fodder, and traditional medicine, making it valuable to local communities. The research examines best practices for growing Melia volkensii, including seedling propagation, planting techniques, and management practices that optimize growth and survival rates in ASAL conditions. Results indicate that the use of drought-resistant seeds, proper site selection, and early-stage watering significantly improve tree establishment and growth. Additionally, agroforestry practices incorporating Melia volkensii with other crops or trees can enhance biodiversity, reduce pest infestations, and improve overall land productivity. This study concludes that cultivating Melia volkensii offers a viable solution for restoring degraded lands in Kenya's ASALs, supporting both environmental sustainability and community resilience. However, further research is needed to refine cultivation techniques and understand long-term impacts on local ecosystems.

Keywords: Drought-resistant trees · Land restoration · Arid and semi-arid lands

Climate Change Induced Cost On Soil Security And Its Implication On Food Security In Homa-Bay County, Kenya

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While there are studies on effect of climate change on food insecurity in Homa-Bay, studies relating to effect of climate change on soil quality and food security arenâĂŹt evident. This paper detailed influence of climate change on soil security and its implication on food security in the study area. It examined the cost of anthropogenic-based practices (ABPs) on climate change, interrogated their ripple effect on soil and food security situation. Praxeology theory was used to explore environmental consequences of ABPs. 250 respondents were sampled from 262,036 households for quantitative data and 20 key Informants purposively identified for qualitative data. It was a cross-sectional survey study and quantitative data were analyzed descriptively and inferentially using Statistical Package for Social Sciences (SPSS) version 25.0. Opinions from FGDs, KII, and Field Observation were qualitatively analyzed. Results showed monoculture (96.2%), tractor tillage (71.4%), livestocking (82.3%), stone mining (92.4%), deforestation (89.1%), and hill slope-based practices (87.9%) induced climate change. Binary Logistic Regression Analysis (BLRA) indicated deforestation ($B = -0.462, S.E = 0.381$ and $P < 0.032$), stone mining ($B = -0.756, S.E = 0.364$ and $P = 0.038$), conventional tillage ($B = -0.961, S.E = 0.489$ and $P = 0.05$), slope-based activities ($B = -0.801, S.E = 0.368 and P = 0.0290$) predicted food insecurity. Study concludes that ABPs result to climate change, soil insecurity and significantly cause food insecurity in Homa-Bay County. The study recommends suspension of slope-based activities on elevated areas particularly on Homa-Hills, review stone extraction and tractor cultivation policies, intensive and purposive reforestation programs.

Keywords: Climate Change· Induced cost · Soil security · Food security

Green ICT's Emerging Trends Towards Sustainability in Mitigation and Adaptation to Climate Change in Great Rift Valley

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The world has been subjected to climate change disruptions,This variations have reflected natural phenomena over decades.From periodic volcano to solar radiation fluctuations.The current climate changes effectsÂă result fromÂă human actions such as burning of fossil fuels.The effects differ from one region to the other where global warming is greater at high latitudes than in tropics.Some areas in great rift valley experience heavy rains while others have short rains or prolonged dry seasons.How the society responds,depends on its capacity to prepare for these disruptions and to respond.Green ICT is the leading driver for climate mitigation and the transition to green energy .Reducing the overall energy demand and adopting nature-based solutions should be incorporated as an integral part of the world's decarbonization plans. Green technology in Great Rift valleyÂă is still in its infancy stage, though many nations around the world have cited its use as an imperative to help meet the goals set out in the Paris Agreement and transition from reliance on fossil fuels. The Conference of the Parties held in December 2007 (COP-13) developed the Bali Action Plan5. This calls for execution of climate actions as indicated as follows. Earth's temperature to be kept at 1.5ÂřC above pre-industrial levels. Reducing global greenhouse gas emissions to half by 2030 and reach net zero before 2050. Reducing emissions requires generating electricity from low-carbon sources for emission reduction. Enabling technologies to reduce global energy consumption, effects of CO2 pollution, and inefficient use of resources. Actions on mitigation of climate change, including reducing emissions from deforestation and forest degradation in Great Rift valley countries. This paper will analyze how emerging trends of green ICTs can assist with each of these actions

Keywords: Climate Change· Greenhouse Gas · Mitigation · Adaptation · Green ICT · Resilience

Authors Index

Keywords Index

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The inaugural International Conference on Climate Change and Environmental Conservation 2024 (ICCCER 2024) is a peer-reviewed international conference that is founded on the need to combat the effects of climate change through innovative research initiatives. ICCCER 2024 aims to provide a scientific forum through which the environmental conservation industry can draw on active research and advocacy, and interact with international experts in the fields of Climate Change and Environmental Conservation. The conference was co-hosted by Moi University and The Restoration Alliance, a consortium of whose membership is drawn from organizations whose main goal is to unite efforts and resources towards restoration of landscapes, mitigation and adaptation of climate change.