BUAN
BOTSWANA UNIVERSITY OF
AGRICULTURE AND NATURAL RESOURCES
Inspiring Sustainable Growth

Republic of Botswana

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

FORUM I

RESILIENT AGRIFOOD SYSTEMS TRANSFORMATION

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

Opening Session for Scientific Conference
17th November 2025

Time (EAT)	Session	Responsible / Speaker
09:00 - 09:10	Opening and Welcome Remarks	Dr Florence Nakayiwa, Deputy Executive Secretary, RUFORUM
09:10 - 09:20	Remarks by the Dean, Botswana University of Agriculture and Natural Resources (BUAN)	Prof. Justin H Chepete Dean, BUAN
09:20 - 09:35	Key Speech - Transforming African Higher Education through Collaborative Leadership	Prof. Mathias Fonteh; Chair, RUFORUM Committee of Deans and Principals
09:35 - 10:00	Remarks by the Executive Secretary of RUFORUM	Prof. Patrick Okori, Executive Secretary, RUFORUM
10:00 - 10:30	Keynote Address - Innovating for Africa's Agricultural Transformation: The Role of Universities	Dr. Tilahun Amede, Director; Climate Change, Sustainable productivity and Resilience at AGRA (Alliance for Green Revolution in Africa)
10:30 - 10:45	Health / Tea Break	
10:45 - 12:00	Panel Discussion: Fostering Academic Excellence and Resource Mobilisation in African Universities	Dr. Patrick Byakagaba: Panel Chair
	• Panelists: Prof. Rashid Serad (UM6P); Prof. Bruce Sinsin (UAC); Robert Zougmoré, Director, Alliance of Bioversity International and CIAT, Prof. Luisa Santos (UEM, Mozambique and ACSS); Prof. Emmanuel Kaunda (LUANAR); Prof. Frans Swanepoel (University of Pretoria)	
	• Discussion guided by a Moderator	
12:00 - 12:15	Synthesis of Key Messages and Way Forward	Prof. Majaliwa Mwanjalolo, Manager RID
12:15 - 12:30	Opening of the ONLINE Scientific Conference of RUFORUM	RUFORUM Secretariat

AGM 2025

Welcome to the Pre-AGM Scientific Conference

DAY ONE

Monday, 17th November 2025

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

Registration Link: https://bit.ly/4oUuDWG

Session Chair: Prof. Flora Josiane Chadare
Rapporteurs: Dr. Hellen Gitonga, Dr. Valence Mutwedu

Time		
12:30-13:45	Lunch Break	
13:45-13:50	Welcome Remarks from the Chair: Prof Flora Josiane Chadare	
	Topic	Presenter
13:50-14:05	Does trust in extension systems influence adoption of conservation agriculture in Southern Africa: Insights from lab in the field experiments	Mark Manyanga
14:05-14:20	Use of climate information services for early farm activities: evidence from smallholder vegetable farmers in Leribe District, Lesotho	Mojaki R. A
14:20-14:35	UTAUT2 estimation of the determinants influencing uptake and sustained use of ofsp value addition technologies in Teso Sub Region, North Eastern Uganda	Ocilaje Otai Michael
14:35-14:50	New approaches in the development of diluents for gamete preservation in African cattle breeds	Eddington Gororo
14:50-15:05	Smart farming adoption among small scale farmers	Sanderson Abel
15:05-15:20	The impact of institutional factors on the adoption of climate-smart innovations by smallholder farmers in the Okavango Delta, Botswana	Tlhomamo Nthaba
15:20-15:35	Harnessing Intellectual Property to Protect and Promote Indigenous Knowledge Systems in Agriculture	Vincent Phemelo Rapoo
15:35-15:50	Effects of affordable inputs program on food poverty alleviation among smallholder farmers in Malawi	Rebecca Nkhoma
15:50-16:05	Enhancing Food Security and Climate Resilience through Bean-Based Climate-Smart Agriculture in Nakuru County, Kenya	Anne Gichangi
16:05-16:20	Health Break	
16:20-16:35	Harnessing Amaranthus for Climate-Resilient Agrifood Systems in southern Africa: Lessons from Physiology to Nutrition	Mhlanga, P. F.
16:35-16:50	Climate Change, Gender and Food Security in Malawi: A Cge Approach	Julius Mukarati
16:50: 17:00	Closing Remaks from the Chair and RUFORUM Representative	

RUFORUM
Capacity Building in Agriculture

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

Abstract No: 001 -OP

Does trust in extension systems influence adoption of conservation agriculture in Southern Africa: Insights from lab in the field experiments

*[a] Manyanga, M., [b]Mulungu, K., Hambulo, [a]Ngoma, H., [b]Simutowe, E. & [a] Thierfelder, C.

[a]International Maize and Wheat Improvement Center (CIMMYT), Southern Africa Regional Office
12.5 Km Peg, Mazowe Road, Mt Pleasant, Harare, Zimbabwe
[b]International Maize and Wheat Improvement Center (CIMMYT), Lusaka, Zambia
Corresponding author: m.manyanga@cgair.org

ABSTRACT

Smallholder farmers in Sub-Saharan Africa increasingly face the challenges of climate change, that has impacted agricultural productivity and food security. Accordingly, governments, researchers, and development practitioners have promoted climate-smart agriculture, particularly conservation agriculture (CA), for over four decades to build production resilience and mitigate climate risks. A key assumption underlying adoption is that farmers are more likely to embrace new practices when they trust the information providers. We conducted an artefactual field experiment in Malawi, Zambia, and Zimbabwe to test whether trust in extension providers influences learning outcomes and adoption intentions for CA. Farmers participated in training sessions facilitated by public, private, and farmer-to-farmer (mother host) extension agents. Trust was measured using a standard trust game, while knowledge was assessed through post-training test scores. Adoption decisions were analyzed using a probit model, with CA adoption (yes/no) as the dependent variable. On average, 13% of households reported intentions to adopt full CA practices, with higher rates in Zimbabwe (16%), followed by Malawi (12%) and Zambia (11%). Farmers exhibited greater trust in public extension agents compared to private agents and fellow farmers, especially in Zimbabwe. Prior, CA experience significantly increased the adoption likelihood by 1.1–1.2 percent. In Malawi, trust in public extension agents had a consistently positive and significant effect on CA adoption intentions, while trust in private agents was not significant. Trust in fellow farmers showed mixed but significant effects across models. In Zimbabwe, relative trust mattered most: when trust in public agents exceeded that in private agents, adoption intentions increased significantly across all model specifications. Overall these results underscore the importance of strengthening credibility, consistency, and advisory capacity of public extension services, while also fostering collaboration with private and farmer-led agents. Furthermore, gender-sensitive approaches remain essential, as structural barriers continue to limit female farmers' uptake of innovations, even when trust is high.

Keywords: Conservation agriculture adoption, extension services, trust, trust games, Sub-Saharan Africa

Use of climate information services for early farm activities: evidence from smallholder vegetable farmers in Leribe district, Lesotho

*Mojaki, R.A., Letsoalo, S.S. & Malahlela, N.D.

Department of Agricultural Economics and Extension, Faculty of Natural and Agricultural Sciences, University of North-West, South Africa

Corresponding author: Mojaki19990@gmail.com

ABSTRACT

Climate change and weather variability pose significant challenges to crop production, which are further exacerbated by several other factors. Climate information services are considered essential support tools for enhancing farm management decisions and activities, thereby helping to minimise climate risks by anticipating, preparing for, and responding to climate-related challenges. Despite the beneficial effects of climate information services, it remains unclear how smallholder vegetable farmers utilise them and whether they perceive them as effective. To address this gap, this study employed a cross-sectional design and a quantitative approach. A multistage sampling technique was employed, and primary data were collected from a random sample of 180 smallholder vegetable farmers in Leribe through face-to-face interviews using KoboCollect. Data analysis was carried out using descriptive statistics in the Statistical Package for the Social Sciences (SPSS) version 25.0 and statistical indicators used were frequencies, percentages and cross tabulations. The findings were presented in tabular form using frequency distributions, means, and standard deviations. The findings revealed that farmers use a variety of climate information services, including daily and weekly forecasts, early warning messages, and agro-meteorological services. Farmers utilise these services for a range of early farm activities, with crop rotation, crop diversification, and land preparation being the primary uses. Varying degree of effectiveness of early action have been observed, with crop rotation and diversification being highly effective. The study concluded that smallholder vegetable farmers use several climate information services to guide early farm management activities and mitigate climate change risks. To enhance vegetable production in the face of a changing climate, timely and tailored climate information services are crucial.

Keywords: Climate information services, early farm activities, smallholder vegetable farmers

UTAUT2 Estimation of the Determinants Influencing Uptake and Sustained Use of OFSP Value Addition Technologies in Teso Sub Region, North Eastern Uganda

*[a]Ocilaje, O.M., [a]Miiro, R., [a]Ekere, W., [a]Orumu, B. & [b]Namanda, S.

[a]School of Agriculture, Makerere University, P.O.Box 7062, Kampala, Uganda
[b]International Potato Centre, 106 Katilima Road, Naguru P.O.BOX 2274 Kampala
Correspondence Author: ocilaje@gmail.com

ABSTRACT

Orange fleshed Sweet Potatoes (OFSP) processing technologies particularly motorized chippers have emerged over the past decade as promising options for enhancing value addition within OFSP value chains. These technologies produce intermediate products such as chips, high quality flour and puree that serve as essential inputs for OFSP based confectioneries and fast foods recipes that cater to the shifting dietary preferences of urbanizing youth. Despite their potential benefits the uptake of improved motorized chippers in Uganda remains low. This study investigates the factors that influence the adoption and sustained use of OFSP value addition processing technologies in Kumi and Serere districts. A cross sectional survey was conducted involving 250 household selected through a multiple sampling approach. Data were collected using structured questionnaire and focus group discussion and analyzed using descriptive statistics and the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model. Internal consistency was assessed using Cronbach's alpha, while Structural Equation Modeling (SEM) analysis was employed to test construct reliability and validity. The findings revealed that habit, social influence, facilitating conditions, and performance expectancy have significant positive effects on user behavior toward motorized chippers among small scale-entrepreneurs. Conversely, effort expectancy, price value, and hedonic motivation exhibited non-significant relationships with user behavior. The study contributes to theoretical understanding by providing empirical evidence on technology acceptance in a developing-country context. The UTAUT2 based analytic insights offer a foundation for concept development, marketing strategies and future design improvements for motorized chippers and mashers. The proposed analytic framework can further support prediction and analysis of farmers' and value chain actor preferences for future OFSP value addition technologies.

Keywords: Orange-fleshed sweet potato, motorized chipper, small scale entrepreneurs, technology uptake, Uganda, UTAUT2 model and constructs

New approaches in the development of diluents for gamete preservation in African cattle breeds

*Gororo, E., Makuza, S.M. & Fungayi, P. C.

Germplasm and Reproductive Technology Laboratory (GRTL), Department of Animal Production & Technology, Chinhoyi University of Technology, P. Bag 7724 Chinhoyi, Zimbabwe
Corresponding author: gororoeddington@gmail.com

ABSTRACT

During cryopreservation, spermatozoa are protected from cryo-damage using semen cryopreservation media called extenders. However, conventional extenders are formulated based on empirical approaches that are inefficient, resource intensive and fail to account for multi-factorial interactions and media complexity in optimisation. Computational techniques such as machine learning may be utilised to provide faster, cheaper and more precise extender media formulations to improve cryopreservation outcomes. This study explored the potential for combining experimental approaches and computational modelling in the design of bovine semen diluents with improved cryo-protective capacity. A dataset of diluent compositions and corresponding post-thaw sperm quality was collated from published literature and experimental records. Key ingredients and concentration ranges that significantly influence post-thaw sperm motility were identified by response surface methodology (RSM). Novel formulations predicted to maximize sperm cryo-survival and minimize component redundancy were proposed using Artificial Neural Network (ANN) based machine-learning models. The best five formulations were validated against a commercial egg-yolk control using semen from three Tuli bulls (n=12). Feature analysis revealed buffers, sugars, CPAs, membrane stabilizers, and antioxidants as the most influential factors. Predictive total motility of the top five computationally optimised extenders (45.4 ± 5.29) was significantly higher ($p < 0.05$) than experimental results (34.7 ± 3.52) obtained at the validation stage. However, post-thaw results for these extenders were comparable ($p > 0.05$) to a standard control egg-yolk based extender. These results demonstrate the feasibility of computational approaches to accelerate development of semen extenders, reduce number of experimental runs, and enhance efficiency of bovine semen cryopreservation.

Keywords: Cryopreservation, machine learning, media design, semen diluents

Smart farming adoption among small scale farmers

*[a]Abel, S., Makuvatsine, M. & [a]Mokumako, T.
Botswana University of Agriculture and Natural Resources, Private Bag 0027, TM, Gaborone Botswana
Corresponding Author: sabel@buan.ac.bw

ABSTRACT

Smart farming promotes precision agriculture by utilizing cutting-edge technology that allows farmers to remotely monitor their plants. Smart farming benefits agricultural processes such as harvesting and crop yields because the automation of sensors and machinery has made the farming workforce more efficient. This study evaluated the smart adoption technologies among small scale farmers in Chiredzi, Zimbabwe. The study was underpinned by the theory of reasoned action and the theory of planned behaviour widely applied in the adoption of ICT for smart farming. Using a mixed methods strategy, small-scale farmers were evaluated on their adoption of smart farming technologies. The study utilised the K-nearest neighbours' analysis. Farmers were predicted and recommended for smart farming adoption, with an impressive accuracy rate of 97%. Results showed that 219 farmers had already adopted technologies like smartphones, sensors, drones, and irrigation systems. However, overall adoption rates were hindered by a lack of awareness, inadequate infrastructure, and high costs. The study recommends improving awareness, infrastructure, and cost reduction, while also providing technical support and encouraging stakeholder partnerships. Future research should explore adoption challenges, validate findings, examine impacts on productivity and sustainability, and assess the potential of technologies such as artificial intelligence and robotics.

Keywords: Crop production, Information Communication Technology, small-scale farmers, smart farming

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

[a]Nthaba M., [a]Kashe K. & [b]Moroke, S.T.

[a]Okavango Research Institute, University of Botswana,Private Bag 285, Maun, Botswana
[b]Botswana University of Agriculture and Natural Resources, Private Bag 0027, Gaborone, Botswana

Corresponding author: nthabatlhoms@ymail.com

ABSTRACT

Flood recession farming, locally known as molapo farming is smallholder-based production system important for riparian communities of the Okavango Delta. This provides residual moisture and natural fertilization through seasonal inundation of floodplains. However, there is limited knowledge on how changes in flooding patterns influence physicochemical properties of soil in the Okavango Delta. This study assessed the physicochemical properties of soils in different flooding patterns in flood recession farming in the Okavango Delta to inform sustainable farming. This study was conducted in Shorobe, Lake Ngami and Makalamabedi areas of Ngamiland District, Okavango Delta. Seventeen molapo fields were sampled for soil from seven saucer-shape, six lake flats and four channel type fields. Physicochemical properties determined included: soil texture, pH, soil organic matter (SOM), phosphorus and exchangeable cations (Ca^{2+}, Mg^{2+}, K^+ and Na^+). Data were analysed using one-way ANOVA and Multivariate Analysis of Variance (MANOVA) at $p < 0.05$. Highly significant differences $p = 0.001$ in the soil nutrient scores were found being highest for Ca (969.40±122.10 $mgkg^{-1}$), followed by Mg (132.11±21.68 $mgkg^{-1}$), Na (26.03±3.13$mgkg^{-1}$) and P (9.75±2.13 $mgkg^{-1}$). Lake flats had significantly $p<0.05$ higher Mg content (M = 220.34 SD = 97.90) than saucer-shaped (M = 74.40 SD = 29.30) and channel type (M = 100.77 SD = 6.44). The P content was significantly highest under channel type (M = 20.56, SD = 8.07) than both saucer -shaped and lake flats. The SOM content was significant difference at χ^2 (2, n = 17) 12.25, $p = 0.002$ with lake flats recording the highest median score (Md = 3.29). Significant differences ($p<0.05$) were observed in the soil pH. The mean score for Lake flats (M = 5.72 ± 0.19) was significantly different (< 0.05) from the saucer-shaped (M = 6.71 ± 0.26) and channel type (M = 7.34 ± 0.17) groups. The silt-clay ratio was consistent, with averages of M = 0.75±0.53 for saucer-shaped, M = 0.50±0.12 for channel type, and M = 0.47±0.25 for lake flats, respectively. Overall, this study provides insights into how variation in flooding pattern influence soil physicochemical properties and the implications for sustainable management is discussed.

Keywords: Agro-ecological zone, flooding patterns, Molapo farming, physical properties

Harnessing Intellectual Property to Protect and Promote Indigenous Knowledge Systems in Agriculture

Rapoo, P.V.

Companies and Intellectual Property Authority, PO Box 102 Gaborone Botswana
Corresponding author vrapoo@cipa.co.bw

ABSTRACT

Traditional Knowledge Systems (TKS) or Indigenous Knowledge Systems (IKS) represent centuries of accumulated wisdom in agriculture, biodiversity conservation, and ecological stewardship. In Botswana and across Southern Africa, TKS/IKS plays a vital role in food security, climate resilience, and sustainable rural livelihoods. However, the lack of formal recognition and protection mechanisms exposes knowledge holders to risks of misappropriation and biopiracy. Access and Benefit Sharing (ABS) legislation plays a critical role in the protection and promotion of Indigenous Knowledge Systems. By embedding ABS principles into national and regional policies, countries can safeguard IKS while promoting innovation and equitable development. The objectives of this study: (a) Explore how the Intellectual Property (IP) system can be used to protect and promote agricultural TKS/IKS; (b) Identify relevant IP tools and international frameworks applicable to traditional agricultural knowledge, (c) Showcase case studies from Botswana and Southern Africa that demonstrate successful integration of TKS/IKS into agricultural innovation and commercialization. A qualitative review of IP frameworks, international treaties, and regional protocols was conducted. Case studies were analyzed to assess the effectiveness of IP tools such as geographical indications, plant variety protections, and trade secrets in safeguarding TKS/IKS. The study found that conventional IP tools can be adapted to protect TKS/IKS when combined with sui-generis systems. Case studies included (a) Hoodia (Southern Africa) (b) Penja Pepper (Cameroon) (c) Morama Bean Project (Botswana), (d) Agro-pastoral systems and sorghum/millet cultivation (Botswana). The study finds that protecting TKS/IKS through IP systems enhances community empowerment, biodiversity conservation, and agricultural innovation. Botswana and other Southern African countries can benefit from hybrid legal frameworks that combine IP rights with culturally appropriate protection models.

Keywords: Agriculture, biopiracy intellectual property, indigenous knowledge systems, plant variety protection, traditional knowledge systems

Effects of affordable inputs program on food poverty alleviation among smallholder farmers in Malawi

†Nkhoma R. and Helder Zavale H.
Eduardo Mondlane University, Faculty of Agronomy and Forestry Engineering, Department of Economics and Agricultural Development, C.P. 252 Maputo Mozambique
Corresponding author: rebeccankhoma272@gmail.com

ABSTRACT

Agricultural input subsidies remain a central policy instrument in Malawi to address persistent rural poverty and food insecurity. The Affordable Inputs Programme (AIP), a large-scale subsidy initiative, was designed to improve access to fertilizers and seed among smallholder farmers with the aim of enhancing household welfare, reducing food poverty, and strengthening resilience in the face of climatic and economic shocks. However, empirical evidence on its effectiveness in improving household food consumption and poverty outcomes remains limited. This study examined the effects of the AIP on household food welfare, with a focus on food poverty reduction and food expenditure among smallholder farmers in Malawi. Using nationally representative data from the Fifth Integrated Household Survey (IHS5), the analysis applied the Control Function (CF) approach to correct for potential endogeneity in programme participation when estimating determinants of food poverty. In addition, Propensity Score Matching (PSM) was used to assess the causal impact of AIP participation on household food expenditure. The CF estimates reveal that access to each additional input coupon reduced the likelihood of food poverty by 18.2 percent and narrowed the food poverty gap by 7.2 percent, confirming the programme's role in mitigating deprivation. The PSM results further indicate that AIP participation had a statistically significant positive effect on household food expenditure, demonstrating its contribution to enhanced food consumption and welfare. Beyond programme access, education, credit, non-farm enterprises, and employment emerged as protective factors against poverty, while climatic shocks such as floods and irregular rainfall heightened vulnerability. The findings provide robust causal evidence that the AIP contributes to reducing food poverty and increasing household food expenditure, thereby strengthening resilience among smallholder farmers. Nonetheless, its overall effectiveness is moderated by structural and environmental constraints. These insights are critical for refining subsidy policies for poverty reduction and resilience investments in Malawi's agricultural development strategy.

Keywords: Affordable Inputs Programme, food poverty, household welfare, control function approach, propensity score matching, Malawi

Abstract No: 009-OP

Enhancing food security and climate resilience through bean-based climate-smart agriculture in Nakuru county, Kenya

*Gichangi, A., Ndaiga, S., Chepngeno, R. & Maritim, G.

Socio-Economic and Policy Development, Field Crops Research Center, Njoro Kenya
Corresponding author: anne.gichangi@kalro.org; wanjugu67@gmail.com

ABSTRACT

Beans play a vital role in agrarian community livelihoods, particularly for smallholders in ecologically fragile zones such as Njoro and Rongai sub-counties of Nakuru County, Kenya. As a low-cost and nutrient-rich crop, beans strengthen household food security while contributing to both agronomic and economic gains. Beans offer several ecological services, fixing nitrogen in the soil and supporting sustainable production. Beans are also highly adaptable, to diverse agro-ecological settings and fit well within crop rotation and intercropping systems, thereby improg productivity and resilience. Beans therefore are an essential component of Climate-Smart Agriculture (CSA). Despite these benefits, widespread adoption of bean-based CSA remains low. Key barriers include limited access to improved varieties, weak extension support, limited farmer awareness of CSA practices, and market challenges. This study assessed the contribution of beans to food security and climate resilience, examined adoption constraints, and evaluated both economic and environmental outcomes. A mixed-methods approach was applied, using household surveys, focus group discussions, and key informant interviews with 150 smallholder agripreneurs. Statistical analysis and cost-benefit assessments were used to evaluate adoption drivers, yield performance, and profitability. Households that adopted bean integration recorded a 38% improvement in food self-sufficiency during dry periods. The use of improved varieties was positively associated (r = 0.62, p < 0.01) with yield increases and stable income. Intercropping beans enhanced land productivity by 21% and lowered production costs by 10%. However, access to certified seeds (72% of respondents), limited market opportunities, and inadequate CSA knowledge were major obstacles. Women farmers demonstrated higher interest in CSA practices but encountered greater challenges in accessing resources. The findings highlight the need for strengthened seed systems, farmer training, and market linkages to promote broader integration of beans into CSA, thereby fostering climate resilience and food-secure livelihoods.

Keywords: Beans adoption, climate resilience, Climate-Smart Agriculture (CSA), food security

Harnessing Amaranthus for climate-resilient agrifood systems in southern Africa: Lessons from physiology to nutrition

[b]Netshimbupfe, M.H., [*a]Mhlanga P.F., [b]Gouws C., [b]Van Der Kooy F., and , [a]Berner J.M.

[a]Unit for Environmental Science and Management, North-West University, Potchefstroom, 2520, South Africa
[b]Centre of Excellence for Pharmaceutical Sciences (Pharmacen™), North-West University, Potchefstroom 2520, South Africa
Corresponding Author: 55859127@mynwu.ac.za

ABSTRACT

Agriculture in sub-Saharan Africa is increasingly constrained by climate change, often manifesting as sudden heat waves, prolonged drought, and erratic rainfall patterns. Such variability makes it difficult for farmers to plan planting and harvesting schedules reliably, exposing them to high production risks and income losses. Addressing this challenge requires growing crops with shorter growth cycles that enables escape of drought especially if they are drought-tolerant genotypes. Amaranthus is a promising crop due to their wide adaptability, rapid growth, and rich nutritional profile. This study presents findings from a multi-year research on four African Amaranthus species (*A. caudatus*, *A. hypochondriacus*, *A. cruentus*, and *A. spinosus*). Physiological analyses using chlorophyll a fluorescence revealed species-specific differences in photosynthetic resilience under combined drought and heat stress, with A. cruentus and A. spinosus being most tolerant. Biochemical profiling demonstrated that stress conditions induced the accumulation of key phenolics and flavonoids (notably rutin and caffeic acid), enhancing both plant tolerance and nutritional value. Furthermore, stress regimes influenced mineral content and antioxidant activity, highlighting the dual role of Amaranthus as both a climate-resilient and health-promoting crop. By reframing these findings within the broader agrifood systems context, this work underscores the potential of Amaranthus to strengthen food and nutrition security in southern Africa. Beyond its laboratory-proven stress tolerance, Amaranthus offers opportunities for smallholder diversification, improved dietary quality, and value addition through nutraceutical and medicinal applications. Importantly, rapid screening approaches such as chlorophyll fluorescence provide scalable tools for identifying resilient genotypes, informing breeding and extension strategies. In conclusion, this case study of Amaranthus demonstrates how integrating underutilized crops into farming systems can help buffer communities against climate and economic shocks while advancing nutrition-sensitive agriculture in the region.

Keywords: Agrifood systems, Amaranthus, bioactive compounds, climate resilience, chlorophyll fluorescence, food security

Climate change, gender and food security in Malawi: A CGE approach

[1]Mukarati, J., [2]Le Roux, P. & [1]Jeke, L.

[1]Department of Economics, Nelson Mandela University, Port Elizabeth, South Africa
[2]Department of Economics, Sol Plaatje University
Corresponding author: s226055523@mandela.ac.za

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.

Key words: Computable general equilibrium, gender equality, poverty, SDGs