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Inspiring Sustainable Growth

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RUFORUM
Capacity Building in Agriculture

PRE-AGM EVENTS- SCIENTIFIC FORUM

17th-21st NOVEMBER 2025

PROGRAMME FOR ONLINE PRESENTATION

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AGM 2025

FORUM I

RESILIENT AGRIFOOD SYSTEMS TRANSFORMATION

Monday 17th to Friday 21st November 2025 from 8:30 to 17:00

DAY THREE

Wednesday, 19th November 2025

Session Chair: Prof. Chinenye Anyadike
Rapporteurs: Dr. Judith Leo, Dr. Catherine Mulinde

08:00-08:05	Welcome Remarks from the Chair: Prof Chinenye Anyadike	
08:05-08:20	Leveraging Indigenous Brose Species for Climate-Resilient Goat Production: Rumen Microbial Responses to Seasonal Variations	France Phiri
08:20-08:35	Bush-Encroachment Plants as Feed and Their Effect on Meat Quality Parameters	Janse van Rensburg
08:35-08:50	A Review of The Fodder Production Situation in Botswana	Keletso Mopipi
08:50-09:05	The Effect of Climate Smart Agricultural Practices on Household Food Security among Smallholder Farming Households in Lesotho	Nthabeleng Nkoko
09:05-09:20	Gender and Youth responsive Approaches to Climate Adaptation and Resource Governance	Gailyne Muthoni
09:20-09:35	Factors Associated with Food Stress and Nutritional Deficiencies in Resettled Women and Children after Cyclones	Francisco C.
09:35-09:50	Climate Change, Gender and Food Security in Malawi: A Cge Approach	Julius Mukarati
09:50-10:05	Harnessing Traditional Processing, Storage and Preparation of Lake Flies (Chaoborus and Chironomus Sp.) to Strengthen Inclusive Food Security and Resilience in Lake Victoria Region in Kenya	Mathews Laston Kambani
10:05-10:20	Evaluating the antifungal efficacy of the resurrection bush (Myrothamnus flabellifolius) as a sustainable control method for tomato (Solanum lycopersicum) soft rot (Rhizopus stolonifer) to reduce postharvest losses and improve marketability of tomatoes in Zimbabwe smallholder farming systems	Velelia Nyanzira
10:20-10:35	School-Based Nutrition and Local Food Systems: Addressing Malnourishment and Protein Deficiencies in Rural Guatemala	Robert H. Stirling
10:35-10:50	Translating Science to Solve Real-Life Farming Community Challenges: Implications for Woody Plant Encroachment in Southern Africa	Tlou Julius Tjelele
10:50-11:05	Influence of Holistic Planned Grazing on Greenhouse Gas Emission and Soil Properties in Mgeno Ranch, Kenya	Diramu Guya Jattani
11:05-11:20	Morphological to molecular responses of potato to heat and drought stress: recent insights and developments	Hanyeleni Mary Maluleke
11:20-11:40	Coffee Break	

11:40-11:55	Establishment of a Biobank for Advancing Livestock Production in Botswana	Abdelkareem A. Ahmed
11:55-12:10	Inclusion Effects of Graded Levels of Amaranthus Curentus Forage on Zootechnical Parameters of Broiler Chickens	Chipo J. Mugova
12:10-12:25	Otoxins in Swine Feed and Their Implications for Health and Production Systems in Southern Africa: A Review	Cyriaque Mfashwanyo
12:25-12:40	Azolla Spp. and Hermetia Illucens Meals as Main Protein Sources for Rabbit Nutrition: Impact on Feed Quality, Growth Performance and Meet Quality	Eyitayo Ogbon
12:40-12:55	Antibiotic Residues in Raw Cow Milk Collected from Smallholder Diary Produces in Kasama and Mbala, Zambia	Abel Chipembo
12:55-13:10	Unmasking Hidden Threats in Quinoa's Resilience to Ozone and Drought Stress	Jacques M. Berner
13:10-13:25	Exploring the Significance of Camels in Enhancing Food Security and Adaptability in a Changing Climate: A Review	Ayana Angassa Abdeta
13:25-13:55	Lunch Break	
13:55-14:10	Antibiotic residues in animal food matrices in Southern Africa development community: A systematic review (1976-2025).	Goliath Eneya Zulu
14:10-14:25	Lessons from Guinea Fowl Farming and Hidden Antimicrobial Risks in the Era of Climate Change	Nyararai Yvonne Olga
14:25-14:40	Assessment of antimicrobial resistance of Escherichia coli, salmonella spp, and Enterobacter spp from chicken meat in mzimba for public food safety	Abel Chipembo
14:40-14:55	Anthracnose Resistance in Farmer Preferred Common Bean Market Classes in Uganda	Alipa Jorem
14:55-15:10	Antibiotic residues in raw cow milk collected from smallholder dairy producers in Kasama and Mbala, Zambia	Goliath Eneya Zulu
15:10-15:25	Coffee Break	
15:25-15:40	Impact of fermentation and extrusion on textural properties and water activity of pigeon pea (Cajanus cajan L.) products	Tamara Tumasile Chirambo
15:40-15:55	Industrial hemp as sustainable crop and a carbon sequestrater in the changing climate: A review	Mhlahlayazi Thembilihle
15:55-15:10	The carbon footprint of the tea agrifood system in the context of SDG 13 (Climate action)	Mkumbukiy., A
15:10-16:25	Variability of soil organic carbon stocks across land cover types in Ilakala village, Tanzania	Pius Lugonja

16:25-16:40	Gender- and Youth-Responsive Approaches to Climate Adaptation and Resource Governance	Gailyne Muthoni
16:40-16:55	Unmasking hidden threats in quinoa's resilience to ozone and drought stress	Jacques M Berner
16:55-17:00	Closing Remaks from the Chair and RUFORUM Representative	

Abstract No: 061-OP

Leveraging Indigenous Brose Species for Climate-Resilient Goat Production: Rumen Microbial Responses to Seasonal Variations

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ABSTRACT

Bush encroachment, the rapid proliferation of woody shrubs into formerly open grasslands, presents both ecological and economic challenges across southern Africa. While it reduces grazing capacity and alters ecosystem function, encroacher species such as Senegalia spp., Dichrostachys cinerea, Seriphium plumosum, and Prosopis spp. also produce substantial biomass with promising nutritional potential for ruminant feeding. Their use, however, is constrained by the presence of anti-nutritional factors, particularly tannins and phenolics, which can depress intake and nutrient utilization. This review synthesizes findings from recent studies, feeding trials, and case reports to evaluate the suitability of bush-encroachment plants as alternative feed resources and their effects on meat quality. Evidence indicates that when appropriately processed, through methods such as chemical treatment, pelleting, supplementation, or co-feeding, bush-derived feeds can support satisfactory animal performance, maintain carcass yield, and produce meat quality comparable to conventional diets. Key parameters including meat pH, colour, tenderness, and fatty acid profiles generally remain within acceptable or desirable industry ranges. Notably, moderate inclusion of tannin-rich browse has, in some cases, enhanced flavour and oxidative stability. Beyond animal-level benefits, the strategic use of encroacher biomass contributes to rangeland restoration, promotes circular resource use, and strengthens feed security under increasingly variable climatic conditions. Overall, encroacher species present a promising, underutilized resource for sustainable livestock production. Nevertheless, gaps remain regarding standardized processing guidelines, long-term impacts on lipid stability and sensory attributes, ecological thresholds for biomass harvesting, and consumer acceptance. Addressing these gaps will be essential for safe, scalable, and environmentally aligned adoption.

Keywords: Alternative feeds, Bush encroachment, Carcass traits, Meat quality, Ruminant nutrition, Sustainability, Tannins

Abstract No: 062-OP

Bush-encroachment plants as feed and their effect on meat quality parameters

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ABSTRACT

Bush encroachment, the rapid proliferation of woody shrubs into formerly open grasslands, presents both ecological and economic challenges across southern Africa. While it reduces grazing capacity and alters ecosystem function, encroacher species such as Senegalia spp., Dichrostachys cinerea, Seriphium plumosum, and Prosopis spp. also produce substantial biomass with promising nutritional potential for ruminant feeding. Their use, however, is constrained by the presence of anti-nutritional factors, particularly tannins and phenolics, which can depress intake and nutrient utilization. This review synthesizes findings from recent studies, feeding trials, and case reports to evaluate the suitability of bush-encroachment plants as alternative feed resources and their effects on meat quality. Evidence indicates that when appropriately processed, through methods such as chemical treatment, pelleting, supplementation, or co-feeding, bush-derived feeds can support satisfactory animal performance, maintain carcass yield, and produce meat quality comparable to conventional diets. Key parameters including meat pH, colour, tenderness, and fatty acid profiles generally remain within acceptable or desirable industry ranges. Notably, moderate inclusion of tannin-rich browse has, in some cases, enhanced flavour and oxidative stability. Beyond animal-level benefits, the strategic use of encroacher biomass contributes to rangeland restoration, promotes circular resource use, and strengthens feed security under increasingly variable climatic conditions. Overall, encroacher species present a promising, underutilized resource for sustainable livestock production. Nevertheless, gaps remain regarding standardized processing guidelines, long-term impacts on lipid stability and sensory attributes, ecological thresholds for biomass harvesting, and consumer acceptance. Addressing these gaps will be essential for safe, scalable, and environmentally aligned adoption.

Keywords: Alternative feeds, Bush encroachment, Carcass traits, Meat quality, Ruminant nutrition, Sustainability, Tannins

Abstract No: 063-OP

A review of the fodder production situation in Botswana

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ABSTRACT

Global demand for food and animal protein is rising with population growth, intensifying pressure on agricultural systems and critical resources such as land, water, and feed. In semi-arid Botswana, where agriculture contributes only 1.7% to GDP, livestock production exceeds domestic needs, with the country ranking as the ninth-largest exporter of range-fed beef to the European Union. Despite this, Botswana produces only 12% of its national fodder demand, importing the remainder. Annual fodder production is estimated at 57,000 metric tonnes, positioning Botswana 89th globally and sixth in the SADC region. This paper reviews policies and programs supporting fodder production, including LIMID, ISPAAD, and the Temo Letlotlo and Thuo Letlotlo initiatives, alongside parastatal support from the National Development Bank and CEDA. While uptake is positive, challenges persist, including unskilled labor, limited participation by women (17.6%) and youth (15%), low commercialization, inadequate seed systems, and climate-related threats. Average fodder yield per hectare improved from 1.71 t/ha (2016/17) to 2.51 t/ha (2021/22), yet average farm size under cultivation declined slightly, highlighting inefficiencies. SWOT analysis identifies strengths in government support, high national demand, and capacity-building initiatives, but weaknesses include poor program implementation, unstructured markets, and insufficient public-private partnerships. Strategic interventions such as climate-smart practices, commercial agricultural clusters, and improved seed and input systems are recommended. Enhancing fodder production has the potential to diversify the economy, create jobs, relieve grazing pressure, and strengthen livestock productivity, but requires coordinated efforts across all stakeholders to address persistent deficits.

Keywords: Agricultural commercialization, Botswana, Climate-smart agriculture, Fodder production, Livestock productivity, Policy review

Abstract No: 064-OP

The effect of climate smart agricultural practices on household food security among smallholder farming households in Lesotho

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ABSTRACT

Climate change and food insecurity are interlinked precarious challenges hindering development in most parts of the world. Climate change has threatened the sustainability and resilience of the food systems increasing the prevalence of food insecurity and malnutrition. Thus, adaptation strategies are critical in reducing the negative effects of climate change. Climate smart agriculture (CSA) transforms agricultural practices to support food security in the face of climate change. However, these practices have not been widely adopted in African countries. Therefore, the study sought to assess the determinants of the choice of CSA practices and the effect of the adoption of CSA practices on household food security in Lesotho. The study employed a quantitative approach and primary data were collected in 8 out of 10 districts in Lesotho among smallholder farming households. A multistage sampling method was used to select the participants and a survey was conducted in August 2023 to July 2024. Data was collected using questionnaires administered by trained enumerators. CSA practices used by farmers were grouped by principal component analysis and linked to food security by multinomial endogenous switching regression model. Household Dietary Diversity Score (HDDS) and Household Food Insecurity Access Scale (HFIAS) were used to measure household food security. The principal component analysis was applied to cluster the CSA practices into 4 components: conservation agriculture and protected agriculture, general farm management, soil water conservation and planting time scheduling and soil and water management. The adoption of CSA was positively influenced by livestock ownership, household size, formal education, farming experience, farm size and the use of social media. The adoption of CSA practices was negatively associated with household income, land fertility and extension services. The analysis for the effect of Climate-Smart Agriculture (CSA) practices on household food security is not yet complete. CSA practices have the potential to enhance adaptation to climate change, resilience and alleviate food insecurity among smallholder farming households while also enhancing environmental health. For increased adaptation, access to extension services must be improved and practices that are suitable for specific areas must be identified. To promote the adoption of Climate-Smart Agriculture (CSA) practices, both incentives and disincentives are necessary, which challenges existing policies and interventions in Lesotho that support government subsidies for synthetic fertilizers and conventional seeds.

Key words: Climate change, Climate-smart agricultural practices, Food Security, Small holder farmers

Abstract No: 065-OP

Gender- and Youth-Responsive Approaches to Climate Adaptation and Resource Governance

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ABSTRACT

African agri-food systems are increasingly exposed to climate shocks, economic disruptions, and structural inequalities, with women and youth disproportionately affected despite their central role in production and innovation. Limited access to land, finance, and decision-making continues to constrain their adaptive capacity and weaken community resilience. This study examined inclusive resilience programming as a pathway to strengthening climate adaptation among marginalized groups. A multi-case study design was employed, drawing evidence from gender- and youth-responsive resilience programs in Kenya. Data were collected through semi-structured interviews, focus group discussions, and program document reviews, and analyzed using a resilience-capacity framework focused on agency, adaptation, and governance participation. Findings show that gender-responsive financial mechanisms, such as savings groups, table banking, and diversification insurance, significantly enhanced women's adaptive capacity and increased household income diversification. Youth-centered digital advisory platforms improved access to localized climate information, resulting in a 35% increase in adoption of climate-smart agricultural practices among young farmers. Programs incorporating participatory natural resource governance demonstrated notable gains in women's leadership, with representation rising from 18% to 42% across participating communities. Collectively, these approaches strengthened social inclusion, improved decision-making power, and built more robust systems for climate resilience. The study concludes that inclusive approaches are essential for equitable and sustainable adaptation. Scaling these models requires supportive policy frameworks, increased investment in inclusive financial tools, and mentorship and innovation ecosystems for youth agripreneurs. Embedding gender and youth perspectives within national and local resilience planning is critical to ensuring that food system transformation efforts leave no one behind.

Keywords: Climate adaptation, Food system transformation, Gender-responsive programming, Inclusive resilience, Youth empowerment

Abstract No: 066-OP

Factors associated with food stress and nutritional deficiencies in resettled women and children after cyclones

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ABSTRACT

Extreme climate events represent a serious threat to population health, as they contribute to food and nutritional crises, mainly through the reduction of food availability, accessibility, and diversity. In addition, these events destroy infrastructure and force the temporary or permanent displacement of thousands of families to resettlement areas. Their impacts disproportionately affect vulnerable groups such as women and children, who face increased risks related to food security and nutritional health. The objective is to analyze the factors associated with food stress and nutritional deficiencies among women aged 15–49 years and children under five years resettled after extreme climate events in Sofala Province, Mozambique. This will be an observational, descriptive, cross-sectional, and analytical study with a quantitative approach. The study population will include women aged 15–49 and children under five, both resettled and non-resettled, following extreme climate events in Búzi and Cheringoma districts. Participants will be stratified into three groups: (a) women and children living in resettlement areas; (b) women and children living in cyclone-affected areas who returned to their original homes; and (c) women and children living in non-affected areas. Resettled and affected groups will be selected from Búzi, while the non-affected group will be selected from Cheringoma. Data will be collected four years after Cyclone Eloise, covering the period 2021–2024. A structured questionnaire will be administered using REDCap via tablets. The first section will collect sociodemographic data, while the second section will assess food habits and consumption frequency, adapted from the UN World Food Programme's Food Consumption Score tool. Nutritional status will be evaluated using anthropometric measures. Descriptive data will be presented as percentages, contingency tables, and graphs. Statistical analysis will include Pearson's Chi-square test (χ^2) at a 5% significance level to compare the prevalence of food stress and nutritional deficiencies between groups. For continuous indicators such as BMI and Z-scores, one-way ANOVA will be applied if the data are normally distributed; otherwise, the Kruskal-Wallis test will be used. This study is expected to provide insights into the nutritional and health status of resettled populations, highlighting differences between resettled and non-resettled groups. The findings will support decision-makers in adopting corrective measures to improve responses to future extreme climate events and strengthen food and nutrition security among vulnerable populations.

Keywords: Children, Cyclone, Mozambique, Nutrition, Women

Abstract No: 067-OP

Climate change, gender and food security in Malawi: A Cge Approach

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ABSTRACT

Climate change threatens livelihoods with evidence suggesting that it may increase poverty, hunger, conflict, and gender inequality. This study uses a gender-dynamic computable general equilibrium (CGE) model to evaluate the potential impacts of climate change on sustainable development goals (SDGs) such as food security (SDG2), gender equality (SDG5), and economic growth (SDG8) for Malawi. The CGE model utilizes the 2021 Social Accounting Matrix (SAM), which calibrates the results from the various models, thereby generating the baseline results which exemplify a "steady-state" and policy shock results illustrating the medium- and long-term effects of climate change on the country's agriculture sector. The findings reveal that climate change not only threatens agricultural productivity but also exacerbates existing gender inequalities, leading to heightened food insecurity for women and their families. Policy implications emphasize the need for targeted interventions that address both climate resilience and gender equity, ensuring sustainable food systems in Malawi. This research contributes to the understanding of socio-economic dynamics in the context of climate change, advocating for holistic strategies that prioritize both gender and food security in climate adaptation policies.

Keywords: Computable general equilibrium, Gender equality, SDGs, Poverty

Abstract No: 068-OP

Harnessing traditional processing, storage and preparation of lake flies (*Chaoborus and Chironomus* sp) to strengthen inclusive food security and resilience in Lake Victoria region in Kenya

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ABSTRACT

Conventional protein sources such as meat, fish, and crops are increasingly under pressure due to climate change and population growth, highlighting the need for alternative, sustainable protein sources. Insects, which are abundant and affordable, present a viable option, with global climate trends likely to increase their availability. In the Lake Victoria region of Kenya, lake flies are a traditional household protein source; however, their consumption is constrained by pronounced seasonality. This study aimed to address the seasonal availability challenge by documenting traditional methods of processing, storage, preparation, and consumption to extend lake flies' usability. An ethnographic design was employed on Rusinga and Mfangano islands, involving 53 participants and triangulating data collection through interviews, observations, and focus group discussions. Key informants (n=5) and community members (n=48) contributed data, which were collected using the Open Data Kit (ODK) and analyzed thematically. Findings identified four main processing stages: collection, smashing, boiling, and drying. Processed lake flies were stored either hanging from kitchen roofs or in traditional pots, achieving a shelf life of over one year. Barriers to lake fly consumption included poverty, perceptions of inedibility, modernization, and gendered division of labor, with women primarily responsible for handling the insects. The study highlights the potential for off-season availability, marketability, and contribution of lake flies as a sustainable source of protein and micronutrients. Policy recommendations include raising awareness of entomophagy, promoting value addition, and integrating gender considerations into the lake fly value chain, thereby enhancing food security for communities along Lake Victoria.

Keywords: Food security, Lake flies, Processing, Preparation, Shelf life

Abstract No: 069-OP

Evaluating the antifungal efficacy of the resurrection bush (*Myrothamnus flabellifolius*) as a sustainable control method for tomato (*Solanum lycopersicum*) soft rot (*Rhizopus stolonifer*) to reduce postharvest losses and improve marketability of tomatoes in Zimbabwe smallholder farming systems

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ABSTRACT

African agri-food systems are increasingly exposed to climate variability, economic shocks, and structural inequalities that threaten food production and market stability. Rising temperatures, erratic rainfall, soil degradation, and the high cost of imported inputs have heightened the vulnerability of smallholder farmers, who form the backbone of food production across the continent. Building resilient and inclusive food systems therefore requires integrated approaches that enhance sustainability, strengthen value chains, and expand equitable access to resources, technologies, and markets. This paper synthesizes pathways for resilience across key domains, soil health, postharvest loss reduction, climate-smart technologies, market strengthening, digital innovation, and inclusive governance. Evidence shows that integrated soil fertility management, organic amendments, and climate-smart practices such as conservation agriculture and agroforestry enhance soil productivity and ecological stability. Reducing postharvest losses emerges as a high-impact strategy for food and nutrition security. In Zimbabwe, the use of Myrothamnus flabellifolius extracts as natural antifungal agents against tomato soft rot demonstrates a viable eco-friendly alternative to synthetic chemicals, improving shelf life while safeguarding soil and human health. Additionally, investments in agro-processing, renewable energy innovations, digital advisory platforms, and regional market integration (e.g., AfCFTA) strengthen value chain resilience and expand livelihood opportunities. Inclusive governance—particularly the participation of women and youth—further enhances adaptive capacity and equitable access to resources. Overall, the findings underscore that resilient agri-food systems depend on coordinated, multi-sectoral strategies that prioritize sustainability, innovation, and social inclusion. Integrating natural postharvest solutions such as M. flabellifolius contributes to environmentally sound, climate-resilient, and socially just food systems across Africa.

Keywords: Agri-food systems, Climate resilience, Inclusive governance, Postharvest management, Soil health, Sustainable innovation

Abstract No: 070-OP

School-based nutrition and local food systems: Addressing malnourishment and protein deficiencies in rural Guatemala

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ABSTRACT

Guatemala continues to face one of the most severe childhood malnutrition crises in the Western Hemisphere, particularly in its rural and Indigenous regions. Nationally, nearly 47% of children under five are chronically malnourished, with stunting rates exceeding 70% in some municipalities (UNICEF, WHO, & World Bank, 2021). Although national policies such as the Gran Cruzada Nacional por la Nutrición (SEGEPLAN, 2020) and the Ley de Alimentación Escolar (Guatemalan Ministry of Education, 2021) have sought to address these issues through school feeding programs, gaps in implementation, protein access, and dietary diversity persist—particularly in rural areas like El Tejar, Chimaltenango. While the global health and development community often focuses on nutrition interventions during the First 1,000 Days, far less attention is given to the ongoing nutritional challenges faced by school-aged children. These children may suffer from protein-energy malnutrition, iron deficiency anemia, and poor dietary diversity, all of which directly impact learning outcomes, psychosocial development, and long-term economic potential. Addressing these gaps requires context-specific, culturally grounded strategies that leverage local agriculture, community leadership, and intersectoral collaboration. This case study uses a qualitative approach to examine the implementation of school-based nutrition programs in five schools in El Tejar. It builds upon the First 1,000 Days framework (Thurow, 2018) and incorporates principles from Jacquez et al. (2013) Community-Based Participatory Research (CBPR) to amplify the voices of educators, NGO leaders, local government officials, fellows, and religious institutions involved in nutrition programming. The study also draws from Guatemala's current national nutrition strategy, which is moving toward decentralized, locally led solutions to food security and malnutrition.

Keywords: Guatemala, school feeding, childhood malnutrition, food security, protein deficiency

Abstract No: 071-OP

Translating science to solve real-life farming community challenges: Implications for woody plant encroachment in southern Africa

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ABSTRACT

Rangelands cover approximately 54% of the global land surface, with Africa accounting for 43% and South Africa alone covering about 74% of its land area. These ecosystems provide critical services beyond livestock and wildlife grazing, including nutrient and water cycling, and play a pivotal role in climate change mitigation and adaptation. Despite their importance, rangelands are increasingly threatened by degradation, which exacerbates food insecurity, poverty, and hunger. Woody plant encroachment is a major driver of this degradation, and current command-and-control management approaches in southern Africa have largely failed. This paper explores strategies for translating ecological science on woody plant encroachment into practical solutions for socio-economic challenges. Using the integrated framework proposed by Twidwell et al. (2021), this study emphasizes collaboration among scientists, industry stakeholders, and extension services. Key insights from ecological research include: (1) the effects of varying tree thinning densities on forage production, (2) utilization of encroaching woody species as a valuable feed resource for ruminants, and (3) exploration of woody plants as potential anthelmintic agents to control gastrointestinal nematodes. Despite numerous theses, peer-reviewed studies, and conference papers documenting these findings, the persistence of land degradation highlights the need for an integrated, inclusive, and coordinated approach. Proactive partnerships that link research, policy, and on-the-ground management are critical to sustainably manage woody plant encroachment, enhance rangeland productivity, and mitigate socio-economic impacts. This study underscores the necessity of moving beyond traditional academic outputs toward actionable solutions that safeguard the multifunctional value of rangelands in Africa.

Keywords: Forage production, Integrated management, Land degradation, Rangelands, Woody plant encroachment

Abstract No: 072-OP

Influence of holistic planned grazing on greenhouse gas emission and soil properties in Mgeno Ranch, Kenya

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ABSTRACT

Soil degradation and livestock-associated greenhouse gas (GHG) emissions are major challenges to sustainable rangeland management in Kenya's semi-arid lands. These ecosystems, frequently subjected to droughts and floods, rely heavily on livestock production for livelihoods. However, traditional grazing systems often lead to soil compaction, nutrient depletion, and elevated GHG emissions, exacerbating rangeland degradation and climate vulnerability. Holistic Planned Grazing (HPG), a high-intensity, low-frequency rotational grazing method, offers a promising alternative by allowing vegetation and soils sufficient recovery time, thereby enhancing soil structure, water retention, and long-term rangeland sustainability. This study assessed the effects of HPG compared to traditional grazing on soil physico-chemical properties, soil organic carbon stocks (SOCS), and GHG emissions at Mgeno Ranch, Taita Taveta County, during the short rain, transition, and long rain seasons. Using a Randomized Complete Block Design, soil samples were collected at 0–20 and 21–50 cm depths, and GHG fluxes measured via static chamber techniques. Analysis revealed that HPG significantly improved SOCS (10 Mg C ha^{-1}), total nitrogen (2.14%), phosphorus, potassium (143 ppm), and soil moisture (16.7%) relative to traditional grazing. While CO_2 fluxes initially peaked under HPG (181.6 mg C m^{-2} h^{-1}), they stabilized over time, and methane emissions were lower (-0.01916 mg C m^{-2} h^{-1}), indicating moderated long-term GHG output. These results demonstrate that HPG enhances soil health, increases carbon sequestration, and reduces long-term GHG emissions, offering a climate-smart pathway for sustainable livestock-based livelihoods. Adoption of HPG across Kenya's rangelands could strengthen food security, build resilience to climatic shocks, and support sustainable agri-food systems.

Keywords: Greenhouse gases, Holistic planned grazing, Rangelands, Soil organic carbon, Taita Taveta

Abstract No: 073-OP

Morphological to molecular responses of potato to heat and drought stress: Recent insights and developments

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ABSTRACT

Potatoes are tuber crop that belong to the Solanaceae family. The tubers store nutrients and starch, serving as the primary yield of the crop. Tubers are also used as seeds for the vegetative growth of new potato plants. Potato yield globally will be reduced from biotic and abiotic stress when produced without adaptations measures as compared to when producing practicing adaptation measures such as the use of tolerant varieties and applying cultural practices in the coming years. The objective of this review was to look at what has been done recently with regards to the effect of drought and heat on morphological traits, physiological traits, biochemical traits and molecular traits, and what needs to be done in future. Recent articles were searched and read to come with recent information on the impact of drought and heat on morphological traits, physiological traits, biochemical traits and molecular traits when developing resilient cultivars. Tuber yields are reduced by abiotic stresses. Traditional breeding has been used to breed for abiotic stress tolerance potato cultivars such as resistance to drought, heat and salinity, however these authors emphasized that traditional breeding should be incorporated with molecular breeding to achieve great and fast results. The availability of sequencing technologies, multi-omics, and genome editing and genome selection makes the use of markers to be efficient in the breeding of abiotic stress tolerance in potatoes. Molecular breeding could change selection process when breeding for abiotic stresses by making it fast and rapid. Identification of the key genes involved in heat, combined heat and drought stress remains essential in potato breeding which are also released by signaling biochemical molecules which are less reported during both stresses. The impact of heat on RUBISCO activity remains unclear, despite the enzyme's essential role in photosynthesis—particularly within photosystem II. Understanding the complex interplay between biochemical, molecular, and physiological mechanisms involved in stress adaptation is crucial for identifying traits that could enhance both traditional and molecular breeding approaches aimed at developing heat- and drought-tolerant crop varieties.

Keywords: Abiotic stress, Drought stress, Heat stress, Morphological traits, Physiological and biochemical traits, Potato

Abstract No: 074-OP

Establishment of a Biobank for advancing livestock production in Botswana

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ABSTRACT

Livestock production is a source of Botswana's agricultural economy, cultural heritage, and food security. Nevertheless, challenges such as climate variability, emerging diseases, genetic erosion of indigenous breeds, and limited innovation capacity threaten the long-term sustainability of the sector. To address these challenges, the Biobank-Botswana: National Livestock Genetic Resource and Innovation Programme (BB-NLGRIP) proposes the establishment of a National Livestock Biobank as a key strategic platform for genetic resource conservation, disease surveillance, biodiversity protection, and research-driven innovation. The BB-NLGRIP will serve as a centralized repository of high-quality biological materials, including DNA, tissues, gametes, and embryos, that will be collected from different livestock breeds in Botswana. The primary objectives of BB-NLGRIP are to (i) preserve and characterize genetic resources of indigenous and exotic breeds, (ii) enhance breeding and selection programs through genomic tools, (iii) strengthen disease surveillance by integrating biomarker discovery and pathogen monitoring, and (iv) support biodiversity conservation in line with regional and global commitments to sustainable development goals. Furthermore, the BB-NLGRIP will act as a hub for innovation, enabling collaborations between researchers, policymakers, and industry stakeholders to drive technology transfer, value addition, and resilience in livestock systems. By establishing this resource, Botswana will position itself as a regional leader in livestock biotechnology and conservation, ensuring food security, improved productivity, and sustainable livelihoods for future generations.

Keywords: Biodiversity conservation, Botswana, Genetic resources, Disease surveillance, Innovation, Livestock biobank

Abstract No: 075-OP

Inclusion effects of graded levels of Amaranthus Cruentus forage on zootechnical parameters of broiler chickens

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ABSTRACT

Amaranth species offer a viable alternative energy and protein source in monogastric feed formulations. The objective of the study was to determine the inclusion effects of Amaranthus cruentus forage (ACF) in broiler diets on zootechnical parameters during the grower and finisher stages. Forty-eight Cobb 500 broilers were randomly assigned to 4 treatment grower diets with 0 %,10%, 20% and 30 % protein in conventional feed replaced by ACF at day 14. Each treatment was replicated 3 times, with 4 birds per replicate. Growth performance data collected included live weight, gain, daily water and feed intake. Feed conversion efficiency was determined. A digestibility trial was conducted from day 21 to day 28 of the trial after allowing the birds to acclimatise to the diet. At the end of the experiment on day 42, three birds per replicate were slaughtered to determine intestine and caecum length, weights of the heart, liver, spleen, lung, and pancreas. An analysis of variance (ANOVA) for a complete randomised design was conducted using General Linear Models of SAS 9.4 and JAMOVI version 2.6.26 at a significance level of $P< 0.05$. Tukey's W test was used to perform post hoc comparisons for a significant ANOVA. ACF inclusion in the diet did not affect the daily feed, water intake, and the water-to-feed ratio ($P>0.05$) of the broilers during their growth. The addition of ACF significantly reduced the apparent digestibility of the feed, average daily weight gain, and feed conversion efficiency ($P<0.05$) of the broilers at 30 % ACF inclusion. Liver weight decreased with an increase in ACF content, and intestine length increased with an increase in ACF content ($P<0.05$), with no effect on all other organs ($P>0.05$). It was concluded that the inclusion of ACF in broiler grower diets at 10-20% does not significantly affect the zootechnical performance of broiler chickens.

Keywords: Amaranthus cruentus forage, Feed formulations, Monogastric

Abstract No: 076-OP

Mycotoxins in swine feed and their implications for health and production systems in Southern Africa: A Review

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ABSTRACT

Mycotoxins are toxic secondary metabolites produced by fungi, primarily Aspergillus, Fusarium, and Penicillium. The responsible condition to most of fungal growth on feeds was reported to be high moisture and warm temperatures of the stock. The exposure to mycotoxin contamination pose significant health problems to both humans and animals; leading to substantial economic losses. This review was intended to analyze mycotoxin contamination in staple feed crops, compound feeds, and animal-derived matrices with relevance to swine production in Southern Africa. A systematic literature search was conducted to compile data using scientific databases to provide relevant studies. Key terms included various staple crops, mycotoxins, swine, and Southern Africa. From 15 studies found, mycotoxin occurrence of aflatoxins, fumonisins, deoxynivalenol, zearalenone, and ochratoxin A were commonly detected in maize, sorghum, millet, cassava, and groundnuts, with contamination levels often exceeding regulatory limits. Maize based-feeds in intensive swine production showed high aflatoxin and fumonisin concentrations, while extensive systems relying on kitchen leftovers and brewing by-products exhibited variable contamination. Chronic exposure was linked to immunosuppression, hepatotoxicity, nephrotoxicity, and carcinogenicity in both animals and humans. Multi-mycotoxin detection using LC-MS/MS was proved most effective, highlighting the need for routine monitoring. Limited literature on mycotoxin contamination in swine production is an alarming gap. This review emphasizes that mitigation strategies must be tailored to production systems and regional environmental conditions to safeguard animal productivity and public health.

Keywords: Animal, Feed crops, Health impacts, Mycotoxin contamination, Southern Africa, Swine

Abstract No: 077-OP

Azolla spp and Hermetia illucens meals as main protein sources for rabbit nutrition: impact on feed quality, growth performance and meat quality

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ABSTRACT

Azolla and BSF larvae are two new, sustainable and environmentally friendly sources of protein that are promoted for use in animal feed. However, when introducing a new ingredient to a feed formula, the quality of the final product must be optimised. This study evaluated the impact of using Azolla and Black Soldier Fly (BSF) larvae meals as the main protein ingredients in formulated rabbit feed on the quality of the feed and the meat produced. Three isocaloric diets were formulated: Az_diet (Azolla meal as the main protein source), BSF_diet (BSF larvae meal as the main protein source), and SM_diet (soybean meal as the main protein source). The growth test was carried out on 36 weaned rabbits aged 5–6 weeks. The rabbits were divided into three treatment groups of 12 and fed one of the three diets (Az_diet, BSF_diet or SM_diet) ad libitum for 42 days. The measured parameters were growth parameters, apparent protein digestibility and the nutritional and health quality of rabbit meat. During the growth test, no mortality or significant differences in feed intake were recorded for the three treatments. The BSF diet treatment resulted in significantly higher weight gain (1012.5 ± 170.13 g). The Az_diet had the highest protein digestibility (80.39 ± 2.08%) and single carcass yield (53.93 ± 1.84%). The dry matter, protein and lipid contents of the hind leg meat of rabbits fed the Az_diet or BSF_diet were similar to those of the control (SM_diet). No Pb or Cd was detected in the hind leg meat of rabbits fed the three diets. In this study, using Azolla and BSF larvae meal as the main source of dietary protein did not negatively affect feed quality, rabbit growth, or rabbit meat quality.

Keywords: Azolla spp, Hermetia illucens, Protein digestibility, Rabbit meat quality

Abstract No: 078-OP

Antibiotic residues in raw cow milk collected from smallholder dairy producers in Kasama and Mbala, Zambia

Zulu, G.E.,[1,6]* Hang'ombe, B.M.,[2] Mainda, G.,[3] Kayesa, E.,[4] Makungu, C.,[3] Chipembo, A.C.,[1,6] Nchima, G.,[5] Pondja,A.,[1,6] Bila, N.M.[1,6]& Moiane, B.[1,6]

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ABSTRACT

Globally, milk production reached 965.7 million tons in 2023, with Africa contributing 53.8 million tons. In Zambia, smallholder dairy farmers supply approximately half of the country's milk, making dairy production a vital source of income, nutrition, and employment. However, widespread and often unregulated antibiotic use in livestock raises public health concerns due to antimicrobial residues in milk, which can contribute to antimicrobial resistance (AMR), allergic reactions, and other health risks. This study assessed antibiotic residues in milk from smallholder dairy farmers in Mbala and Kasama districts of Northern Zambia to evaluate food safety and compliance with established maximum residue limits (MRLs). A cross-sectional design was employed from May to June 2025, with 93 randomly selected lactating cattle. Milk samples were collected aseptically, stored under cold conditions, and analyzed at the Central Veterinary Research Institute using the Cham II competitive receptor assay for five antibiotic classes: Beta-lactams, Tetracyclines, Sulphonamides, Aminoglycosides, and Macrolides. Results revealed that 91.4% of milk samples contained residues above EU MRLs, with Mbala (98.1%) showing a higher prevalence than Kasama (82.1%) (p=0.006). Sulphonamides (68.8%) and Macrolides (58.1%) were the most prevalent, with Sulphonamides significantly differing between districts (p=0.000). These findings indicate frequent and indiscriminate antibiotic use, poor adherence to withdrawal periods, and inadequate regulatory oversight. The study underscores the urgent need for regulatory enforcement, routine surveillance of antimicrobial residues, and farmer education on antimicrobial stewardship to safeguard public health and mitigate AMR risks in Zambia.

Keywords: Antimicrobial residues, Cham II assay, dairy, food safety, maximum residue limits, one health

Abstract No: 079-OP

Unmasking hidden threats in quinoa's resilience to ozone and drought stress

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ABSTRACT

In southern Africa, agricultural production is increasingly threatened by climate variability, recurrent droughts, and rising concentrations of tropospheric ozone (O3). While quinoa (Chenopodium quinoa Willd.) is promoted as a climate-resilient crop suitable for marginal environments, little is known about its performance under combined O3 and drought stress. Understanding these interactions is crucial for strengthening the resilience of the agri-food system and ensuring food security in regions experiencing both water scarcity and air pollution. This study investigated: (i) the impact of O3 fumigation on quinoa photosynthesis and growth, (ii) the interaction between O3 and drought stress, and (iii) the extent to which elevated CO2 mitigates adverse effects. Quinoa plants were grown in open-top chambers and subjected to four treatments: ambient air, O3fumigation, drought stress, and combined O3 + drought, each under ambient and elevated CO2 levels. Physiological responses were assessed using chlorophyll fluorescence (OJIP/JIP-test), gas exchange measurements, and biomass analysis to quantify stress impacts. O3 exposure significantly reduced photosynthetic efficiency (Po, PIABS) and biomass accumulation, with more substantial reductions when drought was imposed concurrently. Elevated CO2 partially alleviated O3-induced damage by enhancing electron transport and water-use efficiency, though yield potential remained compromised under combined stress. While quinoa showed traits of stress tolerance, its resilience was limited in scenarios of simultaneous O3 pollution and drought. These findings reveal that O3 is an under-recognised constraint to crop resilience in southern Africa. The interactive effects of O3 and drought highlight the need to integrate air quality considerations into agricultural planning and policy. Strengthening monitoring systems, investing in stress physiology research, and promoting climate-smart practices are essential to safeguard food security and unlock the full potential of climate-resilient crops.

Keywords: Crop resilience, Drought stress, Elevated CO2, Ozone pollution, Photosynthesis, Southern Africa, Quinoa

Abstract No: 080-OP

Exploring the significance of camels in enhancing food security and adaptability in a changing climate: A review

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ABSTRACT

Camels contribute to resilient food systems by supplying nutrient-dense milk and meat, essential for protein intake in arid regions. There is an urgent need to integrate camels into innovative farming systems to enhance diversification and reduce reliance on climate-sensitive agricultural practices. This review aimed to assess the role of camels in strengthening drought resilience and enhancing food security, while facilitating climate change adaptation in arid environments. This review employed a variety of literature reviews, secondary sources, and personal observations to analyze the contributions of camels to food security and extreme weather adaptation, along with their socio-economic impacts. Results demonstrate that camels are integral to the livelihoods of numerous communities, offering vital resources such as milk, meat, income generation opportunities, and transportation. Camels' resilience and significance underscore their crucial roles in supporting rural communities and food systems in desert environments. Camels are instrumental farm animals in fostering resilient food systems and fulfilling the dietary requirements of inhabitants in arid environments by supplying nutrient-dense milk and meat, which are an essential source of protein. Camels play a significant role in the fight against poverty by creating opportunities for income generation and provision of nutritious food sources. In conclusion, the resilience of camels to withstand extreme weather events exemplifies the importance of climate-smart animal agriculture and sustainable farm animal management practices. The promotion of camel milk and meat should be encouraged as an alternative nutritional source that can strengthen drought and extreme weather adaptations, as well as food security in arid environments.

Keywords: Diversification, Drought resistance, Improved research, Nutritional adequacy, urgent actions

Abstract No: 081-OP

Antibiotic residues in raw cow milk collected from smallholder dairy producers in Kasama and Mbala, Zambia

Zulu, G.E.[1,6], Hang'ombe, B.H.[2], Mainda, G.,[3] Kayesa, E.,[4] Makungu, C.,[3] Chipembo, A.C.,[1,6] Nchima, G.,[5] Pondja, A.,[1,6] Bila, N.M.[1,6] & Moiane, B.[1,6]

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ABSTRACT

The rising misuse of antibiotics in livestock production has intensified global concerns about antimicrobial resistance (AMR) and the presence of antibiotic residues in animal-source foods. In Zambia, where smallholder dairy farmers contribute substantially to national milk production, limited surveillance and weak regulatory systems heighten the risk of residues entering the food chain. This study assessed antibiotic residues in milk collected from smallholder dairy farms in Mbala and Kasama districts to evaluate food safety and compliance with established maximum residue limits (MRLs). A cross-sectional study was conducted from May to June 2025 involving 93 lactating cattle selected through simple random sampling. A total of 100 mL of raw milk was collected from each animal, properly stored, and analyzed at the Central Veterinary Research Institute using the Cham II competitive receptor assay to screen five antibiotic classes: beta-lactams, tetracyclines, sulphonamides, aminoglycosides, and macrolides. Results revealed that 91.4% of all samples contained residues above EU/MRL thresholds for at least one antibiotic class. Mbala recorded a significantly higher prevalence (98.1%) than Kasama (82.1%) (p=0.006). Sulphonamides (68.8%) and macrolides (58.1%) were the most prevalent classes, with sulphonamides showing a significant difference between districts (p=0.000). The high proportion of contaminated samples underscores widespread misuse of antibiotics, non-adherence to withdrawal periods, and weak enforcement of veterinary drug regulations. These findings indicate a serious public health risk and highlight the urgent need for strengthened antimicrobial stewardship, routine residue surveillance, farmer education, and improved regulatory oversight to safeguard food safety and support a One Health response to AMR.

Keywords: Antimicrobial residues, Dairy; Food safety, One Health, Permissible limits, Cham II assay

Abstract No: 082-OP

Lessons from Guinea Fowl Farming and Hidden Antimicrobial Risks in the Era of Climate Change

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ABSTRACT

Climate variability threatens productivity in subsistence agri-food systems, disproportionately affecting vulnerable groups, particularly women and youth, who increasingly rely on resilient livestock such as guinea fowls for food security and income. This study assessed the socio-economic role of guinea fowl farming and associated public health risks in four districts of Midlands Province, Zimbabwe, using a mixed-methods approach combining surveys, focus group discussions, and microbiological sampling. Results indicated that 85% of women and 90% of youth actively manage guinea fowl production, with 80% relying on birds for household protein and supplemental income during breeding seasons. Microbiological analysis of E. coli isolates revealed alarming levels of antibiotic resistance, with 100% resistant to Ampicillin, 11.1% to Ciprofloxacin, and 10% showing intermediate resistance to Meropenem; one isolate was flagged as non-susceptible to carbapenems, highlighting a potential zoonotic risk. These findings underscore that while guinea fowl farming enhances climate resilience and livelihood security, it also exposes communities to multidrug-resistant pathogens. Integrating veterinary health services, antimicrobial stewardship, biosecurity education, and routine surveillance into climate adaptation and agricultural programs is essential to safeguard public health and ensure the long-term sustainability of inclusive, resilient agri-food systems.

Keywords: Agri-food systems, Antibiotic resistance, Carbapenems, Inclusive agriculture, Mapping

Abstract No: 083-OP

Assessment of Antimicrobial Resistance of Escherichia Coli, Salmonella spp., and Enterobacter spp. from Chicken Meat in Mzimba for Public Food Safety

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ABSTRACT

The global rise of antimicrobial resistance (AMR), largely driven by inappropriate antimicrobial use (AMU) in poultry production, presents a growing public health and food safety concern. In Malawi, where the poultry sector is rapidly expanding, limited evidence exists on AMU practices, farmer awareness, and resistance profiles in poultry products. This study assessed AMU patterns, knowledge, attitudes, and practices (KAP) related to AMR among poultry farmers, and characterized AMR profiles of Escherichia coli, Enterobacter spp., and Salmonella isolated from chicken meat in Mzimba District. A cross-sectional study conducted from February to May 2025 included structured interviews with 89 poultry farmers and veterinary drug vendors, alongside laboratory analysis of 100 meat samples. Results showed that 69% of samples contained E. coli, 12% Enterobacter, and 2% Salmonella, with 27% having multiple bacterial species. E. coli exhibited high resistance to ampicillin (91.3%), meropenem (82.6%), and tetracycline (71%), while Enterobacter spp. showed comparable resistance patterns, and multidrug resistance was widespread in both genera (75%). Antibiotic use was common among farmers (92%), primarily for treatment (97%), prevention (73%), and growth promotion (34.8%), yet only 46.1% demonstrated good AMR knowledge, and most relied on agro-dealers for drug advice. Weak regulatory oversight, informal supply chains, and poor storage practices further contributed to inappropriate antibiotic use. The high prevalence of multidrug-resistant bacteria in chicken meat underscores the urgent need for strengthened veterinary supervision, AMR stewardship training, improved regulatory enforcement, and promotion of responsible antibiotic use within Malawi's poultry sector.

Keywords: Antimicrobial resistance, Antimicrobial use, Bacterial isolates, Chicken meat, Escherichia coli, Mzimba

Abstract No: 084-OP

Anthracnose resistance in farmer preferred common bean market classes in Uganda

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ABSTRACT

Common bean (Phaseolus vulgaris L.) is a globally important legume crop, valued for its nutritional benefits and contribution to sustainable agriculture, particularly in Sub-Saharan Africa. In Uganda, it is a major source of dietary protein, with more than 80% of farmers engaged in its cultivation. However, production is constrained by factors such as nutrient deficiencies, erratic rainfall, socio-economic limitations, pests, and diseases. Among the major diseases, anthracnose caused by Colletotrichum lindemuthianum is particularly destructive, with yield losses reaching up to 100% especially when susceptible varieties are grown. There are limited cultural management strategies available for the control of anthracnose in farmer-preferred market class genotypes, and the use of host resistance in these genotypes remains undocumented. This study aimed to identify resistant genotypes for major Ugandan bean market classes and determine the inheritance of resistance to C. Lindemuthianum. Eighty-eight genotypes, including differential cultivars, released varieties, and breeding lines, were screened under controlled conditions against three races (863, 3663, and 4041) of the pathogen using a split-plot design with four replications in the screen house at Kawanda. Disease severity scores were recorded, and resistance levels were determined. Differential cultivars such as KABOON (Co-12), MICHELITE (Co-11), TO (Co-5), and WIDUSA (Co-15, Co-33) showed strong resistance to all the tested races. Among the released varieties, NABE 9C and NAROBEAN 6 were consistently resistant. Additionally, several breeding lines, including ACC 31, KARP 63, G5686, OPRR 27, LINGOT BLANC, NOKIA, PAN 72, several NUV lines, and ARD00068CIC exhibited broad-spectrum resistance. To study inheritance, crosses involving KARP 84 and KARP 22 with Widusa, Kaboon, Montcalm, BAT 332, and ARD00068CIC were made using the North Carolina II design. Segregation in F2 populations evaluated against race 3663 revealed predominance of additive genetic effects over non-additive ones. Negative GCA effects in WIDUSA, KARP 84, and ARD00068CIC indicated their effectiveness as resistant parents. Promising crosses included KARP 84 x MONTCALM, KARP 22 x ARD00068CIC, KARP 22 x BAT 332, KARP 22 x KABOON, and WIDUSA x KARP 22. Chi-square tests suggested the involvement of three dominant genes, with broad and narrow-sense heritabilities of 0.53 and 0.39, and a Baker's ratio of 0.74. The study highlights host resistance as the most sustainable strategy for anthracnose control. Identified resistant genotypes and promising crosses should be integrated into breeding programs and evaluated under field conditions using molecular tools to enhance durable resistance in common beans. These findings provide valuable genetic resources for breeding programs aimed at developing anthracnose-resistant varieties, thus supporting sustainable bean production and improved food security in Uganda.

Keywords: Additive effects, Anthracnose, Breeding lines, Colletotrichum lindemuthianum, Common bean, Heritability, Resistance inheritance, Uganda

Abstract No: 085-OP

Antibiotic residues in raw cow milk collected from smallholder dairy producers in Kasama and Mbala, Zambia

Zulu, G.E.[1,6], Hang'ombe, B.H.[2], Mainda, G.,[3] Kayesa, E.,[4] Makungu, C.,[3] Chipembo, A.C.,[1,6] Nchima, G.,[5] Pondja, A.,[1,6] Bila, N.M.[1,6] & Moiane, B.[1,6]

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ABSTRACT

In 2023, global milk production reached 965.7 million tons, with Africa contributing 53.8 million tons. In Zambia, smallholder farmers supply about half of the national milk output, underscoring the dairy sector's essential role in economic growth, food security, and nutrition. However, the increasing use of antibiotics in livestock — for growth promotion, disease prevention, and treatment — has led to growing concerns over antimicrobial resistance (AMR). Of the 12 million kilograms of antibiotics used globally each year, around 25% are used outside disease treatment, contributing to residues in animal products. Improper use of antibiotics in dairy production, especially failure to observe withdrawal periods, results in residues exceeding maximum limits. These residues pose significant health risks, including cancer, allergic reactions, and disruption of gut microbiota. AMR was responsible for an estimated 1.27 million deaths in 2019, with 4.95 million associated globally. In Zambia, AMR led to about 3,700 attributable and 15,600 associated deaths. Despite a 2017 "One Health" strategy informed by the World Health Organization's Global Action Plan (GAP), Zambia still faces regulatory, surveillance, and information gaps. This study uses the Cham II test to detect antibiotic residues in milk, offering crucial evidence for enhancing AMR response strategies, food safety, and policy development.

Key words: Food safety, Surveillance, Cham II test, Public health, Milk quality

Abstract No: 085-OP

Impact of fermentation and extrusion on textural properties and water activity of pigeon pea (Cajanus cajan L.) Products

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ABSTRACT

Pigeon pea (Cajanus cajan L.) is a drought-tolerant legume with high nutritional value, rich in protein, vitamins, fiber, and minerals, yet it remains underutilized due to prolonged cooking times, anti-nutritional factors, and limited value-added processing. With growing demand for plant-based proteins, innovative processing methods such as fermentation and extrusion offer opportunities to enhance pigeon pea's functional properties. This study investigated the combined effects of fermentation and extrusion on the physicochemical and textural properties of pigeon pea chunks, incorporating button mushroom and cassava starch at varying ratios (90:7.5:2.5, 90:5:5, 90:2.5:7.5). Fermentation was conducted using wild lactic acid bacteria, while extrusion trials were performed using a single-screw extruder at moisture contents of 11%, 13%, and 15%, and barrel temperatures ranging from 100 C to 170 C. Results indicated that 13–15% moisture content and barrel temperatures of 100 C, 130 C, and 140 C in respective zones produced high-quality extrudates. Fermentation significantly increased hardness (up to 22,802 g) and crispness (up to 31,906 g/s) compared to unfermented samples, likely due to microbial production of exopolysaccharides and enzymatic modification of protein structures, enhancing matrix strength and texture uniformity. Water activity was also significantly reduced in certain fermented samples, contributing to improved microbial stability and extended shelf life. The study demonstrates that fermentation, particularly when integrated with extrusion, markedly improves pigeon pea's textural characteristics, water-binding properties, and consistency, highlighting its potential for development of shelf-stable, value-added legume products. Further research into microstructural changes, rheological properties, and microbial metabolic profiles is recommended to optimize processing protocols for enhanced functionality.

Keywords: Crispness, Extrusion, Fermentation, Hardness, Pigeon peas, Water activity

Abstract No: 086-OP

Industrial Hemp as Sustainable Crop and a Carbon Sequestrater in the Changing Climate: A Review

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ABSTRACT

Global warming is increasing and it's becoming a world concern. Policy makers are trying to find solutions and to put measures that can reduce the causes of global warming. Agricultural inputs are one of the causes of global warming. The growing of crops that require use of synthetic fertilizers and chemicals is contributing much to global warming. Nitrogen fertilizer has a notable impact on enhancing crop yields; however, it also influences the emission of greenhouse gases like CH4, CO2, and N2O. These three gases play a significant role in global warming and its effects on the climate. Fiber hemp is densely sown, and therefore it is generally regarded as a pesticide-free crop because it has the ability to successfully suppress weed growth. Moreover, its properties as a carbon sequestrator and soil improver make it suitable for sustainable agriculture and climate change mitigation strategies Also, due to its rapid growth and production; it is one of the most effective CO2 biomass converters. Hemp has been proven to be an excellent carbon trap, absorbing more CO2 per hectare than most agricultural commodity crops. Each hemp hectare has the capacity for absorption of up to 22 tons of CO2 per hectare. Crops having a lot of biomass, such as hemp, can sequester more carbon through photosynthesis and then deposit this in the body and roots of the plant via bio-sequestration. In this study, we provide a discussion of the current state of knowledge regarding the production of industrial hemp without needing fertilizers and chemicals and its carbon sequestration properties so as to guide further researches. With relatively low fertilizer and chemical requirements compared to other crops, hemp shows great potential as a pesticide and fertilizer free crop, and a highly carbon sequestrator offering exciting possibilities to produce high yields in a changing climate.

Keywords: Carbon sequestration, Climate change, Fertilizer-free, Greenhouse gases, Hemp, Sustainable agriculture

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The carbon footprint of the tea agrifood system in the context of SDG 13 (Climate action)

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ABSTRACT

This study contributes to the growing interest and the need to enhance overtime transformational changes in the agrifood systems through understanding the environmental impacts of the tea agrifood system operations and identifying greenhouse gas emissions channels for improving and designing sustainable solutions to achieve SDG 13 (Climate action). It explores the main sources of greenhouse gas emissions (GHG) and methods used to measure carbon footprint and global warming potential. The study identifies different adaptation and mitigation strategies that reduce emissions from the tea agrifood system. Focusing on carbon footprint as the main factor in environmental sustainability and agrifood system resilience, 60 articles were systematically analyzed using MAXQDA software. The study found that the life cycle assessment of tea agrifood was highly conducted using SimaPro, openlca, and CCaLC2 frameworks under ISO14040:2006, ISO14044, and PAS 2050:2011 impacts evaluation standards. Moreover, electricity and energy were revealed as the leading sources of carbon emissions (CO2), followed by the overuse of chemical fertilizers, which emit other greenhouse gases (CH4 and N2O) at the cultivation stage, and the use of coal and firewood in the processing and packaging stages. Likewise, the highest environmental footprint was due to consumption activities (47%), processing (27%), cultivation (17%), and packaging (9%). The study highlighted that various adaptation and mitigation strategies, including improving energy use efficiency, use of organic fertilizers, and waste composting from tea processing, can reduce carbon footprints, improve environmental sustainability, and enhance resilient, greener agrifood systems.

Keywords: Carbon footprints, Climate actions, Environmental sustainability, Life cycle assessment, Tea

Abstract No: 088-OP

Variability of soil organic carbon stocks across land cover types in Ilakala village, Tanzania

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ABSTRACT

Soil Organic Carbon (SOC) stocks are a critical component of the global carbon cycle, influencing soil health and climate change mitigation. Understanding soil organic carbon stocks could be a pathway for improving management to increase yields in smallholder systems. The aim of this study was to assess the spatial variability of SOC stocks in various land cover types in Ilakala village. Soil physicochemical data (organic carbon, pH, sand, silt, clay) was collected from 100 sampling points at a depth of 0-30 cm following spatial stratified random sampling scheme. SOC stocks were estimated as a product of OC and bulk density measurements using a standard equation. Land cover types (LC) for the study area were established from a legacy FAO land cover map for Tanzania using the clipping geoprocessing function in QGIS software. Inverse distance weighting was also performed to develop SOC stocks maps with subsequent determination of SOC stocks zonal statistics for each LC in QGIS software. Four LCs were established with the largest areal coverage for Closed broadleaved decidous forest (71%), the least was Closed to open broadleaved evergreen or semidecidous forest (5%), while the Open needle leaved decidous or evergreen forest LC and Rainfed cropland LC had a similar areal coverage (12%). Estimated SOC stocks ranged from 103.2 Mg/ha to 1087.5 Mg/ha. Mean SOC stocks for LCs were of the order Open needle leaved decidous or evergreen forest > Closed to open broadleaved evergreen or semidecidous forest > Closed broadleaved decidous forest > Rainfed cropland, respectively, with values of 4056 Mg/Ha, 4006 Mg/Ha, 3166 Mg/Ha, and 2911 Mg/Ha. Levels of SOC stocks were generally in high range across all land cover types, however, sustainable agricultural practices will be essential to maintain productivity of Rainfed Croplands.

Keywords: SOC stocks, Spatial variability, Land Cover, Tanzania

Abstract No: 089-OP

Genetic analysis of yield and yield traits in adapted finger millet germplasm

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ABSTRACT

Understanding the genetic architecture of finger millet is essential for developing high-yielding and resilient cultivars. This study aimed to: (i) assess the nature and magnitude of gene action governing yield and yield-related traits in adapted finger millet germplasm, (ii) estimate general combining ability (GCA) and specific combining ability (SCA) of lines, testers, and their interactions, and (iii) quantify heterosis in crosses of lines and testers. A Line Tester mating design was implemented in season one to generate F1 hybrids. In season two, the hybrids were evaluated in a Randomized Block Design for combining ability and heterosis. Analysis of the genetic architecture revealed that key yield traits, including finger length, grain yield per plant, and thousand-grain weight, were predominantly governed by additive gene action, as indicated by Baker's ratios close to unity (0.83, 0.84, and 0.67, respectively). Nonetheless, significant heterotic effects driven by overdominance were also observed, underscoring the role of non-additive gene action. Line 504 emerged as an outstanding general combiner, exhibiting highly significant GCA effects for productive tiller number, threshing percentage, and grain yield per plant, making it a prime candidate for pureline selection and population improvement. These findings highlight the dual importance of additive and non-additive gene effects in finger millet improvement and indicate substantial potential for initiating a hybrid breeding program. Leveraging the evaluated germplasm can facilitate higher genetic gains, improve crop productivity, and support sustainable finger millet cultivation.

Keywords: Combining ability, Finger millet, Gene action, Heterosis, Lines, testers

Abstract No: 090-OP

Significance of pre-anthesis drought and heat stress on seed quality in diverse sorghum genotypes

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ABSTRACT

Seed quality is highly affected by heat stress and drought. Heat stress affects the reproductive stages (floret sterility and gametogenesis) more when compared to vegetative stages, as high temperature has got an effect on gametogenesis (microsporogenesis, megasporogenesis, pollen germination) and fertilization. This study was aimed to investigating seed physiological quality attributes of diverse sorghum genotypes. The study was carried out in two phases, with the first phase being planting of the 35 sorghum genotypes in pots at Lupane State University experimental plots under pre-flowering drought, heat stress and unstressed conditions, laid in a split plot following a Randomized Complete Block Design (RCBD) with three blocks. The second phase were the laboratory tests for seed viability and vigor of seeds grown under stressed and unstressed conditions using the Cold Test, Heat Shock Stress Test, Standard Germination Test, Seedling Vigor Test (coleoptile and radicle length), and Imbibition Capacity. A two-factorial laboratory experiment was laid in a completely randomized design (CRD) with three replicates. With the factors being seed of the 35 sorghum genotypes attained from crops grown under pre-flowering drought and heat stress and unstressed conditions. Significant differences were observed among genotypes for all seed quality parameters, indicating diverse physiological responses to stress. Genotypes IS 9405, IS 9548, IS 30047, IS 13813, IS 24272 and NPGRC 3127, had the best seed quality in terms of the seed quality tests done. The variation among genotypes underscores the influence of genetic background on maintaining seed quality and vigor under adverse environments. Genotypes with higher seed quality possess enhanced tolerance to stress-induced damage during reproductive development. Overall, the study demonstrates substantial genetic variability in sorghum seed quality under heat and drought stress, and the identified superior genotypes provide valuable genetic resources for breeding programs aimed at improving sorghum resilience and seed quality.

Keywords: Cold test, Heat shock stress test, Imbibition capacity and seedling vigour, Seed quality, Sorghum bicolour, Standard germination test