Republic of Botswana

BUAN
BOTSWANA UNIVERSITY OF AGRICULTURE AND NATURAL RESOURCES
Inspiring Sustainable Growth

21st Annual General Meeting
01-05 December 2025
Botswana

RUFORUM
Capacity Building in Agriculture

PRE-AGM EVENTS- SCIENTIFIC FORUM

17th-21st NOVEMBER 2025

PROGRAMME FOR ONLINE PRESENTATION

#RUFORUMAGM2025

AGM 2025

Welcome to the Pre- AGM Scientific Conference

Building Resilient and Inclusive Agri-Food Systems in the Face of Climate and Economic Shocks

DAY FOUR

Thursday, 20th November 2025

Session Chair: Prof. Folasade Ajayi
Rapporteurs: Prof. Chabi Adéyèmi Marc Sylvestre Djagoun, Prof. Zelalem Bekeko

08:00-08:05	Welcome Remarks from the Chair: Prof Folasade Ajayi	
08:05-08:20	Strain-Specific Fitness of Spodoptera frugiperda on Pearl Millet to support Resistance Screening	M. N. Kuboka
08:20-08:35	Knowledge, Attitude and Practices of Maize Farmers Fall Armyworm, Spodoptera frugiperda, Management: Implication for Extension Practices in Botswana	Garmonyou A. Sam
08:35-08:50	Credit Constraint, Unmet Fertilizer Needs and Climate- and Pest-related Crop Losses: Evidence from Three Selected Sub-Saharan African Countries	Jacob Nunoo
08:50-09:05	Efficacy of Bitter Leaf Powder (Vernonia amygdalina) against Root Knot Nematodes on Tomato in Borno State, Northern Nigeria	Kumshe, I.B.
09:05-09:20	Antibiotic resistance of lactic acid bacteria isolated from a maize-based fermented beverage (Kwete) consumed by ethnic communities in Northern Uganda	Prossy Nassanga
09:20-09:35	Bio-efficacy of phytopesticidal extracts of Tagetes minuta L. and Melia azedarach L. as protectant of Maize (Zea mays) against fall armyworm (Spodoptera frugiperda)	Shomari KIETE
09:35-09:50	Assessment of infestation, damage levels and eggs parasitism of fall armyworm (spodoptera frugiperda) in maize Moamba (sabie)	Wigner Tima Patrício
09:50-10:05	Identifying optimal lines for enhanced symbiotic performance in a mini-core collection of cowpeas [vigna unguiculata (l.) Walp]	Gelase Nkurunziza
10:05-10:20	Effectiveness of Raw Diatomaceous Earth alone or/in combination with permethrin dust against Rhyzopertha dominica (Coleoptera: Bostrychidae) on stored wheat (Triticum spp)	Bukar, A
10:20-10:35	Water Stress Effect on Chlorophyll Content at Different Rice (Oryza sativa L.) Plant Growth Stages	A. B. O. Abdelmajid
10:35-10:50	Kigelia fricana (lam.) Benth. Fruit powder as a sustainable natural supplement for broiler performance and health in Zimbabwe	Chindomu, Y. A

10:50-11:05	Distributional impact of agricultural land tenure and contract systems on climate-smart agriculture intensification in Ghana	Clement Oteng
11:05-11:20	Assessing Biomass Accumulation of Three Cassava Varieties under Different Cutting Lengths and Growth Media	Emmanuel Ogyiri Adu
11:20-11:40	Health Break	
11:40-11:55	Conservation Agriculture Practices for Resilient Maize Production under Soil Fertility Constraints in Kavango East, Namibia	Irya Junias
11:55-12:10	Green extraction of starch from pseudo cereals (quinoa and amaranth): A review	Jane Tafadzwa Muchekeza
12:10-12:25	Integrative effect of triple superphosphate, urea, and chicken manure on cabbage productivity in North-Central Namibia	Leuya H. Hamalwa
12:25-12:40	Investigating gender differences in sorghum variety selection and agricultural practices under climate change conditions in Masvingo District, Zimbabwe	Micheal Mubvuma
12:40-12:55	Evaluation of Soil Water Dynamics Using Selected Irrigation Water Management Tools under Two Irrigation Systems	Ronald Kgobe
12:55-13:10	A study on the effects of botanical rooting stimulants on the vegetative propagation of dragon fruit (Hylocereous undatus)	Madaure Jacqueline T
13:10-13:25	Growth Performance and Haematology of Oreochromis Niloticus (Linnaeus, 1758) Fed Phosphorus-Supplemented Feeds and Physiological Response of Lactuca Sativa (Linnaeus, 1753) in Aquaponic System	Manyor Batemanyor
13:25-13:55	Health Break	
13:55-14:10	Spatial variation of climate change-induced heat stress risk for dairy cows in Botswana	Jonas Kwedibana
14:10-14:25	Assessment of physicochemical properties of soil under different flood patterns in flood recession farming in the Okavango Delta, Botswana	Modise Nthaba
14:25-14:40	Early Warning Systems and Risk Reduction Strategies	Nyasha Nyakuchena
14:40-14:55	Empowering smallholder farmers: unveiling the key drivers of climate smart agriculture adoption across Africa: a systematic review	Ramakgasha Molobe Joyce
14:55-15:10	Closing Remaks from the Chair and RUFORUM Representative	

Abstract No: 107-OP

Strain-specific fitness of Spodoptera frugiperda on pearl millet to support resistance screening

Kuboka, M. N.,[1,3]* Togola, A.,[2] Ogola, G.[2] & Santos, L.[1]

[1] Faculdade de Agronomia e Engenharia Florestal, Universidade Eduardo Mondlane, Maputo, Mozambique
[2]Global Maize Program, International Maize and Wheat Improvement Center (CIMMYT), Nairobi, Kenya
[3]Dryland Crops Program, International Maize and Wheat Improvement Center (CIMMYT), Nairobi, Kenya
***Corresponding Author:** keighmaureen@gmail.com

ABSTRACT

The recent invasion and rapid spread of the Fall Armyworm in Africa has posed a significant threat to the production of several staple cereal crops, including pearl millet. The continuous and indiscriminate use of chemical insecticides to control FAW has raised serious concerns regarding their economic, environmental and human health impacts. Moreover, FAW populations have developed resistance to a range of commonly used insecticides, further complicating control efforts. Developing pearl millet genotypes with genetic resistance to FAW represents a sustainable and eco-friendly approach for managing this pest. However, there is limited information on the identification of FAW-resistant pearl millet genotypes and the genetic mechanisms conferring resistance. Additionally, the relative aggressiveness of the FAW C-strain versus the R-strain on pearl millet remains unclear. This study aimed to assess the feeding behavior of both FAW strains on pearl millet under laboratory conditions. The experiment consisted of two treatments (C-strain and R-strain), each with 50 replicates. Leaf portions of Pearl millet were cut into small pieces of 5 cm long and placed in 25 ml plastic vial. A single neonate of each strain was put in each vial. Leaves were changed every 2 to 3 days until pupation. Each pupa was kept in the 25 ml vial until the adult stages. The emerged adults were paired and fed with sucrose solution soaked in cotton wool for oviposition. The collected data was about the life table parameters of FAW strains including larval survival rate, pupal survival rate, adult emergence and sex ratio, numbers of eggs led. The C-strain demonstrated a higher larval survival rate, a shorter larval duration, higher adult emergence rates, a greater number of adults produced and a better-balanced sex ratio. In addition, fecundity assessments showed the Corn strain produced significantly more eggs. These findings highlight superior performance of C-strain across key developmental and reproductive parameters, suggesting this strain for use in artificial infestation experiments to screen pearl millet genotypes for resistance to Fall Armyworm.

Keywords: Artificial infestation, C-strain and R-strain, Feeding preference, Pearl millet resistance, Spodoptera frugiperda

Abstract No: 108-OP

Knowledge, Attitude and Practices of Maize Farmers Fall Armyworm, Spodoptera frugiperda, J. E. Smith Management: Implication for Extension Practices in Botswana

Garmonyou, A. S.,[1,2]* Tiroesele, B.,[2] Omoloye, A.A.,[2] Legwaila, M.M.[2] & Olutade Torimiro, D.O.[2]

[1]Department of General Agriculture, College of Agriculture and Forestry, University of Liberia, Republic of Liberia
[2]Department of Crop and Soil Sciences, Botswana University of Agriculture and Natural Resources (BUAN), Republic of Botswana
***Corresponding author:** garmonyouasam@yahoo.com

ABSTRACT

The study was carried out to analyze the maize farmers knowledge, attitude and practices (KAP) of fall armyworm management (FAW), Spodoptera frugiperda (J.E. Smith, Lepidoptera: Noctuidae) in Botswana. From each of the following six districts (Central, Kweneng, Kgatleng, Northeast, Southeast and Southern), 45 farmers were randomly selected making a total of 270 selected for the study. A set of validated pre-tested questionnaire were administered to solicit information from the respondents. Farmers' responses were classified into high, moderate, and low levels across the districts in respect of the KAP analysis. Mean plus or minus (±) Standard Deviation was used to categorize the KAP into levels. For knowledge, (≥ 38.29 = high, between 27.25 – 38.29 = moderate and ≤ 27.25 = low); attitude, (≥ 21.29 = high, between 16.13 - 21.29 = moderate and ≤ 16.13 = low); practices, (≥ 31.21 = high, between 25.74 - 31.21 = moderate and 25.74 = low). The results reveal a significant disconnect between farmers' knowledge of the pest and their actual management practices, with knowledge levels characterized as moderate to high in certain districts but practice levels uniformly low across all regions. Specifically, farmers in the Northeast and Southeast districts exhibited high knowledge levels (18.3% and 19.2%, respectively), yet their management practices remained insufficient (e.g., Northeast = 13.2%). In contrast, Central Kgatleng (26.3% each) and Southern (25%) displayed higher attitudes toward pest management but lacked the requisite knowledge to critically engage with effective pest management strategies. The study assessed the nature of existing information dissemination channels, revealing a reliance on traditional media (40 %) and personal observations (41 %) rather than structured extension services (17 %). The study concludes that insights gained from this study indicate that socio-economic constraints, including limited financial resources for pest control inputs, further exacerbate the gap between knowledge, attitude and practice. Though, knowledge of FAW is relatively widespread, especially in Northeast and Southeast, but did not translate into positive attitudes or sustainable practices. Central, Kgatleng, and Southern showed willingness yet require more knowledge and support. The findings emphasize the need for an elaborate approach to strong extension practices that enhances farmers' understanding of integrated pest management (IPM) strategies while addressing economic and behavioral challenges that impede effective pest management.

Keywords: Botswana, Spodoptera frugiperda, knowledge, attitude, practices, pest management, maize, farmers

Abstract No: 109-OP

Credit constraint, unmet fertilizer needs and climate- and pest-related crop losses: evidence from three selected sub-Saharan African countries

Nunoo, J.,[1,2]* Coffie, M.,[1] Opoku, A.[1] & Sekyi, S.[2]

[1]Department of Applied Economics, University of Cape Coast, Cape Coast, Ghana
[2]Department of Economics, SDD UBIDS, Wa, Ghana
Corresponding Author: jacob.nunoo@ucc.edu.gh

ABSTRACT

Climate and pest related crop losses pose a major challenge to agriculture in Sub-Saharan Africa (SSA), threatening food security and livelihoods. Credit constraints, defined as the inability of households to borrow against future income, can limit farmers' access to fertilizers, pest-control measures, and other inputs, exacerbating their vulnerability to climate- and pest-related shocks. This study investigates how credit constraints influence crop losses and the mediating role of unmet fertilizer needs, using nationally representative data from 7,526 farming households in Kenya, Nigeria, and Tanzania. Probit, IV-probit, and Two-Stage Residual Inclusion (2SRI) models were employed to correct for endogeneity between credit constraints and crop losses. Structural Equation Modelling (SEM) assessed the mediation effect of fertilizer access, while subgroup analyses explored heterogeneities by farm size, income level, and rural–urban residence. Results show that credit-constrained farmers are significantly more likely to experience crop losses, with the strongest effects observed among smallholders, poor households, and rural farmers. Credit constraints increase unmet fertilizer needs, which partially mediates the relationship with crop losses. Country-level effects were most pronounced in Tanzania. These findings highlight the critical role of financial inclusion in building climate-resilient agricultural systems. Policies that expand access to credit, coupled with support for fertilizers, improved seeds, irrigation, and extension services, are essential to reduce crop losses and enhance agricultural resilience. Targeted interventions for vulnerable groups can contribute to achieving Sustainable Development Goals 1 (No Poverty) and 2 (Zero Hunger). Keywords: Agricultural resilience, Climate-related crop losses, Credit constraints, Fertilizer needs, Financial inclusion, Pest-related crop losses, Smallholder farmers, sub-Saharan Africa.

Keywords: Agricultural resilience, climate-related crop losses, credit constraints, fertilizer needs, pest-related crop losses, smallholder farmers

Abstract No: 110-OP

Efficacy of bitter leaf powder (Vernonia amygdalina) against root knot nematodes on tomato in Borno State, Northern Nigeria

Kumshe, I.B.*, Bukar, A. & Zubairu, M.

Department of Agronomy and Soil Science, Borno State University, P. M. B 1122, Maiduguri, Borno state, Nigeria
***Corresponding Author:** bukarkumsheisa@yahoo.com

ABSTRACT

Field trials were carried out to assess efficacy of bitter leaf (Vernonia amygdalina) powder against root knot nematodes (Meloidogyne spp) on tomato (Solanum lycopersicum L.). The objectives of the study were to evaluate the efficacy of bitter leaf (V. amygdalina) powder in reducing plant parasitic nematode population in tomato; and to assess the effect of the amendment on growth and yield of tomato. The experiment was laid out in a randomized complete block design (RCBD) with four (4) treatments and three replications. The treatment used are: 4g, 8g, 12g/ plant stand of bitter leaf and control. The parameters observed were: initial nematode population (Pi), final nematode population (Pf), reproduction factor (Rf), change in nematode population, galling index, fresh shoot height (cm), fruit weight (kg/ha), root length (cm), and dry shoot and root weight (g). The results obtained revealed that significant difference (P 0.05) were observed in nematode population, shoot weight, root length, root gall index, dry shoot and root weight. Significant difference (P 0.05) were observed on shoot height and root weight. The result shows that least (9.3) nematode population was recorded in 12g/plant stand of bitter leaf, followed by plot treated with 8g/ plant stand , then 4g/ plant stand with 21 and 31 respectively. Furthermore, highest (-90.7) percentage change in population was recorded in 12g/ plant stand and the lowest (62) was observed under control. The result further shows that at the highest dose rate of 12/ plant stand, tomato fruit weight of 269.33g while at the least dose rate of 4g/ plant stand, 165g fruit weight was recorded, when compared with the control which recorded least fruit weight of 119.67g. The study concluded that improved results were observed in all treated plants, were bitter leaf powder reduced the adverse effect of nematodes as result of reduced population due to toxicity of V. amygdalina on root knot nematode can be suggested for tomato farmers for use as it proved to be effective in the management of nematodes.

Keywords: Botanicals, Meloidogyne spp., Nematodes, Tomato, Vernonia amygdalina

Abstract No: 111-OP

Efficacy of bitter leaf powder (*Vernonia amygdalina*) against root knot nematodes on tomato in Borno State, Northern Nigeria

Kumshe, I.B.*, Bukar, A. & Zubairu, M.

Department of Agronomy and Soil Science, Borno State University, P. M. B 1122, Maiduguri, Borno state, Nigeria
***Corresponding Author:** bukarkumsheisa@yahoo.com

ABSTRACT

Traditional fermented beverages are important sources of Lactic Acid Bacteria (LAB) with recognized probiotic potential. However, LAB may carry antibiotic resistance genes, posing public health risks. This study investigated the phenotypic antibiotic resistance profiles of LAB isolates from Kwete, a maize-based fermented beverage consumed in Northern Uganda. LAB isolates were obtained from two ethnic sub-regions (Acholi and Lango) and included Lacticaseibacillus rhamnosus ATCC 7469 as a reference strain. Antibiotic susceptibility testing was performed using the disc diffusion method against twelve commonly used antibiotics, and results were analyzed with ANOVA and heat maps to compare resistance patterns. Findings revealed marked heterogeneity in antibiotic susceptibility across isolates. All LAB from Acholi and L. rhamnosus ATCC 7469 were resistant to colistin, gentamicin, ciprofloxacin, and metronidazole, but susceptible to amoxillin. In contrast, Lango isolates displayed broader resistance, with isolate 111 showing resistance to the highest number of antibiotics. Multiple antibiotic resistance was observed in all isolates, with resistance patterns varying by sub-region. Sulphamethoxazole, tetracycline, and erythromycin resistance were more prevalent in Lango isolates. The results indicate that regional variations in microbial ecology, production practices, and local ingredients influence antibiotic resistance profiles of LAB in fermented beverages. This study highlights the need for safety evaluation of LAB from traditional fermented foods before their use as probiotics. Monitoring antibiotic resistance in LAB can inform selection of safe strains for functional food development, guide public health campaigns, and ensure the promotion of safe, culturally relevant probiotic beverages.

Keywords: Acholi, Antibiotic resistance, Kwete, Lactic acid bacteria, Lango, Northern Uganda

Abstract No: 112-OP

Bio-efficacy of phytopesticidal extracts of Tagetes minuta L. and Melia azedarach L. as protectant of Maize (Zea mays) against fall armyworm (Spodoptera frugiperda)

Kiete, S.,[1]* Tiroesele, B.,[2] Legwaila, M.M.[3] & Mmabaledi, B.[4]

[1]Department of Crop Production and Protection, Faculty of Agriculture and Environmental Sciences, Université Espoir du Congo
[2]Department of Crop and Soil Sciences, Faculty of Agriculture, Botswana University of Agriculture and Natural Resources
[3]Department of Crop and Soil Sciences, Faculty of Agriculture, Botswana University of Agriculture a nd Natural Resources
[4]Department of Biological Sciences, Faculty of Sciences, Botswana University of Agriculture and Natural Resources
***Correspondence Author:** xaviersshomari@gmail.com

ABSTRACT

Fall armyworm (FAW) is a nocturnal, voracious, and polyphagous pest native to tropical regions of the Americas, feeding on more than 80 plant species, preferably cereals, including maize. Firstly, reported earlier in 2016 in Africa, its severe damage to maize is responsible for losses estimated to be approximately a billion per year in over 45 countries in sub-Saharan Africa, with direct impact on food insecurity and poverty exacerbation. The study aimed to determine the efficacy of biopesticidal extract of T. minuta and M. azedarach on the population of S. frugiperda as a sustainable and effective low-cost means of its biocontrol. Carried out at the Sebele valley (24 33'S, 25 54'E, 994 m above sea level), the experiment consisted of a Factorial Block laid in a randomized complete block design (RCBD). Extracts of Melia (M) and T. minuta (T) and in 1:1 ratio, the combination of both Melia and Tagetes (TM), were studied as the treatments with three doses (100g, 500g and 1000g/5L of water) replicated three times each, with two controls (Negative, with no application) and Positive (Cypermethrin, a commonly used insecticide at 20mL/20L of water). The plant extracts were isolated and characterized using Sukhdev's protocol for qualitative and quantitative analysis of phytochemical profile. Bioassay on larvae population was carried out in controlled conditions using IRAC method adapted to FAW. The phytochemical analysis results showed different concentrations of total flavonoid content on M. azaderach (87.7 and 87.2 mg QE/mL) and total phenolic content and on T. minuta (46.7 and 47.63 mg QE/mL) as active compounds responsible for both repellence and lethality, while qualitative analysis showed considerable concentrations of flavonoids, tannins, saponins, and terpenoids. The results on incidence and severity indicated that the negative control exposed maize to FAW attack with a prevalence of 94% and severity of (3.56±1.25a). Comparatively, Melia treatments were effective in FAW control with a cumulated average of 14.8% of FAW occurrence and a severity score of 0.36±0.91 (null to light attack), while Tagetes treatment were less effective, as plots treated respectively T1, T2 and T3 (66.7; 63.9; and 50%) were by far, the most suitable feeds of FAW inflicting light to moderate attacks, with a cumulated severity score of 2.93±2.03 (moderate to intense attack). The combined doses have shown

promising tolerance to the presence of FAW, with mostly absence to light attacks (quasi absence of damages on upper parts, leaves and stems) though they highly hosted FAW population (TM1 (44.4%) being most hospitable, followed by TM2 (33.3%) and TM3 (25%). Standard control seemed to be a better means of control since it led to lower occurrence (19.4%) and almost null severity (0.53±1.13). The plant extracts exhibited positive effects on yield components as the combination doses led to the highest yield per plot (11.6±1.28), followed by Melia (5.84±0.53), Tagetes (3.58±0.52) and negative control (2.72±0.74). The highest mortality of larvae under bioassay was obtained from SC and M3 (100% after 24 hours of larvae exposure to plant extracts, while the worst result was obtained from T1 (25% after 48 hours), and TM2 has shown intermediary results as it led to a mortality ranging from 50 to 70% after 48 hrs of exposure. The study highlighted the importance of nature-based solutions for FAW control. Moderate doses of M. azedarach combined with T. minuta are recommendable for effective and low-cost, affordable and eco-friendly FAW control and sustainable agriculture. Providing affordable solutions to control one of the most pressing pest in framework of sub-Saharan agriculture where millions of farmers live under the poverty threshold would improve productivity, food security, and alleviate poverty.

Keywords: Bio-efficacy, Melia azedarach, Phytopesticidal extracts, Spodoptera frugiperda, Tagetes minuta, Zea mays

---

Abstract No: 112-OP

Assessment of infestation, damage levels and eggs parasitism of fall armyworm (Spodoptera frugiperda) in maize Moamba (Sabie)

Patrício,W.T.,* Thuku, S., Deborah, A., Tembe, G., Lyabagaga, B. & Ntawizera, G.

Eduardo Mondlane University, Main Campus, Av. Julius Nyerere, nr. 3453
Maputo – MoçambiqueMozambique
***Corresponding Author:** wignertima.patricio@gmail.com

ABSTRACT

Maize (Zea mays L.) is a staple crop in Africa, providing essential calories and carbohydrates. However, its production and the livelihoods of smallholder farmers are increasingly threatened by the fall armyworm (FAW), Spodoptera frugiperda. This study assessed FAW infestation levels and the contribution of egg parasitoids as natural biocontrol agents in maize fields of Moamba District, Mozambique. A survey was conducted from 17th to 21st March 2025 across 19 small-scale maize fields at the vegetative stage (V5–V12) with no prior insecticide application. In each field, 50 plants were randomly selected using a "W" sampling pattern. FAW presence, leaf damage (1–9 scale), egg mass abundance, and parasitism rates were recorded. Results showed the highest FAW infestation in Diamane (91.6 ± 5.15%), followed by Gavaza (85.0 ± 3.0%) and Godjua (79.0 ± 6.19%), with the lowest in Ligongole (60.0 ± 6.0%), indicating significant spatial variation (P = 0.049). Although the mean number of egg masses and egg mass infestation rates did not differ significantly among sites, Diamane recorded the highest egg mass count (3.4 ± 1.75), and Sabie Sede had the highest

egg mass infestation (8.0%). Significant parasitism by native parasitoids, especially Trichogramma spp., was observed, suggesting potential overlap in biological control with other stemborer pests. These findings emphasize the importance of integrating biological control into FAW management strategies. Conservation approaches, including intercropping, reduced pesticide use, and habitat enhancement to support natural enemies such as Trichogramma and Telenomus spp., are recommended to strengthen sustainable pest management and improve maize productivity in Mozambique.

Keywords: Egg, Integrated pest management, Maize, Parasitoids, Spodoptera frugiperda, Food security

---

Abstract No: 113-OP

Identifying optimal lines for enhanced symbiotic performance in a mini-core collection of cowpea [Vigna unguiculata (L.) Walp]

Nkurunziza, G.* Odong, T. L., Mbeyagala, E.K., Edema, R.Dramadri, I.O., Adjei, E. A., Badji, A.,, Abraha, R.H., Bararyenya, A., Sodedji, K.A.F., Mugarra, J., Tukamuhabwa, P.,, Ssemakula, M.O. & Tumuhairwe, J. B.

Makerere University, P. O. Box 7062 Kampala, Uganda
Corresponding Author: nkurugelase@gmail.com

ABSTRACT

Cowpea (Vigna unguiculata L. Walp), is an important food security and climate-resilient legume grain crop grown in the semi-arid regions of sub-Saharan Africa (SSA). It can symbiotically fix atmospheric nitrogen and improve soil fertility, which should be harnessed to increase its yield in the region. This study assessed the mini-core cowpea collection genotypes for effective and efficient nodulation, aiming to select the superior genotypes for further field evaluation in Ugandan agro-ecologies. A total of 252 cowpea genotypes were planted in pots in a screen house at Makerere University Agricultural Research Institute, Kabanyolo, (MUARIK), in a randomized complete block design (RCBD) with two replications. Seeds were inoculated with Bradyrhizobium spp, (Strain ICB756). At early pod formation stage, data were collected on plant vigor (based on plant height, leave greenness and biomass) and nodulation-related traits including number of nodules per plant (NN), proportion of active nodules (AN) and nodule dry weight per plant (NDW). Results showed that NN and AN ranged from 0 to about 89 and 0 to 100%, averaging 25 and 44.6%, respectively. NDW ranged from 0 to 128.9 mg/plant, averaging 31.7 mg/plant. Analysis of variance showed significant differences ($p<0.05$) among genotypes for AN, and NDW, indicating a genetic diversity between the genotypes which were grouped in 4 clusters. There was a positive correlation between symbiotic traits and plant vigor, implying a combined possible improvement of these traits. Genotypes such as TVu-14971, TVu-1477, and TVu-14691 were identified as best performers for both nodulation traits and plant vigor,

while TVu-9259, TVu-14621 and TVu-7719 exhibited poor nodulation. After confirmation under standardized screening conditions, the present findings could contribute to cowpea breeding programs aiming at developing new cultivars, contributing to agricultural sustainability and food security while maintaining a healthy environment.

Keywords: Biological nitrogen fixation, Bradyrhizobium spp, Mini core genotypes, Nodulation, screening

---

Abstract No: 114-OP

Effectiveness of Raw Diatomaceous Earth alone or/in combination with permethrin dust against Rhyzopertha dominica (Coleoptera: Bostrychidae) on stored wheat (Triticum spp)

Bukar, A.,*Zubairu, M. & Kumshe, I.B.

Department of Agronomy and Soil Science, Kashim Ibrahim University, P. M. B. 1122, Maiduguri, Borno State

Corresponding Author: ahmadubukar72@gmail.com

ABSTRACT

Laboratory experiments was carried out to evaluate the efficacy of raw DE alone or/in combination with permethrin dust against R. dominica on wheat, to assess insect mortality caused by exposure to raw DE and/ or permethrin, effects on progeny production of exposed beetles and prevention of grain damage by the test insect. R. dominica was obtained from laboratory cultures which has been maintained in the laboratory for over year, where F1 progeny was used for the experiment. The raw DE was tested at application rates of 0 (untreated control) 500, 750, 1000, 1500 mg raw DE/kg alone and with 2 and 5 mg active ingredient permethrin to each DE dose making a total of 12 treatment combinations. Each treatment combination and control, 50 g grain samples in three replicates were place in 250 ml capacity bottles, and thirty adults insects were placed into each replicate. Adult mortality, progeny production and percentage damage kernel by R. dominica were assessed. The result reveals that at higher dose rate of 1500 mg/kg of raw DE and with combination of permethrin gave appreciable adult mortality after 7 days of exposure interval, after continuous exposure to 14 days, complete 100% adult mortality was noticed at 1500 mg/kg dose rate. Progeny production was suppressed after 40 and 80 storage period. Greater than 88% progeny suppression where recorded at the lowest dose rate of 500 mg/kg on raw DE and enhanced DE as the dose rate increases, complete progeny inhibition were noticed at the highest dose rate of 1500 mg/kg or 500 mg + 2 or 5 mg permethrin when compared with untreated controls. The percentage damage kernel decreases at the dose rate of 1500 mg/kg with raw DE combined with 2 and 5 mg/kg were 1.3±1.0 and 0.0±0.0, respectively.

Keywords: Diatomaceous earth, Mortality, Progeny Rhyzopertha dominica, Wheat

Abstract No: 115-OP

Water Stress effect on chlorophyll content at different rice (Oryza sativa L.) Plant growth stages

Abdelmajid, A. B. O., [1,2,3]* Lamo, J.,[3] Chiteka, Z. A.,[1] Gibson, P.,[1] Badgi, A.,[2] Adjei, E. A. [2,5] & Edema, R. [1,2] & Kpoviessi, A. D.[2]

[1]Departement of Agricultural Production, College of Agricultural and Environmental Sciences, Makerere University, Kampala, Uganda
[2]Makerere University Regional Center for Crop Improvement (MaRCCI), Makerere University, Kampala, Uganda
[3]Cereal (Maize and Rice) Breeding Program, National Crops Recourses Research Institute (NaCRRI), Namulonge, Kampala, Uganda
[4]Biotechnology and Biosafety Research Center (BBRC), Agricultural Research Corporation (ARC), Khartoum, Sudan
5CSIR-Savannah Agricultural Research Institute P.O. Box TL 52, Tamale, Ghana
***Corresponding author**: ahmedbashir.sd@gmail.com

ABSTRACT

Rice (Oryza sativa L.) is a major staple food crop, and its demand is increasing in Uganda. Drought is a major yield-reducing factor by affecting various physiological and biochemical processes. Rice is known to be very sensitive to drought during the vegetative and reproductive stages. Plant responses to drought are complex and involve many physiological changes, including a reduction in chlorophyll content. This study aims to examine the effect of drought on rice chlorophyll content during the vegetative and reproductive stages. Sixty-one rice genotypes with varying degrees of drought tolerance were grown under controlled conditions in two separate sets of experiments. In the first experiment, the plants were stressed during the vegetative stage and reproductive stage in the second experiment, by withholding watering for 14 days and re-watering. As a response to dehydration conditions, the study showed that genotypes, when stressed during the vegetative stage, recorded less chlorophyll dehydration grand mean (28.14) and median (31.25) compared to when stressed during the reproductive stage (Mean=36.44, Median=45.5). However, the slightly higher recovery grand mean was observed during the vegetative stress (46.82) than during the reproductive stress (46.55). The highest value was recorded in NM-17-72-6 (49.65), while the lowest value was recorded in NM-17-72-33 (20.85). After re-watering the plants for seven days to assess the recovery, the readings ranged from 52.8 to 33.54. The highest value was recorded in NM-17-72-22 (52.8), while the lowest value was recorded in Basmati 307 (33.54). Highly significant differences were observed among genotypes and genotypes by irrigation methods interaction for chlorophyll dehydration and recovery. In the two experiments, the findings showed a remarkable variation in chlorophyll dehydration (reduction) among the studied genotypes at the end of the water stress episodes; however, the dehydration effect observed on the plants was more severe during the vegetative stage. After re-watering, the plants stressed during the vegetative stage also showed a higher recovery rate compared to when stressed during the reproductive stage. Overall, the best and highest chlorophyll recovery from dehydration in the two experiments was recorded in NM-17-72-22, NM-17-72-30, NM-17-72-23, NM-17-72-37, 42 (56), NM-17-72-40, NM-17-72-17, and NM-17-72-48. In cereals, higher total chlorophyll content under stress conditions has been reported as an indicator of drought tolerance. Therefore, these genotypes hold high drought tolerance potential and can be used in the subsequent breeding stages for drought.

Keywords: Chlorophyll Dehydration, Chlorophyll Recovery, drought, reproductive stress, vegetative stress

Abstract No: 116-OP

Effect of risk management on the performance of rice production supply chain in Kebbi State, Nigeria

Khalid, B.A.,[1]* Kamarulzaman, N.K.,[2] Man, N.,[2] Ali, F.[2] & Gindi, A.A.[3]

[1]Abdullahi Fodiyo University of Science and Technology, Aliero, Nigeria
[2]Department of Agribusiness and Bioresource Economics, Faculti of Agriculture, Universiti Putra Malaysia
[3]Department of Agricultural Economics and Extension, Kebbi State University of Science and Technology Aliero
***Corresponding Author:** armiyau13@gmail.com

ABSTRACT

This study examines the impact of risk management on the performance of the rice production supply chain in Kebbi State, Nigeria. Risks include weather, biological, environmental, market, logistics, financial, and operational risks. The research uses Contingency Theory and an exploratory mixed-methods research approach, involving interviews and questionnaires. The results show that risks from weather, biology, market, finance, logistics, and operations affect the efficiency of the supply network. The study found a connection between the variables and a statistically significant risk effect, while risk mitigation had a statistically significant effect. The study highlights the importance of risk management in the success of the rice production supply chain, enabling stakeholders to make informed decisions and invest in risk mitigation strategies. The study provides new empirical data on risk management's impact on rice production supply chain performance, enabling policymakers and stakeholders to make informed decisions and invest in risk mitigation strategies.

Keywords: Management, performance production, rice, risk, supply chain

Abstract No: 117-OP

Distributional impact of agricultural land tenure and contract systems on climate-smart agriculture intensification in Ghana

Oteng, C.,1* Egbendewe, A.Y.G.[2] & Thiele, R. [3]

[1]University of Cape Coast, 4P48+59H, Cape Coast, Ghana
[2]Université de Lomé, 01 BP 1515, Lomé, Togo
[3]Kiel Institute for the World Economy, Germany
***Corresponding Author:** clement.oteng@ucc.edu.gh; coteng2000@gmail.com

ABSTRACT

The adoption of climate-smart agriculture (CSA) practices is crucial for enhancing agricultural productivity, mitigating carbon emissions, and building resilience among smallholder farmers in Sub-Saharan Africa (SSA). Despite the proven benefits, adoption rates in SSA remain low due to both supply- and demand-side constraints, including input availability, credit access, labor shortages, land tenure insecurity, and farmer behavioral biases. This study examines the influence of land tenure systems and agricultural contracts on CSA adoption among rural farmers in Ghana. Employing a quasi-experimental design with multistage sampling, four districts across Northern and Southern Ghana were selected. Data were collected from treated and control groups and analyzed using Poisson regression models. The results reveal that insecure land tenure, such as short-term rentals or sharecropping arrangements, significantly reduces farmers' incentives to adopt CSA practices. Conversely, farmers engaged in pre-planting and buyer contracts demonstrated higher adoption intensities, reflecting the importance of formalized agreements in facilitating access to inputs and markets. These findings underscore the role of institutional and contractual arrangements in shaping adoption behavior. Policy implications include the formalization of land tenure through titles or legally recognized customary systems, capacity-building for contract negotiation, and the establishment of deferred input credit schemes. Additionally, fostering collaboration between farmers, input suppliers, and financial institutions can enhance access to CSA technologies. Overall, understanding the interplay of land tenure, contractual arrangements, and behavioral factors is critical for designing effective interventions that promote sustainable agricultural intensification and food security in Ghana.

Keywords: Agricultural contracts, Agricultural land tenure system, Climate change, Climate-smart agriculture, Food security, Smallholder farmers

Abstract No: 118-OP

Assessing biomass accumulation of three cassava varieties under different cutting lengths and growth media

Adu, E. O.* & Nkunu, K.V.

Department of Crop Science, School of Agriculture, College of Agriculture and Natural Sciences, University of Cape Coast, Cape Coast, Ghana
***Corresponding author**: emmanuel.adu@ucc.edu.gh

ABSTRACT

This study was conducted to assess biomass accumulation patterns of three cassava varieties Cape Vars bankye, Taah bankye, and Adom bankye, under different stem cutting lengths and growth media. It intended to identify cost-effective propagation strategies that enhance early growth and improve cassava productivity. A factorial experiment arranged in a Completely Randomized Design CRD was carried out at the University of Cape Coast with three cutting lengths of one-node, 15 cm, and 30 cm, two growth media of soil and sawdust, and three cassava varieties, giving 18 treatment combinations with five replications. Data collected included root fresh weight, root length, shoot fresh weight, and total biomass, and were analyzed using ANOVA with Tukey's HSD for mean separation. The results showed that cutting length and variety significantly influenced all measured traits, whereas growth medium alone had no significant effect. Longer cuttings of 15 cm and 30 cm consistently outperformed one-node cuttings in root and shoot development, with 15 cm cuttings proving more resource efficient than 30 cm cuttings. Among the varieties, Taah bankye accumulated the highest biomass, followed by Cape Vars bankye, while Adom bankye performed poorly across all parameters. Interactions revealed that Cape Vars bankye performed best in sawdust, whereas Taah bankye accumulated more biomass in soil. It is concluded that 15 cm cuttings represent the optimal balance between planting material use and growth performance. Farmers are recommended to adopt 15 cm cuttings for efficient cassava propagation, while variety-specific responses to growth media should be considered in nursery and field management strategies.

Keywords: Biomass, cassava, cuttings, growth, media, productivity

Abstract No: 119-OP

Conservation agriculture practices for resilient maize production under soil fertility constraints in Kavango East, Namibia

Junias, I.

International University of Management, Namibia
***Corresponding Author:** iryasimanekajunias@gmail.com

ABSTRACT

Soil fertility declines and increasing climate variability pose major threats to maize production in Sub-Saharan Africa. In Namibia's Kavango East region, smallholder farmers are particularly affected, experiencing reduced yields due to nutrient-depleted soils and erratic rainfall patterns. These challenges undermine food security, household incomes, and the overall resilience of rural farming systems. Conservation agriculture (CA) has gained prominence as a sustainable approach for restoring soil health and enhancing adaptive capacity in resource-constrained environments. This study assessed the effects of key conservation agriculture practices, minimum tillage, crop rotation, residue retention, and agroforestry integration, on soil fertility and maize productivity. Field observations from the Musese Green Scheme were combined with secondary data from research reports and farmer interviews to compare outcomes between conventional tillage and CA-based systems. Preliminary results show that CA significantly improves soil organic matter, enhances moisture retention, and increases water infiltration, resulting in more stable maize yields under variable rainfall. Farmers practicing CA also reported reduced production costs and lower dependence on external inputs, indicating improved economic resilience. These combined ecological and financial benefits suggest that CA can strengthen farmers' capacity to withstand climate and market shocks. Overall, conservation agriculture presents a promising pathway for sustainable maize production and resilience-building in Namibia. Scaling up adoption will require targeted extension support, farmer-led knowledge exchange, and enabling policy frameworks that incentivize sustainable land management. Strengthening CA uptake can contribute meaningfully to food security, climate adaptation, and the development of inclusive, shock-resilient agri-food systems in the region.

Keywords: Climate change, Conservation agriculture, Maize production, Namibia, Resilience, Soil fertility

Abstract No: 120-OP

Green extraction of starch from pseudo cereals (quinoa and amaranth): A review

Muchekeza, J. T.[1,2]* Itenge, T.O.[4], Moyo, M.[5] & Nantanga, K.K.M.[1]

[1]Department of Food Science and Systems, School of Agriculture and Fisheries Sciences, University of Namibia
[2]Department of Animal and Wildlife Sciences, Midlands State University, P Bag 9055, Gweru, Zimbabwe
[3]Department of Chemical Sciences, Midlands State University, P Bag 9055, Gweru, Zimbabwe
[4]Department of Animal Production, Agribusiness and Economics. School of Agriculture and Fisheries Sciences, University of Namibia, Namibia
***Corresponding Author**: muchekezaj@staff.msu.ac.zw

ABSTRACT

Pseudo cereals such as quinoa and amaranth are increasingly recognized for their nutritional value and adaptability to marginal environments. Their starch content presents significant potential for food and industrial applications. However, conventional extraction methods, such as mechanical, chemical, and enzymatic, often rely on chemical reagents that pose environmental and health concerns, particularly in food-grade contexts. However, water-based extraction has emerged as a green alternative, aligning with sustainability goals and minimizing carbon footprints. This review critically examined starch extraction methods applied to pseudo cereals, with a focus on water-based techniques. It highlights the environmental and functional properties of aqueous extraction, especially in reducing chemical usage and supporting clean-label starch extraction. A systematic literature review was conducted using peer-reviewed articles, book chapters, and technical reports published between 2010 and 2025. Extraction methods were categorized into mechanical, chemical, enzymatic, and aqueous approaches. Comparative analysis was performed on starch yield, purity, physicochemical analysis, environmental impact, and suitability for food-grade applications. Emphasis was placed on studies involving amaranth and quinoa. The review found that water-based methods yielded starch with minimal damage, with a lower yield and purity in comparison to other methods. Compared to alkaline and solvent-based techniques, aqueous methods reduce chemical usage by over 90% and decrease wastewater toxicity. Functional properties such as gelatinization temperature, swelling power, and paste clarity were preserved and enhanced. Additionally, water-extracted starch demonstrated compatibility with biodegradable packaging and clean label formulations. Water-based starch extraction from pseudo cereals offers a viable and sustainable alternative to conventional methods, particularly for food-grade applications. Its low environmental impact, cost-effectiveness, and preservation of functional integrity make it suitable for a climate-resilient agri-food system. The adoption of aqueous extraction supports global efforts to reduce carbon footprints and transition towards eco-friendly processing technologies. Future research should focus on optimizing process parameters, scaling up water extraction, and integrating renewable energy sources to further enhance sustainability.

Keywords: Aqueous extraction, clean label processing, pseudo cereal starch, starch extraction sustainability

Abstract No: 121-OP

Integrative effect of triple superphosphate, urea, and chicken manure on cabbage productivity in North-Central Namibia

Leuya H. Hamalwa1*, Simon K. Awala1, Kudakwashe Hove2, Cecil Togarepi3, Anastacia N. Aluvilu1 and Petrus A. Ausiku1

1Department of Crop Production and Agricultural Technologies, Faculty of Agriculture, Engineering and Natural Resources, University of Namibia

2Department of Wildlife Management and Tourism Studies, Faculty of Agriculture, Engineering and Natural Resources, University of Namibia

3Department of Agricultural Economics, Faculty of Agriculture, Engineering and Natural Resources, University of Namibia

*Corresponding Author: leuyahalleluya@gmail.com

ABSTRACT

Smallholder cabbage (Brassica oleracea var. Capitata L.) producers in North-Central Namibia often experience low yields due to infertile soils with low nitrogen and phosphorus contents. While chemical fertilizers can supply nutrients quickly, their high costs limit farmers' adoption; conversely, ecologically friendly, locally available organic amendments release nutrients more slowly. Integrated nutrient management (INM) that combines chemical and organic fertilizers may offer both agronomic and economic benefits. A two-season field trial was conducted at the University of Namibia-Ogongo Campus during the 2023 and 2024 winter seasons to evaluate the effects of different fertilizers on cabbage performance. A factorial arrangement of three triple superphosphate rates (0, 45, and 90 kg P ha–), three urea rates (0, 60, and 120 kg N ha–) and three chicken manure (M) rates (0, 20, and 40 t ha–) was laid out in a randomized complete block design with three replications. The combined application of 90 kg P ha– , 120 kg N ha– , and 40 t M ha– consistently produced the highest cabbage yields, before trimming (119.0–127.6 kg ha–) and after trimming (90.7–95.0 kg ha–), demonstrating the synergistic effect of the INM approach. As a way of reducing fertilizer costs, we recommend that farmers use the band-placement application method, which could save up to 60% of the fertilizer requirement. Moreover, future studies should strive to identify the economically optimal combination of chemical and organic fertilizers for smallholder cabbage producers and conduct cost-benefit analyses to guide INM recommendations.

Keywords: Cabbage yield, integrated nutrient management, smallholder farmers, sub-Saharan Africa, Sustainable agriculture

Abstract No: 122-OP

Investigating gender differences in sorghum variety selection and agricultural practices under climate change conditions in Masvingo District, Zimbabwe

Mubvuma, M.[1]*& Zvobgo, E.[2]

[1]Department of Soil and Plant Sciences, Great Zimbabwe University,
P. O. Box 1235, Masvingo, Zimbabwe
[2]Director, Mbuya Nehanda Centre for Gender and cultural Studies,
Great Zimbabwe University, Zimbabwe
Corresponding Author: mmubvuma@gzu.ac.zw

ABSTRACT

The study had the objectives to investigate gender differences in sorghum variety selection and agricultural practices in Masvingo District, Zimbabwe, as coping mechanisms against drought and water stress related to climate change. We examined how men and women farmers differ in their choice of sorghum varieties, agronomic practices, and decision-making processes, considering economic gains and climate resilience. Our findings revealed a significant gender difference in decision-making and agricultural practices, with men prioritizing economic gains and women focusing on crop yield. Men predominantly made decisions on planting dates, methods of planting, and when to harvest, while women managed weeding, pest and disease scouting, and marketing of produce. However, men ultimately controlled financial decisions, determining how income from sorghum sales was utilized. The study highlights the need to integrate gender perspectives into climate-resilient agricultural practices, ensuring that both men and women's needs and priorities are considered. The findings have implications for policy and practice, emphasizing the importance of gender-sensitive agricultural extension services, inclusive decision-making processes, and climate-resilient sorghum varieties that meet both men's and women's needs.

Keywords: Agricultural practices, climate resilience, gender differences, sorghum varieties, decision-making, Zimbabwe

Abstract No: 123-OP

Evaluation of soil water dynamics using selected irrigation water management tools under two irrigation systems

Kgobe, R.*, Clift-Hill, A., Mmolawa, K. & Aliwa, J.

Botswana University of Agriculture and Natural Resources (BUAN), Department of Agricultural and Biosystems Engineering, Private Bag 0027, Gaborone, Botswana

Corresponding Author: kmmolawa@buan.ac.bw

ABSTRACT

Botswana is a semi-arid country and therefore, water-conserving irrigation methods and tools are essential. Self-regulating Low Energy, Clay-based Irrigation (SLECI) is an innovative system that uses the suction force of soil to regulate water release within the system and is ideal for dryland agriculture. The objectives of this study were to: Investigate the performance of irrigation water management tools under drip and SLECI irrigation systems and; to determine the quantity of water used by under the two irrigation systems to grow maize (hybrid SC 419). In the first objective, the performance of the irrigation water management tools: Tensiometers; Time Domain Reflectometry TDR); Wetting Front Detectors (WFDs); and Chameleon soil water sensors were evaluated. In the second objective, the quantity of water used was digitally measured. The studies were conducted at BUAN's, Notwane farm in Gaborone. Experiments were laid out following a split-plot design, with the two irrigation systems as the main plot and depth below the soil surface as the sub-plot. Secondary-treated wastewater was used. Tensiometers readings were higher under SLECI (6.5 kPa), compared to drip-irrigated plots (10.9 kPa). Similarly, TDR measurements indicated higher volumetric moisture content in the SLECI plot (15%), compared to drip-irrigated plot (12%). Chameleon soil water sensors recorded continuous wet and moist conditions in the SLECI plots, compared to the variable readings under drip irrigation. WFDs underestimated soil moisture status in the SLECI plot compared to the conventional drip-irrigated plot. Out of 160 observations of the WFDs under SLECI irrigation, only 3 observations were active (up / yes response) due to a rainfall event. Whereas under drip irrigation, WFDs worked well because a wetting front infiltrated the base of the WFDs funnel to activate the float. Maize irrigated with the SLECI system received significantly less water than the conventional drip system to achieve similar or even higher crop yields. The cumulative volume of irrigation water for SLECI and drip irrigation systems was 4.731 and 6.601 m3, respectively. Water productivity of the SLECI irrigation system was 1 kg/m3 compared to 0.5 kg/m3 of drip irrigation system. The implications of these findings are discussed.

Keywords: Chameleon soil sensors, conventional drip irrigation, Irrigation water management tools, Tensiometer, Waterfront detector, Time domain reflectometry, SLECI

Abstract No: 124-OP

A study on the effects of botanical rooting stimulants on the vegetative propagation of dragon fruit (Hylocereus undatus)

Tavagwisa, M., Somerset, M., Maryika, C. & Jacqueline,T. M.[1]*

Department of Horticulture/Agronomy, Women's University in Africa, Marondera, Zimbabwe
***Corresponding Author:** jacquelinemadaure@yahoo.com

ABSTRACT

Dragon fruit (Hylocereus undatus) is an emerging high-value crop with strong potential for commercial production in Zimbabwe due to its nutritional benefits, medicinal properties, and suitability for climate-resilient farming systems. However, widespread adoption remains limited by the low availability of vegetative planting material and low rooting success of stem cuttings. This study investigated the use of botanical rooting stimulants, Aloe barbadensis and Cinnamomum verum, as sustainable, climate-smart alternatives to commercial rooting hormones for enhancing the rooting performance of H. undatus stem cuttings. A 2 × 4 factorial experiment was conducted using full and half stem-cuttings treated with A. barbadensis gel, C. verum, commercial rooting hormone, and water (control). Treatments were arranged in a randomized complete block design under shade-house conditions, with irrigation applied every five days. Data on aerial roots, underground roots, and incidence of rot were collected 40 days after planting. Results showed that full-length stem cuttings produced significantly ($p<0.05$) higher numbers of both aerial and underground roots compared to halved cuttings. Full stem-cuttings treated with A. barbadensis gel exhibited the highest ($p<0.05$) underground root development, outperforming *C. verum* and the control. Rot incidence differed significantly ($p<0.05$) across treatments and was most prevalent in halved cuttings. These findings demonstrate that botanical stimulants, particularly A. barbadensis, enhance rooting success and reduce propagation constraints for H. undatus. Overall, the study provides important insights for improving the climate-smart and sustainable production of dragon fruit in Zimbabwe, supporting its wider adoption among growers.

Keywords: Botanicals, Hylocereus undatus, Phytochemicals, Rooting stimulants, Stem-cuttings

Abstract No: 125-OP

Growth Performance and Haematology of Oreochromis Niloticus (Linnaeus, 1758) Fed Phosphorus-Supplemented Feeds and Physiological Response of Lactuca Sativa (Linnaeus, 1753) in Aquaponic System

Batemanyor, M.,* Makombu, J.G.[1], Matouke, M.M.,[1] Belda Q. Mosepele, B,Q., Thema, F.T.[2]

[1]Department of Fisheries and Aquatic Resources Management, Faculty of Agriculture and Veterinary Medicine, University of Buea, P. O. Box 63, Buea, Cameroon
[2]Botswana University of Agriculture and Natural Resources, Gaborone, Botswana
***Corresponding Author:** batelennon@gmail.com; manyor.batemanyor@ubuea.cm

ABSTRACT

Aquaponics is a bio-integrated system that links recirculating aquaculture with hydroponic production. Bio-integration is beneficial for resource efficiency, climate resilience, increased product diversity and profit. Though Oreochromis niloticus and Lactuca sativa are common in aquaponic production, nutrient balance particularly phosphorus, a vital macronutrient for both species reportedly varies across growth phases. This study investigated the effects of phosphorus supplemented feed on the growth performance, nutritional content and hematological response of O. niloticus and L. sativa in aquaponics. Three iso-experimental diets were differentiated by graded phosphorus levels: commercial feed (control, 1.1g/kg, T0), (6.1g/kg, T1) and (8.6g/kg, T2). The experiment was conducted in triplicate using O. niloticus fingerlings (9.3±0.10g) and two weeks old L. sativa seedlings stocked at 7.5kgm^{-3} and 15seedlings m^{-2} respectively. Weekly, O. niloticus growth (length, weight) and survival and L. sativa response (growth, total chlorophyll) were determined for 10 weeks. Then, the proximate and mineral content and haematology of O. niloticus and L. sativa were evaluated. The specific growth rate was significantly higher T2 (2.55±0.27%) compared to T1 (2.40±0.18%) and T0 (1.99±0.16%). The haemoglobin concentration was significantly higher at T2 (10.13±0.03g/dL) than T1 (9.37±0.03g/dL) and T0 (7.849±0.04 g/dL). Crude protein of L. sativa was significantly higher at T2 (1.81±0.01%), than T1 (1.71±0.10%) and T0 (1.60±0.13%). Total chlorophyll content was significantly higher at T2 (19.46±2.85) compared to T1 (15.92±1.88) and T0 (15.42±2.48). Phosphorus (8.6g/kg) enhanced metabolic activities including nucleic acid synthesis, erythropoiesis, chlorophyll biosynthesis enhancing cell physiology. Strategies to improve phosphorus availability in aquaponics are crucial to optimize the potential and sustainability of aquaponics. This study mainly contributes to Sustainable Development Goals 2; 12; 13 of zero hunger, responsible consumption and production and climate action respectively.

Keywords: Aquaponics, Botswana, Oreochromis niloticus, Lactuca sativa, Phosphorus-supplement

Abstract No: 126-OP

Spatial variation of climate change-induced heat stress risk for dairy cows in Botswana

Kwedibana, J.[1]*& Batisani, N.[2]

[1]Department of Animal Sciences, Faculty of Animal and Veterinary Sciences, Botswana University of Agriculture and Natural Resources, Private Bag 0027, Gaborone, Botswana
[2]Department of Water and Aquatic Resources, Botswana University of Agriculture and Natural Resources, Private Bag 0027, Gaborone, Botswana
***Corresponding author**: jaykaybw05@gmail.com

ABSTRACT

Rising temperatures and frequent heat waves associated with climate change pose a significant challenge to dairy production, particularly in arid and semi-arid regions such as Botswana. Heat stress in dairy cattle results from elevated metabolic heat loads, reducing productivity, reproduction, health, and welfare, and causing economic losses for smallholder farmers. This study assessed the spatial and temporal distribution of heat stress for dairy cows in Botswana under current (2020) and projected future conditions (2030, 2050, 2070) using the Temperature Humidity Index (THI) under the high-emission scenario SSP5-8.5. Data from 24 synoptic weather stations across nine administrative districts were analyzed, and spatial mapping was performed using ordinary kriging in ArcGIS Pro. Results indicate a warming trend across Botswana, with annual mean maximum temperatures increasing from 27.97–31.77 C in 2020 to 31.93–35.82 C in 2070. Correspondingly, THI values and the number of heat stress days are projected to increase, particularly in northern districts, where moderate to severe heat stress will dominate. By 2070, the entire country is projected to experience over 320 days of heat stress per year, with severe heat stress increasing in frequency and intensity in the north. The findings highlight the urgent need for cost-effective heat abatement strategies and climate adaptation measures to support sustainable dairy production in Botswana. Without interventions, large areas of the country may become unsuitable for dairy farming due to escalating heat stress, underscoring the importance of integrating climate projections into policy and development programs for the sector.

Keywords: Botswana, Climate Change, Climate Projections, Dairy Cows, SSP5-8.5, Temperature Humidity Index

Abstract No: 127-OP

Assessment of physicochemical properties of soil under different flood patterns in flood recession farming in the Okavango Delta, Botswana

Nthaba, M.[1]* Kashe, K.[1] & Moroke, T.S.[1]

[1]Okavango Research Institute, University of Botswana, Private Bag 285, Maun, Botswana
[2]Botswana University of Agriculture and Natural Resources, Private Bag 0027, Gaborone, Botswana
***Corresponding Author:** modicent@gmail.com

ABSTRACT

Flood recession farming, locally known as molapo farming, is a critical livelihood for riparian communities in the Okavango Delta. This study assessed the influence of different flooding patterns on soil physicochemical properties across three floodplain types: saucer-shaped (Shorobe), lake flats (Lake Ngami), and channel type (Makalamabedi). Seventeen molapo fields were sampled, and soil samples were collected at 30 cm depth along systematic transects to create composite samples per field. Soil analyses included texture, pH, organic matter (SOM), available phosphorus, and exchangeable cations (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}). Statistical analyses included one-way ANOVA, MANOVA, and Kruskal-Wallis tests with Bonferroni-adjusted alpha for multiple comparisons. Results indicated that flooding patterns significantly influenced soil nutrients, SOM, and pH. Calcium was the dominant nutrient (969.40 ± 122.10 mg/kg), while lake flats exhibited the highest magnesium (M = 220.34 ± 97.90) and channel type the highest phosphorus (M = 20.56 ± 8.07). SOM was highest in lake flats (Md = 3.29), reflecting greater organic matter accumulation and potential fertility. Soil pH varied, with lake flats showing acidic conditions (M = 5.72 ± 0.19), whereas saucer-shaped and channel type soils were near-neutral. Soil texture, classified as sandy loam, and silt-clay ratios were consistent across all flood types, indicating physical properties were largely unaffected by flood pattern. These findings highlight that flooding dynamics shape nutrient availability, SOM, and pH, with implications for crop suitability and sustainable management in flood recession farming. Understanding these patterns can guide targeted interventions to optimize productivity in wetland agricultural systems.

Keywords: Flooding patterns, Molapo farming, Okavango Delta, Organic matter, Soil nutrients, Soil pH

Abstract No: 128-OP

Early warning systems and risk reduction strategies

Nyakuchena, N.

Women's University in Africa, Faculty of Agricultural, Environmental and Health Sciences, Mutare Campus. No 122 Upper 3rd Street, 11th Avenue Mutare, Zimbabwe
***Corresponding author:** gloriousnyakuchena@gmail.com

ABSTRACT

The increasing threat of climate-related disasters highlights a critical gap in traditional post-event disaster response. A paradigm shift toward proactive risk reduction is essential for building long-term resilience, yet a significant research gap exists in understanding how community-based early warning systems (EWS), anticipatory action plans, and financial tools are effectively integrated to protect livelihoods. The purpose of this systematic literature review was to investigate the efficacy and key factors influencing the successful implementation of integrated risk reduction strategies. The study aimed to provide a unified framework that guides policymakers, practitioners, and communities in developing more robust and effective disaster preparedness programs. A rigorous systematic literature review was conducted, synthesizing academic and grey literature from 2000 to the present. Searches were performed across five major databases (Scopus, Web of Science, PubMed, JSTOR, and Google Scholar) using a combination of keywords related to EWS, anticipatory action, and financial risk tools. A qualitative thematic synthesis approach was used to analyze extracted data and identify recurring themes related to implementation challenges and success factors. The study findings are consistent with the "diffusion of innovations theory," which postulate that successful implementation requires co-creation. Robust community engagement, accessible and timely information channels, and strong cross-sectorial partnerships were foundational for program success. The most compelling result was that financial tools, such as weather-index insurance, provided the crucial catalyst that turned a passive warning into an active, livelihood-protecting decision. This research contributes a comprehensive, integrated framework to the field of disaster risk reduction. It underscores that the true power of these strategies is realized through their strategic fusion, which closes the "last-mile" gap between warning and action. The findings provide a clear directive for future practice: prioritize community-centric co-creation models, invest in multi-channel communication, and foster strong public-private partnerships to build sustainable, disaster-resilient communities.

Keywords: Anticipatory action, climate resilience, disaster risk reduction, early warning systems, financial risk tools

Abstract No: 129-OP

Empowering smallholder farmers: unveiling the key drivers of climate smart agriculture adoption across Africa: a systematic review

Ramakgasha, M. J.[1]* & Chipfupa, U.[2]

Department of Agriculture and Animal Health, School of Agriculture and Life Sciences, University of South Africa, 28 Pioneer Ave, Florida Park, Roodepoort 1709, South Africa
Department of Agriculture and Animal Health, School of Agriculture and Life Sciences, University of South Africa, 28 Pioneer Ave, Florida Park, Roodepoort 1709, South Africa
*Corresponding Author: 18992048@mylife.unisa.ac.za

ABSTRACT

Climate change presents a serious threat to African agriculture, resulting in food shortages; thus, the adoption of climate-smart agricultural (CSA) practices is crucial for ensuring food security and sustainability. However, smallholder farmers, particularly in Africa, have low adoption rates despite the potential benefits, such as higher yields, increased resilience and reduced input costs. This review aims to synthesize existing literature to identify key factors influencing CSA adoption among smallholder farmers, with an emphasis on gender disparities. This study conducted a systematic literature review following PRISMA guidelines, focusing only on peer-reviewed articles in English and using keywords related to "climate-smart agriculture" (with/without hyphen) or "CSA" AND "smallholder farming/agriculture" OR "small-scale farmers," in titles, keywords, and abstracts. After screening and selection, 39 relevant studies published between 2013-2024 were included in the analysis. The review identified over 30 CSA practices, grouped into soil-based (e.g. zero/minimum tillage), crop-based (e.g., crop rotation), and water-based (e.g. irrigation), alongside adoption factors categorized as socio-demographic, institutional, and resource endowment. The findings indicate that factors such as age, gender, education, household size, farm size, income, access to credit, and livestock ownership have mixed effects on CSA adoption, reflecting geographic, practice-specific and cultural variations. In contrast, access to extension services, media exposure, market access, and farmer group membership consistently enhance adoption. Notably, many studies report lower adoption rates among female farmers, often linked to structural barriers such as limited land rights and access to inputs. These insights highlight key patterns in CSA adoption and provide a basis for gender-sensitive policy approaches. By providing evidence-based insights, this review can inform targeted extension programs, enabling interventions to promote CSA adoption and address gender disparities among African smallholder farmers.

Keywords: Adoption, Agricultural policies, Climate Change, Empowering farmers, Extension services, Gender-sensitive approachess