Abstracts of all the accepted papers

Abstracts of the upgraded contributed papers

1. Assessing agricultural employment adjustment under structural transformation in the Republic of South Africa.

Buhlebemvelo Dube, Joseph Kau, Solly Molepo, Mamakie Lungwana, Azola Msezeni.

Agriculture remains an important source of rural employment in South Africa despite continued structural transformation towards service-oriented industries. Whether this transformation has integrated agricultural employment into broader labour market dynamics remains largely unexplored. This study investigates the long-run equilibrium, short-run adjustment, and dynamic intersectoral transmission of employment across seven major sectors using quarterly data from Statistics South Africa spanning 2008Q1–2025Q2. Following unit root, structural break and diagnostic testing, a Johansen cointegration framework is employed to estimate a Vector Error Correction Model, complemented by impulse response functions and forecast error variance decomposition. The results identify a single long-run cointegrating relationship, confirming that sectoral employment shares a common equilibrium path. However, agricultural employment exhibits no statistically significant error-correction behaviour, in contrast to manufacturing, construction, trade and finance, which actively restore long-run equilibrium following disturbances. Dynamic analysis further reveals that shocks originating in other sectors generate only weak and transitory responses in agricultural employment, while forecast error variance decomposition indicates that agricultural employment is overwhelmingly explained by sector-specific innovations. These findings suggest that South Africa's structural transformation has been characterised by segmented labour market adjustment, whereby agriculture remains connected to the broader economy in the long run but largely insulated from short-run cross-sector employment dynamics. Policies aimed at expanding agricultural employment should therefore prioritise sector-specific productivity, climate resilience, skills development and value chain competitiveness.

Keywords: Agricultural employment; structural transformation; Johansen cointegration; vector error correction model; labour market dynamics; South Africa.

2. Trading Below the Frontier: Export Efficiency and Potential in Namibia’s Live Goat Trade Using a Stochastic Frontier Gravity Model.

Kunda Kalimbwe, Nazir Muhammad Abdullahi, John N. Ng’ombe, Salomo Mbai.

This study analysed the determinants, efficiency, and untapped export potential of Namibia's live goat exports to its five major trading partners over the period 2000–2024. The analysis

employed the gravity model, estimated using Generalised Least Squares (GLS), Poisson Pseudo-Maximum Likelihood (PPML), and the Stochastic Frontier Gravity Model (SFGM). The results indicate that GDP of importing nations, import demand, and a common language positively influence Namibia's live goat exports, whereas geographical distance significantly constrains trade. Conversely, Namibia's GDP negatively affects exports, as domestic economic growth drives local consumption and reduces exportable surplus. The negative coefficient for colonial ties stem from limited sample variation rather than an independent relationship. The stochastic frontier estimates further reveal that improved access to electricity and greater agricultural land availability significantly reduce export inefficiency, thereby enhancing export performance. Despite these favourable conditions, Namibia currently operates below its export frontier, realising only about half of its estimated export potential, with South Africa remaining its most promising export market. This demonstrates how economic growth in small economies can reduce niche commodity exports via domestic consumption. Expanding exports requires investment in livestock infrastructure, rural electrification, and rangeland management. Regional integration, better logistics, and market diversification beyond South Africa would unlock this untapped potential.

Keywords: Gravity model, Namibian, goat, Stochastic Frontier analysis, export.

3. An Investigation into South Africa's Agricultural Trade Opportunities and Market Access Alignment within BRICS+.

Schultz, K., Jooste, A. and Stellian, R.

South Africa’s agricultural trade is shaped by various trade agreements and its strategic role within BRICS+. Although BRICS+ is not a formal trade bloc, it provides opportunities to expand agricultural exports, support economic growth, and strengthen South Africa’s global trade position. This article investigates how South Africa can use BRICS+ as a platform to diversify agricultural exports and align market access priorities with areas of comparative strength and weakness. Using a product–year–country dataset for 2001–2023, the study evaluates the empirical properties of 27 Revealed Comparative Advantage (RCA) indexes, including their time behaviour, distributional characteristics, and ordinal ranking consistency, to identify the most appropriate index for analysing South Africa’s regional specialisation in agricultural exports within the BRICS+ framework. Although the Revealed Trade Advantage (RTA) index performs strongly empirically, the Revealed Competitiveness 5 (RC5) index is adopted because it offers a stronger balance between empirical performance and theoretical suitability, including symmetry correction, GDP scaling and time-

standardised trade flows. The RC5 is used to classify products according to frequency and intensity of comparative advantage and disadvantage against BRICS+ partners. The results suggest that South Africa's greatest export opportunities lie in wine and beverages, horticultural products, and animal fibers and hides, particularly in the markets of Saudi Arabia, the United Arab Emirates, Russia, and Indonesia. Persistent disadvantages are found in selected staples, oils, processed foods and cotton textiles. The article recommends that South Africa prioritise market access for products with strong and persistent advantages while using carefully selected, low exposure disadvantage products as possible concessions in future BRICS+ trade negotiations.

Keywords: BRICS+; agricultural trade; revealed comparative advantage; comparative disadvantage; market access alignment; South Africa.

CONTRIBUTED PAPERS

1. "More Dangerous Than Drought": Pastoral Households' Practices, Challenges, And Willingness to Control *Ipomoea* on Kajiado's communal Grazing Lands, Kenya.

Kidist Abebe Mersha, Margaret Ngigi, Raphael Gitau.

Invasive *Ipomoea* plant species threaten pastoral livelihoods in Kenya's arid and semi-arid lands by reducing grazing availability and causing livestock mortality. This study examined household practices, challenges, and willingness to contribute for collective *Ipomoea* control in Kajiado County, Kenya, grounded in Ostrom's theory of common-pool resources. A double bounded contingent valuation survey was administered to 260 households, and a seemingly bivariate probit model was estimated to identify determinants of willingness to contribute labour. The results show that 93.85% of households were aware of *Ipomoea*'s health effects on livestock, with animal death reported by 80.33% of respondents. Manual uprooting was the dominant control method (96.15%), yet households faced persistent regrowth (82.69%), time consumption (80.38%), and high labour costs (48.46%), no household reported using herbicides or biological control. Mean willingness to contribute labour was 14.13 days per household per year, with 61.15% accepting the initial labour bid, though willingness was highly sensitive to higher labour demands. The bivariate probit model revealed that past collective action (marginal effect = 0.1452), leadership effectiveness (0.1183), and social trust (0.0781) were the strongest positive predictors of willingness, supporting Ostrom's design principles that prior cooperation, local leadership, and shared norms enhance collective action. Conversely, larger family size negatively

influenced willingness (coefficient = -0.0658), reflecting competing domestic labour demands. The study recommends strengthening extension services, facilitating access to effective herbicides, and designing collective action arrangements with small, achievable labour targets that leverage existing social capital and address free-rider concerns.

Keywords: *Ipomoea* species, contingent valuation, willingness to contribute labour, collective action, common-pool resources, Kajiado County, Kenya.

2. The impact of Climate Smart Agricultural technology adoption on household's welfare of smallholder farmers in the Eastern Cape Province.

Trevor Jembere, Abbysinnia Mushunje, Petronella Chaminuka.

Sub-Saharan Africa (SSA) is struggling with surging food demand in the face of a growing population and challenges of climate change. The projected change in climate events will have serious consequences for food security in dry weather countries. The devastating impacts of climate change being realised in societies in subtropical regions of SSA include amplified occurrence and intensity of extreme weather events like droughts, floods, heatwaves, environmental damage, rise in pests and diseases, depletion of household assets and rise in rural urban migration. Smallholder farmers can derive benefits from Climate Smart Agriculture in the face of climate induced agriculture impacts. This paper aims to explore the impact of Climate-Smart Agricultural technology adoption on smallholder farmer's household welfare in South Africa. The endogenous switching regression model was used to analyse the impact of CSA technologies on households' welfare. Factors such as farming experience, arable land size, soil quality, and CSA awareness were identified as having a bearing on the decision to adopt CSA technologies. The Average Treatment Effect of the Treated was noted to be positive and significant, meaning CSA adoption significantly impacted the welfare of smallholder farmers. The Average Treatment Effect on the Untreated (ATU) showed that the non-adopters would have benefited if they had adopted CSA. Interventions that are aimed at enhancing climate-smartness in rural agricultural communities may improve the food and income security of the smallholder farmers. The government should promote awareness of CSA practices to smallholder farmers through workshops, seminars, and practical demonstrations.

Keywords: Endogenous switching regression model, food security, household income, household welfare, smallholder farmers

3. Influence of Social Capital Networks on Adoption of Climate Change Adaptation Strategies in OR Tambo District, South Africa.

Nobukhosi Nhliziyo and Abbyssinia Mushunje.

Projected shifts in climate and the rising occurrence of extreme events in the twenty-first century pose significant effects on development of agriculture in third world nations. The purpose of the study was to analyse the influence of social capital networks on adoption of climate change adaptation strategies in Port St Johns Local Municipality. Multistage sampling was used to carry out the study. Purposive sampling was used to select households who are into farming in the selected villages in Port St Johns Local Municipality. Cross-sectional research design was used in carrying out the study and structured questionnaires were used as data collection tool. Data collected was analysed using descriptive statistics and Binary Logit Model. The findings of the study show that social capital networks positively influence adoption of climate change adaptation strategies. Besides influence of social capital networks on adoption of climate change adaptation strategies, gender, age, marital status, education, income farming type, extension services and distance to the nearest output/input market were found to affect adoption of climate change adaptation strategies. The study concludes that a farmer who decide to join a social capital network highly adopt climate change adaptation strategies than a farmer who decide not to. The study recommends that policy interventions should encourage small-scale farmers to participate in social capital networks because these networks will foster group interactions, improve exchange of information, and improve climate change adaption.

Keywords: adaptation, climate change, influence, small-scale farmers, social capital network.

4. Climate Change and the Future of Crops in South Africa: A Cost–Benefit Perspective on Agricultural Adaptation.

Walter Shiba, Whitney Mankaba Matli, Harold Weepener, Manana Mamabolo, Tribute Jabulile Mboweni1, Mmakhashu Sechube, Papi Kubheka2 and Siphe Zantsi.

This study applied a cost-benefit analysis (CBA) framework to assess the economic implications of climate change-induced shifts in crop suitability across South Africa's key agricultural regions. By integrating biophysical suitability modelling with economic valuation, the study evaluates the viability of adaptation strategies involving shifts in production patterns under different climate scenarios. The findings show that all six commodities analysed achieved benefit-cost ratios (BCRs) greater than 1.0 at an 8% social discount rate, confirming the overall economic viability of production area shifts as a climate adaptation strategy. Maize (BCR = 1.50) and citrus (BCR = 1.51) generated the strongest

returns due to their large production bases and contributions to food security and export earnings. Sorghum (BCR = 1.41) emerged as a relatively resilient option under severe climate scenarios because of its drought tolerance. In contrast, perennial crops such as avocado (BCR = 1.29) and macadamia (BCR = 1.31) showed weaker performance due to high establishment costs and long production lead times. Under SSP5-8.5 end-century scenarios, maize and avocado BCRs declined significantly, highlighting the importance of spatial suitability mapping in identifying viable future production zones. Overall, the results indicate that climate adaptation through shifting production patterns can enhance national welfare, employment, and resilience, but outcomes remain highly commodity-specific and dependent on climate risks, market conditions, and production costs. The study underscores the need for targeted, evidence-based adaptation strategies in South Africa's agricultural sector and establish operational crop suitability monitoring system using ARC climate surfaces updated annually.

Keywords: Scenarios, drought resilient, benefit cost ratio, new zones, shared socioeconomic pathways (SSPs).

5. Complementary Effects of Indigenous and Scientific Climate Knowledge on Livestock Diversification: Evidence from Smallholder Farmers in South Africa.

Msenge A. and Manyike J.Z.

Climate variability continues to threaten smallholder livestock production, increasing the need for reliable climate information to support adaptation decisions. While indigenous and scientific climate knowledge have each been widely studied, limited empirical evidence exists on how they jointly influence livestock diversification. This study examined the effects of indigenous and scientific climate knowledge, individually and interactively, on livestock diversification among 168 smallholder livestock farmers in Raymond Mhlaba Local Municipality, Eastern Cape, South Africa. Indigenous Climate Knowledge and Scientific Climate Knowledge indices were constructed from farmer survey data, while livestock diversification was measured using the Tropical Livestock Unit (TLU)-based Simpson Diversity Index. A fractional logit regression model was employed to estimate the determinants of livestock diversification. The results indicate that indigenous climate knowledge positively influences livestock diversification, whereas scientific climate knowledge alone has no statistically significant effect. However, the interaction between indigenous and scientific climate knowledge is positive and marginally significant, suggesting that integrating both knowledge systems enhances farmers' livestock

diversification decisions. Male farmers, older farmers, and those participating in farmer groups were more likely to maintain diversified livestock portfolios, while education was negatively associated with diversification. The findings highlight the importance of strengthening indigenous climate knowledge while promoting its integration with scientific climate information through participatory extension services and farmer organizations to enhance climate-resilient livestock production.

Keywords: Indigenous climate knowledge; Scientific climate knowledge; Livestock diversification; Climate adaptation; Fractional logit model.

6. The geopolitics of climate shocks: assessing climate change, agricultural total factor productivity, and food security dynamics in selected SADC countries (1990–2025).

Vhenekai Moyo

Climate change has ceased to be environmental shocks that are isolated and has become a critical geopolitical challenge for the Southern African Development Community (SADC), where 95 per cent of agricultural production is rain-fed and the rate at which the region is warming is twice the global average rate. This paper aims to present a conceptual and methodological foundation of a longitudinal study that seeks to investigate the dynamic relationship between climate change, agricultural Total Factor Productivity (TFP), and food security outcomes across seven structurally selected countries in the SADC region: South Africa, Zimbabwe, Zambia, Botswana, Malawi, Mozambique and Tanzania, spread out over the period 1990 to 2025. A non-probability purposive sampling framework is used to classify and indicate the diversity of the countries into distinct agro-economic archetypes. The study utilizes a Panel Autoregressive Distributed Lag (PARDL) model as it can capture both the climate shock elasticities and the long-run equilibrium relationships within these selected countries. Total Production Factor (TFP) is used to measure agricultural efficiency, while food security is operationalized through both Cereal Import Dependency Ratio (CIDR) and the Prevalence of Undernourishment (PoU). A Policy Effectiveness Index (PEI) is further proposed to evaluate how climate-adaptation frameworks moderate environmental pressure on productivity. Grounded in Neoclassical Production Theory, Induced Innovation Theory, the IPCC Vulnerability Framework, the FAO Four Pillars of Food Security, and Resilience Theory, the paper argues that climate-induced TFP contraction causes a shift directly into food price volatility and widening trade imbalances, evidenced by escalating national cereal import bills. By linking environmental moisture stress to macroeconomic vulnerability rather than treating climate, productivity, and food security as separate literatures, the study aims to equip regional ministries, central banks, and the SADC Secretariat with an evidence-based tool for shifting agricultural policy from reactive disaster management toward proactive, long-term resilience.

Keywords: Total Factor Productivity (TFP); Panel Autoregressive Distributed Lag (PARDL); Policy Effectiveness Index (PEI); food security; SADC; geopolitics of agriculture.

7. Carbon Footprint Assessment of Agricultural Research Farms: A Pathway to Low-Carbon Agriculture in the Western Cape, South Africa.

Vanessa Barends-Jones

In this study, we conducted a longitudinal analysis of the carbon footprint of the agricultural research farms that fall under the mandate of the Western Cape Department of Agriculture over the period from 2011/12 to 2022/23 and which covers 7,956 hectares located in varied agro-ecological regions. Emissions were quantified using the operational control approach of the GHG Protocol into the three scope categories for developing evidence-based knowledge for decision-makers in the context of South Africa's emerging carbon taxation regime, especially after 2026 and the EU's CBAM. The total emissions from the seven farms in 2022/23 stood at 22,231 tCO_2e, down by 9% from the post-COVID high of 24,396 tCO_2e in 2021/22. The impact of the pandemic lockdown resulted in a drop in emissions by 41%, yet the 126% recovery rate shows that it is the structural measures that are needed to make lasting reductions. The emissions emanated mostly from waste and manufacturing (58%), while those of electricity made up 20%, followed by enteric fermentation at 16%. This was contrary to expectations where livestock and fertilisers were supposed to lead the pack. Carbon tax liability is projected to rise thirty-five-fold, from R176,736 in 2023 to R6.2 million by 2030, as the tax rate climbs, agriculture enters Phase 2 liability from 2026, and free allowances contract from 95% to 40%. Priority mitigation measures – improved waste recycling (saving over 7,000 tCO_2e annually), energy audits, and 30–50% renewable energy integration are identified. The paper demonstrates a replicable farm-level carbon accounting methodology applicable across South Africa's agricultural sector as it navigates the 2026 Phase 2 Carbon Tax and 2030 NDC commitments.

Keywords: carbon footprint; emissions; research farms; carbon taxation; Western Cape; mitigation strategies.

8. Approaches to promote the accessibility and use of improved seed varieties in South African smallholder farming.

Lindumusa Myeni, Mokhele Edmond Moeletsi, Sue Walker and Mitsuru Tsubo.

Climate variability and change have long been a major source of uncertainty in crop yield and food security among rural smallholder farming communities. Although seed technology has advanced over time, resource-poor farmers continue to face challenges in accessing and

utilising improved seed varieties. The use of improved seed varieties, particularly those that possess climate-smart features such as improved yield, drought tolerance, high water-use efficiency, high nitrogen-use efficiency, early maturity, frost and heat tolerance, or pest and disease resistance, is one of the most effective strategies to combat adverse effects of climate variability in smallholder farming. Therefore, a study was undertaken to co-identify, synthesise and provide actionable policy recommendations tailored to improve the accessibility and use of improved seed varieties under South African smallholder farming conditions using a two-stage approach. Firstly, a systematic literature review was conducted to synthesise key constraints limiting the adoption of improved seed varieties and potential policy interventions to enhance the accessibility and utilisation of these seeds in African smallholder farming. Secondly, five multi-stakeholder focus group discussions were held to validate the literature findings and capture localized insights through thematic analysis. The study recommends that the promotion of improved seed varieties needs to be supported by conducive institutions and policies that will raise awareness, knowledge and access to climate-smart technologies through participatory learning models. Furthermore, access to adequate finance (capital) and markets as well as the selling of affordable small packages of good quality seeds at local markets are recommended to advance the availability, accessibility and affordability of improved seed varieties in smallholder farming. These policy recommendations can be utilised by the government and other organizations to formulate interventions tailored to improve food security, climate-resilience and rural economic development in the most vulnerable farming communities of South Africa as well as other developing countries facing similar challenges.

Keywords: adaptation, climatic risk, climate-smart agriculture, climate-resilient seeds, dryland, rural development.

9. Digital Agriculture and Inclusive Rural Transformation: A Systematic Review of Market Access, Technology Adoption and Smallholder Livelihoods in South Africa.

Belemu V, Oluwatayo IB and Munyai T.

Digital farming is seen as an important means to transforming smallholder agriculture systems in South Africa by increasing productivity, strengthening market access and enriching rural livelihoods. Nevertheless, the rise of interest in digital innovations, smallholder farmers continue to contend with long-standing structural inequalities with regard to equitable access and benefits from the technologies. This article seeks to undertake

a systematic examination of the current literature of digital agriculture and inclusive rural transformation in South Africa by focusing on market access, technology acceptance and smallholders' livelihoods. It examines in particular how digital technologies affect agricultural value chains and identifies barriers and opportunities to inclusive adoption. This study is informed by a systematic literature review method that synthesizes academic journal articles, policy reports, and institutional publications that address digital agriculture, smallholder systems, and rural development in South Africa and similar African settings. The review states that digital technologies that support information access, price discovery, supply chain integration and increase income opportunity for smallholder farmers include mobile-based extension services, precision agriculture, artificial intelligence, GIS and remote sensing, digital financial services, electronic commerce platforms and blockchain systems. Digital adoption is constrained by inequality between people, poor rural infrastructure, little digital literacy, financial constraints, gendered disparities, institutional frailties, and nascent issues such as data governance and ethical use of AI. It shows the importance of enhanced rural digital infrastructure, more inclusive digital policies, improved extension services, and tailored support for improving the adoption of advanced data from rural to urban areas. It also urges that stronger partnership between public and private actors, gender-responsive interventions, and ethical data governance frameworks are recommended. Future research should consider longitudinal impact estimates, regional comparisons and climate-smart digital agriculture to inform sustained development and evidence-based policy development for inclusive rural transformation.

Keywords: Digital agriculture, Rural transformation, Technology adoption, Market access, Precision agriculture, Artificial intelligence, Climate-smart agriculture.

10. Effect of Livelihood Diversification on Farm Household Welfare: Evidence from Ghana.

Mensah, Malik Atahwu Rahaman, Colleta Gandidzanwa, Nipah Frederick.

Agriculture remains the primary livelihood source for rural households in Ghana yet increasing structural constraints have compelled many farm households to seek additional income sources. This study examined the effect of livelihood diversification strategies on farm household welfare in Ghana. Specifically, the study assessed the livelihood activities pursued by farm households, the contribution of different livelihood sources to total household income, and the impact of diversification on household welfare. A cross-sectional survey of 400 farm households was conducted using a multistage sampling procedure. Data

were analysed using descriptive statistics and an Endogenous Switching Regression (ESR) model, with the Inverse Probability Weighted Regression Adjustment (IPWRA) estimator employed as a robustness check. The results revealed that 74.5% of sampled households diversified their livelihoods, with non-farm activities contributing approximately 30% of total household income. Crop farming remained the dominant livelihood activity, while trading, wage employment, and small businesses constituted the major non-farm income sources. The determinants of diversification included education, access to extension services, access to market information, access to credit, farming experience, and positive perceptions toward livelihood diversification. The ESR results showed that livelihood diversification significantly improved household welfare. Diversifying households realized an additional income gain of approximately GHC 910.22, experienced higher asset accumulation, improved dietary diversity, better dwelling conditions, and significantly lower food insecurity compared with non-diversifying households. The study concludes that livelihood diversification is both an income-enhancing and resilience-building strategy that contributes substantially to improving the welfare of rural farm households. Consequently, policies that promote access to education, extension services, credit, market information, and non-farm employment opportunities can play a critical role in enhancing household welfare and reducing rural poverty in Ghana.

Keywords: Livelihood diversification, Farm household welfare, Income-generating activities, Food security, farm and non-farm activities.

11. Who Captures the Value? Financial Viability of Hemp Fibre Production Under Alternative Enterprise Models in South Africa.

Sechube, M.P, Zantsi, S, Jordaan, H and Kubeka, P.

Following decades of informal cannabis cultivation, industrial hemp has emerged as a strategic crop due to its potential to support rural development, employment creation, and economic diversification. However, there's a lack of empirical evidence on whether current conditions support a financially viable hemp enterprise. This study evaluated the financial viability of hemp fibre production under alternative enterprise models using enterprise budget analysis. Primary data were collected from 25 smallholder hemp farmers in Gauteng Province using a snowball sampling technique, complemented by secondary enterprise information obtained from industry sources. Enterprise budgets were developed to estimate production costs, value of production, and net returns. The results revealed that smallholder hemp fibre production was not financially viable, generating a negative net return of R76

132/ha. In contrast, a vertically integrated hemp fibre enterprise generated a positive net return of R30 990/ha despite higher production costs. The findings suggest that financial viability is influenced less by production costs alone than by an enterprise's ability to capture value through product differentiation. Low prices received for raw hemp stalks constrained farmers' profitability. The study makes emphasise on the importance of value capture mechanisms in improving financial sustainability and inclusiveness of South Africa's emerging hemp fibre sector.

Key words: Hemp fibre, financial viability, enterprise budgeting, value capture, smallholder farmers, South Africa.

12. Determinants of Compliance with Food Safety and Quality Standards among Agro-Processing Enterprises in Limpopo Province, South Africa.

Makwarela S, Nevhutalu T, Nengovhela R, and Ledwaba L. J.

Compliance with food safety and quality standards is critical for protecting consumers, improving market access, and enhancing the competitiveness of agro-processing enterprises. However, many small-scale agro-processors in South Africa face financial, technical, and institutional constraints that limit compliance. This study assessed compliance with food safety and quality standards among agro-processing enterprises in Limpopo Province and identified factors associated with compliance. The study utilised primary data from the Department of Agriculture, Land Reform and Rural Development (LDARD) needs assessment survey. Descriptive statistics were used to analyse enterprise characteristics, training participation, compliance status, and barriers to training attendance, while an ordered probit model was employed to determine the factors influencing compliance. The results showed that 53.5% of the surveyed enterprises were non-compliant with food safety and quality standards, while only 9.3% achieved full compliance. Although all enterprises with available records had attended at least one food safety training programme, the high cost of training and limited access to training facilities remained the main barriers to participation. The ordered probit model identified processing tier as the most significant determinant of compliance, suggesting that enterprises engaged in higher levels of value addition encounter more complex regulatory requirements that often exceed their technical and financial capacity. The study concludes that improving compliance requires more than regulatory enforcement. Targeted financial support, accessible training programmes, strengthened extension and advisory services, and investment in food safety infrastructure are essential to improve 2 compliance and enhance the competitiveness and sustainability of South Africa's agro-processing sector.

Keywords: Food safety compliance, agro-processing enterprises, food safety standards, ordered probit model, training barriers, Limpopo Province, South Africa.

13. Empowerment of Rural Women and Its Influence on Household Food Security in Oyo and Osun States, Nigeria.

Oyeleye, A.A, Olaniyi, O.A and Ogunleye, K.Y.

Household food security remains a major development challenge in rural Nigeria, where poverty, unemployment, volatile food prices, climate variability, and limited access to productive resources undermine livelihoods particularly those of rural women. This study assessed how multidimensional empowerment of rural women influences household food security in Oyo and Osun States. Using a multi-stage sampling procedure, 294 women were selected and interviewed with a structured schedule. Descriptive statistics (frequency, percentage, weighted mean score) and Pearson product moment correlation were used for analysis. Among empowerment domains, social empowerment ranked highest across the study areas (WMS = 2.47). Overall, 61.2% of households were classified as food insecure. Women's involvement in household financial decision-making and receipt of nutrition education jointly scored highest as influences on food security (WMS = 4.80). Pearson correlations showed positive, statistically significant relationships between household food security and each empowerment dimension: psychological ($r = 0.572$, $p = 0.009$), economic ($r = 0.299$, $p = 0.017$), social ($r = 0.441$, $p = 0.011$), personal ($r = 0.310$, $p = 0.015$), political ($r = 0.264$, $p = 0.021$), and technological ($r = 0.264$, $p = 0.019$) at $p < 0.05$. Psychological empowerment exhibited the strongest association with food security. The findings indicate that empowerment is multidimensional and that integrated, sustained development programmes combining psychological, economic, social, technological, and political components are more likely to produce durable improvements in household food security than short-term or fragmented interventions.

Keywords: Rural women, Empowerment, Household Food security, Dimension, Nigeria.

14. Measuring Maximum Residue Limits (MRLs) restrictiveness in export markets for South African citrus.

Kupelo, N, Punt, C and Jooste, A.

South Africa is one of the world's leading citrus exporters. Global market access is increasingly pressured by evolving non-tariff measures (NTMs), particularly plant-related sanitary and phytosanitary (SPS) measures intended to prevent the spread of pest and disease. Maximum residue limits (MRLs) have become a key regulatory tool, and divergence in MRL standards

across markets creates regulatory heterogeneity that can increase compliance costs and affect exporter competitiveness. This study examines the relative restrictiveness of MRL standards faced by South African citrus exports in key markets. Using Codex standards as the international benchmark, an MRL score per country per year (2022-2024) is constructed from different MRL chemicals per citrus type, comparing the extent to which national standards deviate from internationally recognised levels. Results show variation in MRL stringency across markets. Korea records the highest level, while the EU, USA, Thailand and Taiwan maintain standards close to or slightly stricter than Codex. Canada, the Russian Federation, Saudi Arabia, the UK, and Japan have more lenient standards. These differences indicate the complexity faced by exporters who supply multiple markets, as the compliance is often determined by the most stringent market rather than the average. The study highlights the importance of integrated pest management and biological control alongside stronger institutional coordination between government and industry to improve compliance capacity and maintain market access. These findings contribute to the understanding of how food safety regulations shape agricultural trade and provide policy insights for strengthening the long-term competitiveness of South African citrus exports.

Keywords: MRLs (Maximum Residue Limits); NTMs (Non-Tariff Measures); SPS measures (Sanitary and Phytosanitary); South African citrus exports; Food safety regulations; Agricultural trade.

15. Consumer Trust and Perceptions of Informal Food Markets: Evidence from Rural Households in South Africa.

Mashegwana VL and Lefophane MH.

Informal food markets play a vital role in improving food access and supporting livelihoods in rural South Africa, particularly where poverty, unemployment and limited formal retail infrastructure constrain household food choices. This study analysed the factors influencing household trust and perceptions of informal food markets in Ga-Mashegwana village, Limpopo Province. Primary data were collected from 142 households through structured face-to-face interviews using a simple random sampling technique. Descriptive statistics, Pearson Chi-square tests and a Binary Logistic Regression Model were used to analyse the data. The results showed that 60.6% of households trusted informal food markets. Affordable prices, product quality, accessibility and market proximity were identified as the main drivers of trust, while spoiled products, poor hygiene, poor storage practices and the lack of legal protection were the principal sources of distrust. Households further identified improved hygiene, better storage

facilities, food safety inspections and vendor certification as key measures to strengthen trust. The Pearson Chi-square results indicated that market type preference, perceived product quality and frequency of market visits were significantly associated with household trust. The Binary Logistic Regression Model further revealed that marital status, household size, market type preference, market experience and perceived product quality significantly influenced household trust, with perceived product quality emerging as the strongest determinant. Overall, the findings demonstrate that 2 market-related factors exert a stronger influence on household trust than demographic characteristics. The study recommends strengthening food quality control, vendor certification, hygiene standards, storage infrastructure and market governance to enhance consumer confidence, improve food security and support more inclusive and resilient rural food systems, thereby contributing to Sustainable Development Goals (SDGs) 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-being) and 8 (Decent Work and Economic Growth).

Keywords: Informal food markets; consumer trust, rural households; informal economy.

16. Why sustainable protein transitions stall: the role of consumer attitudes in constraining plant-based meat adoption in South Africa.

Tsvakirai C

This study examines the dominant consumer attitudes limiting the sustained and frequent consumption of plant-based meat alternatives (PBMAs), specifically plant-based burger patties, among South African consumers. While prior research has focused on reducing barriers to initial trial, persistent psychological factors continue to constrain mainstream dietary integration. The study aims to identify these attitudinal barriers and assess their relative influence on regular consumption behaviour. The study employs principal component analysis to identify and evaluate the dominant consumer attitudes, and regression analysis was used to determine their influence on PBMA consumption. Survey data from South African consumers were analysed to determine the extent to which specific psychological constructs predict reduced frequency of plant-based burger consumption. Demographic patterns associated with these attitudes were also examined. Food technology neophobia and the belief that government, rather than individuals, should drive progressiveness in the food system emerged as the dominant psychological barriers to regular PBMA consumption. Consistent with global sustainable consumption trends, these attitudes significantly reduced mainstream adoption. These barriers were less pronounced among younger consumers, females, vegans/vegetarians, and individuals with higher education levels. In contrast to findings from several previous studies, the barriers to frequent PBMA consumption were more pronounced among lower-

income consumers in this study. The study advances existing literature by shifting focus from trial behaviour to sustained consumption, highlighting the role of responsibility attribution and technology-related scepticism in shaping dietary transitions. It provides actionable insights for policymakers and industry stakeholders seeking to accelerate the mainstreaming of PBMAs through consumer education and targeted market strategies.

Keywords: Consumer psychology, Food choice, Sustainable food transitions, Meat analogues, Sustainable food systems, Dietary change.

17. Essential skills and competencies of future agricultural economists: Insights from the developing world.

Melissa Van Der Merwe

Agricultural economists play an increasingly important role in addressing complex challenges facing modern agri-food systems, yet concerns remain regarding the alignment between university training and workplace skill requirements. This study examines the skills needed by agricultural economists to meet future sectoral demands and evaluates the extent to which current curricula prepare graduates for employment in South Africa. A mixed-methods approach was employed, combining a national cross-sectional survey of 133 agricultural economists with eight semi-structured interviews conducted across different career stages. Survey data were analysed using the Borich Needs Assessment Model, while interview data were subjected to thematic analysis. The findings reveal a persistent mismatch between graduate capabilities and industry expectations. Although graduates generally possess strong foundational disciplinary knowledge, notable deficiencies remain in critical soft skills, including communication, conflict resolution, adaptability, and time management, as well as advanced technical competencies such as data analytics, econometrics, risk analysis, and market analysis. The results further suggest that inconsistencies in graduate attribute frameworks across South African universities contribute to variations in graduate preparedness and employability outcomes. The study highlights the need for curriculum reform that prioritises work-integrated learning, case-based teaching approaches, stronger collaboration between universities and industry stakeholders, explicit development of professional and interpersonal skills, and enhanced training in digital and analytical competencies. By providing discipline-specific evidence from a developing-country context, the study contributes to the graduate employability and skills-needs literature and offers practical guidance for curriculum design, workforce development, and extension-oriented training in agricultural economics.

Keywords: agricultural economics education; graduate employability, skills needs assessment, curriculum development, soft and technical skills, Borich needs assessment.

18. Assessing Poultry Production Systems and Value Chain Linkages for Enhanced Market Access in Vhembe Biosphere Reserve, South Africa.

Phumudzo Gift Munyai-Matshotshi and Betty Sehlola

The poultry sector is one of the fastest-growing agricultural subsectors globally and contributes significantly to the attainment of SDG 1 (No poverty) ,2 (Zero) and 8 (Decent work and economic growth). Despite its importance, smallholder poultry farmers continue to face challenges in accessing formal markets. This study assessed poultry production systems, stakeholder support systems, and their influence on access to formal poultry markets among smallholder poultry farmers in the Vhembe Biosphere Reserve, South Africa. A quantitative research approach was adopted, and primary data were collected from 138 poultry farmers using structured questionnaires. Descriptive statistics, Binary Logistic Regression, and Pearson Chi-square tests were employed to analyse the data. The descriptive results showed that broiler production dominated the study area (90%), females constituted majority of poultry farmers (83.3%), and most respondents possessed secondary or tertiary education. The Binary Logistic Regression results revealed that level of education ($p = 0.060$), production purpose ($p = 0.020$), and access to extension services ($p = 0.001$) significantly influenced farmers' access to formal poultry markets. Farmers with access to extension services were approximately five times more likely to access formal markets than those without such support ($Exp(B) = 5.213$). The Pearson Chi-square analysis further indicated a significant relationship between stakeholder support effectiveness and market access ($\chi^2 = 8.932$; $p = 0.063$). The study concludes that access to extension services, and effective stakeholder support systems are critical determinants of market access among poultry farmers in the Vhembe Biosphere Reserve. Strengthening stakeholder coordination, improving extension service delivery, and enhancing market linkage initiatives may improve smallholder integration into formal poultry markets and contribute to sustainable poultry value chain development.

Keywords: Poultry production systems; market access; value chains; smallholder farmers; Vhembe Biosphere

19. Transformation of Entrepreneurial Drive: The Impact of Agricultural Training among Small-Scale Farmers in Gauteng Province, South Africa.

Mabala, S.G.,Senyolo, G.M. and Mokoena, M.R.

Entrepreneurial drive is essential for transformation of small-scale farmers from subsistence to commercial agriculture. The transition requires entrepreneurship specific training that equips farmers with necessary skills, knowledge and capabilities to identify opportunities, calculate risk and compete in markets. This study was aimed at investigating the impact agricultural training on entrepreneurship drive among 267 small-scale farmers in Gauteng Province. The study adopted the entrepreneurship orientation (EO) competencies employed on the principal component analysis (PCA) and the two-limit Tobit regression model to examine the four dimensions of entrepreneurial drive; proactiveness, innovativeness, competitiveness and risk taking. The descriptive results

revealed that farmers demonstrated moderate to high entrepreneurship orientation competencies. Moreover, the Tobit regression results revealed that training significantly had a positive association on three dimensions contributing to the entrepreneurial drive. Training strongly affected the farmer innovative followed by proactive and competitive dimensions. However, training was not significant in transforming the risk taking of farmers, confirming that most farmers remain survival entrepreneurs. Other factors that were found significantly contributing to the entrepreneurial drive of farmers were education, extension services, farm size, adoption of technology, household size, farm income and credit access. The study recommends that training alone is insufficient to transform the entrepreneurship strive of farmer, hence a complementary pack (determinants of entrepreneurship) is supported along with training for farmers transformation in relation to the National Development Plan (NDP) 2030 goals.

Keywords: Agricultural training, entrepreneurship drive, small-scale, Tobit model, principal component analysis, Gauteng Province.

20. Informal Food Markets and Urban Food Security in Africa: A Nuanced Review of Rural-Urban Linkages, Livelihoods and Inclusive Food Systems

Belemu V and Oluwatayo IB

Rapid urbanization across Africa is transforming food systems and reshaping how urban households access food. As cities expand and demand for food rises, informal food markets have become indispensable sources of affordable and accessible food, particularly for low-income populations. At the same time, persistent income inequality, high levels of structural unemployment, and increasing urban poverty continue to raise concerns about food security and the sustainability of urban food distribution systems. This paper reviews the contribution of informal food markets to urban food security in Africa, with particular emphasis on their role in strengthening rural–urban linkages, supporting livelihoods, and promoting more inclusive food systems. Drawing on evidence from academic literature, policy documents, and reports from government and development agencies, the paper examines the capacity of informal markets to improve food access, generate employment, and enhance the resilience of urban food systems. The review shows that informal food markets are central to ensuring the availability of affordable, diverse, and nutritious foods while providing income and employment opportunities for women, youth, and migrant populations. They also serve as vital channels connecting rural producers with urban consumers through flexible and efficient distribution networks. However, their effectiveness is constrained by inadequate infrastructure, weak regulatory frameworks, food safety concerns, and limited policy recognition and

institutional support. Emerging challenges, including climate change, digital transformation, and data governance, are further reshaping the operating environment of informal food systems. The paper argues that strengthening inclusive urban food governance, investing in market infrastructure, and implementing supportive regulatory frameworks are essential for integrating informal food markets into national food security strategies. Recognising and supporting these markets as legitimate components of urban food systems will be critical for building resilient, equitable, and sustainable food systems across Africa.

Keywords: Urbanisation, Informal food market, Food security, Livelihood, Rural urban linkage, Food system.

21. The impact of Climate Smart Agricultural technology adoption on household's welfare of smallholder farmers in the Eastern Cape Province.

Trevor Jembere, Abbysinnia Mushunje, Petronella Chaminuka.

Sub-Saharan Africa (SSA) is struggling with surging food demand in the face of a growing population and challenges of climate change. The projected change in climate events will have serious consequences for food security in dry weather countries. The devastating impacts of climate change being realised in societies in subtropical regions of SSA include amplified occurrence and intensity of extreme weather events like droughts, floods, heatwaves, environmental damage, rise in pests and diseases, depletion of household assets and rise in rural urban migration. Smallholder farmers can derive benefits from Climate Smart Agriculture in the face of climate induced agriculture impacts. This paper aims to explore the impact of Climate-Smart Agricultural technology adoption on smallholder farmer's household welfare in South Africa. The endogenous switching regression model was used to analyse the impact of CSA technologies on households' welfare. Factors such as farming experience, arable land size, soil quality, and CSA awareness were identified as having a bearing on the decision to adopt CSA technologies. The Average Treatment Effect of the Treated was noted to be positive and significant, meaning CSA adoption significantly impacted the welfare of smallholder farmers. The Average Treatment Effect on the Untreated (ATU) showed that the non-adopters would have benefited if they had adopted CSA. Interventions that are aimed at enhancing climate-smartness in rural agricultural communities may improve the food and income security of the smallholder farmers. The government should promote awareness of CSA practices to smallholder farmers through workshops, seminars, and practical demonstrations.

Keywords: Endogenous switching regression model, food security, household income, household welfare, smallholder farmers.

22. Cropland Abandonment and Its Impact on Rural Livelihoods in South Africa.

Bhekiwe Fakudze and Charles Machethe

Cropland abandonment is accelerating globally, with particularly pronounced effects in Africa, where it disrupts rural livelihoods. Despite the scale of this phenomenon, empirical evidence on its impact on rural livelihoods remains limited, particularly for a critical dimension of welfare in rural settings where dependence on smallholder farming is high and food insecurity is persistent. This study examines the impact of cropland abandonment on household food security, using data from 250 rural households in the former homeland areas of Mpumalanga Province, South Africa. The analysis employs Lewbel's heteroskedasticity approach, which constructs internally consistent instrumental variables to estimate the effect of cropland abandonment on food security. The results highlight a negative relationship between cropland abandonment and household food security in South Africa's former homeland areas. Given these findings, policy interventions should focus on reallocating abandoned cropland to productive uses to increase production and on strengthening rural infrastructure to safeguard household food security in South Africa's former homeland areas. This provides a balanced approach that supports agricultural productivity, contributes to rural livelihoods, enhances food security, and ensures the sustainable utilisation of agricultural land. The study further contributes to the limited literature on the welfare impact of cropland abandonment and addresses the methodological gap regarding its causal effect by using an approach that constructs internal instruments when endogeneity is present in cross-sectional primary data.

Keywords: cropland abandonment, impact, former homeland areas, Lewbel Instrumental Variables, endogeneity, household food security, agricultural production

23. Determinants of climate change vulnerability among rural coastal farming households households: implications for agricultural extension in Ngqushwa Municipality, South Africa.

Jonga, S and Taruvinga, A

Rural farmers are most vulnerable to climate change due to their reliance on rain-fed agriculture, limited resources, and exposure to extreme weather events affecting food security. The effects of climate change on rural farmers are more pronounced in coastal areas due to heightened exposure to coastal hazards, which threaten agricultural land and water resources. A need therefore arises to understand underlying factors that condition vulnerability to climate change of rural coastal farmers. Sample size of 385 rural coastal farmers was randomly selected from villages within 20km of the Indian Ocean in the Eastern Cape, Ngqushwa Municipal

ityity. The ordered logit regression analysis results showed that age, educational attainment, availability of extension services, access to formal crop farming inputs, and crop production are significant factors that increase climate change vulnerability, while livestock production reduces vulnerability of coastal farming households to climate change change. The study argues that coastal areas where forestry and livestock production are the dominant livelihood livelihoods, factors that reduce climate variability may not always provide the expected positive results worth understanding to avoid blanket recommendations. The findings therefore suggests that education , extension services and formal markets in such circumstances should be viewed and supported in the context of dominant livelihoods activities activities.

Keywords: Climate change vulnerability index; sociosocio-economic factors ; rural coastal household farmers.

24. Geopolitics Of Sustainable Land Management: Investment and Policy Constraints to Agricultural Land and Water Resource Rehabilitation in the Western Cape, South Africa

Vanessa Barends-Jones

Invasive Alien Plant (IAP) species constitute one of the most economically impactful but underfinanced sustainability challenges to effective land and water management in South Africa's Western Cape province. This paper explores the obstacles facing investment and policy approaches to address the rehabilitation of agricultural land and water affected by IAP invasions in the context of geopolitics around climate change governance, transboundary environmental policy and under-investment in natural solutions. Using desktop reviews of current literature, program evaluations and cost-benefit studies, the paper explores the cost implications of inaction which include water loss amounting to 1.44 billion cubic meters annually at the national level, the loss of agricultural production areas, fire risks and biodiversity loss compared to costs and benefits of land rehabilitation efforts. The Greater Cape Town Water Fund has been provided as an example of blended finance, which has been implemented on a massive scale in clearing 46 000 hectares and recovering 15.2 billion litres of water per year since 2019 to 2023, while the financing gap is still R370 million just for the Cape Town catchment. Five structural barriers that hinder the successful implementation of blended finance have been described by the authors, namely, lack of public funds, exclusion of rehabilitation from agricultural finance, lack of PES systems, shrinking budgets of programs, and geopolitics of international climate finance and nature-based adaptation. Seven policy suggestions have been provided.

Keywords: invasive alien plants; land rehabilitation; sustainable land management; blended finance; water security; geopolitics; Western Cape; payment for ecosystem services.

25. Rural Households Awareness and Willingness to Pay for Moringa Products: Evidence from Chief Albert Luthuli Municipality, Mpumalanga Province, South Africa.

Hlatshwayo, N.C., Ledwaba L. J., and Nkoana, M.A.

Moringa is a multipurpose plant that plays a significant role in improving household health through its nutritional and medicinal properties while also contributing to income generation and poverty reduction. Despite these benefits, awareness and utilisation of Moringa products among rural households remain limited. This study therefore examined the level of awareness and the willingness to pay for Moringa products among rural households in Sincobile Village, Chief Albert Luthuli Municipality, Mpumalanga Province, South Africa. Primary data were collected from a sample of 150 rural household members in Sincobile Village. Descriptive statistics were used to analyse the socio-economic characteristics of respondents and assess their level of awareness of Moringa products. Perceptions regarding Moringa products, measured using a Likert scale, were also analysed using descriptive statistics. A Probit regression model was employed to identify the factors influencing rural households' willingness to pay for Moringa products. The results of the Probit regression analysis revealed that age, gender, occupation, household income, awareness of Moringa products, and the perceived improvement in family health significantly influenced rural households' willingness to pay for Moringa products. Awareness was significant at the 1% level, while age and perceived improvement in family health were significant at the 5% level. Gender, occupation, and household income were significant at the 10% level. Based on these findings, the study recommends implementing awareness campaigns, community-based training programmes, and strengthened agricultural extension services to educate rural households about the nutritional, medicinal, and economic benefits of Moringa. Such initiatives could enhance awareness, increase utilisation, and improve rural households' willingness to pay for Moringa products.

Keywords: Moringa, Willingness to pay, Awareness, rural Households, Probit regression.

26. Exploring gender dynamics in the impact of micro, small and medium food enterprises in low-income South African communities.

Olerato Makgamatha and Wegayehu Fitawek.

The study examined gender dynamics within food MSMEs and their impact on owners' incomes in low-income urban communities in Gauteng. Using data from 474 large and small food MSMEs, the Harvard Gender Analytical Framework demonstrated that males had greater access, control, and decision-making power than female owners, albeit marginally. The gendered disparities in access, control and decision-making power likely reveal the constraints and opportunities available to females and males, respectively. Participation in larger food MSMEs resulted in a lower weekly income, by R 2 036.27, than that of smaller food MSME owners in the short term. To promote the participation of youth and women, policies should prioritise strengthening support and encouraging active participation to foster economic growth and reduce unemployment. It is further recommended that food MSMEs receive mandatory food hygiene and safety training to ensure adherence to food safety standards and improve public health outcomes. Lastly, to address the constraints females face in the sector, it is essential to formulate tailored gender-sensitive policies and programmes aimed at alleviating the impact of institutional frameworks that marginalise females and promoting equality.

Keywords: gender dynamics, food enterprises, South African communities.

27. The effects of African Continental Free Trade Area on South Africa's economy: Computable General Equilibrium (CGE) approach.

Solly Molepo, Phelelani Sibiya, Bhekani Zondo, Buhlebemvelo Dube, Khethiwe Mnguni, Antti Simola, Joseph Kau, Mamakie Lungwana, Victor Thindisa and Heinrich Bohlmann.

The African Continental Free Trade Area (AfCFTA) is a lead agreement established by African Union, which is a vehicle for realising economic growth in Africa. The study examines the effects of AfCFTA on South African economy. Policy shocks adopted in the study include the reduction of tariff rates by 90%, then followed by another reduction of 97% and finally it is erosion of tariffs and non-tariff measures for intra-Africa trade. The study adopted the static GTAP model version 7, using database version 11, at multi-region, multisector computable general equilibrium (CGE) model to analyse economy-wide impact of trade liberalisation with AfcFTA. The sectors were aggregated from 65 to 39, while regions were aggregated from 141 to 42. The study simulates four different scenarios to assess the economic-wide effects of AfcFTA on South African economy: (1) The 97% reduction on all commodities within Africa; (2) The 97% reduction on agricultural commodities within Africa; (3) Reducing the NTMs only by 25%; (4) Combine an elimination of tariffs and taxes with a 25% reduction of NTMs within Africa. The results highlight that implementation of trade liberalisation under the AfCFTA brings an economy-wide impact on the South Africa economy. The results shows that South

Africa is realising overall Welfare gain of US$10,580.52 due to diversified markets created intra-Africa trade. The total outputs of selected industries are expected to increase, which translates into positive multipliers through the entire economy. South Africa is competitive producers of agriculture, manufactured and other commodities in Africa, which stands a chance to benefit from positive trade balance. The study aims to inform trade and development policy space by reflecting the effects to trade liberalisation under the AfCFTA.

Keywords: Computable general equilibrium (CGE), African continental Free Trade Area (AfCFTA), Tariffs.

28. Exploring individuals' perception, experience of local food environments and factors influencing food outlet choices.

Zodidi Cebiso, Wendy Geza, Mjabuliseni Ngidi, Maxwell Mudhar and Tafadzwanashe Mabhaudhi.

Food environments are increasingly recognised as key determinants of dietary behaviour and food access. In low-income urban settings, these environments are characterised by the coexistence of formal and informal retail systems, yet how individuals navigate them remains underexplored. This study examined individuals' perceptions and experiences of their local food environment and identified factors influencing food outlet choice in Pietermaritzburg, Msunduzi Local Municipality, KwaZulu-Natal, South Africa. A triangulated mixed-methods design combining survey data (n = 382) and focus group discussions (n = 40) was used. Quantitative data were analysed using multinomial logistic regression, and qualitative data were analysed thematically using NVivo software.

The findings reveal a hybrid food sourcing pattern: 47.6% of respondents used a spaza shop, 38.5% used a supermarket, and 13.9% accessed mixed outlets. Consumers preferred supermarkets for bulk purchasing and product variety, whereas spaza shops provided convenience. Product price emerged as a dominant driver of outlet choice. Consumers use adaptive strategies, such as bulk buying, timed shopping, and mixed-outlet use, to manage constraints on income, transport, and access. The findings highlight that food outlet choice is constrained and adaptive rather than preference-driven. Therefore, in response, policy interventions should focus on structural barriers by improving affordability, regulating informal retail, reducing transport constraints, and supporting community-based food systems.

Keywords: food environments; lived experiences; food outlet choice; spaza shops; mixed methods.

29. Smallholder Farmers' Perceptions and Willingness to Adopt Soybean Production: The Case of Lusikisiki, Eastern Cape, South Africa.

Phakama Mdlakazi

This study examines the factors influencing smallholder farmers' perceptions and willingness to adopt soybean production in Lusikisiki, Eastern Cape, South Africa. Soybean production is increasingly promoted for its potential to improve household income, enhance soil fertility, and strengthen food security, yet adoption among smallholder farmers remains limited. A cross-sectional research design was adopted, using primary data collected from 219 smallholder farmers through structured questionnaires. Descriptive statistics were used to summarise farmers' socioeconomic characteristics, while binary logistic regression models were employed to identify determinants of perceptions and willingness to adopt soybean production. The results show that 58% of respondents perceive soybean production as viable, and 88.1% are willing to adopt the crop. The perception model indicates that awareness, perceived market availability, soil suitability, ease of production, and perceived pest resistance significantly increase positive perceptions, while age and high input costs reduce them. The willingness-to-adopt model reveals that education level, income category, perceived viability, and access to training and funding significantly influence adoption intentions. Overall, the findings reveal a gap between favourable perceptions and actual adoption intentions, suggesting the presence of structural and institutional constraints. Key barriers include limited market access, inadequate training, and financial limitations. The study concludes that strengthening extension services, improving market linkages, and enhancing access to financial and technical support are essential for translating positive perceptions and willingness into actual adoption of soybean production.

Keywords: soybean production, smallholder farmers, perception, adoption, Eastern Cape, South Africa.

30. Bridging the Postharvest Gap: Perceptions and Determinants of Vegetable Losses among Smallholder Farmers in eThekwini Municipality, South Africa.

Qange S, Mdoda L and Mditshwa A.

Postharvest losses remain a major constraint to smallholder agricultural productivity, food security, and market participation in South Africa, yet limited empirical evidence exists on how farmers perceive these losses and the factors driving their severity across the postharvest value chain. This study investigates smallholder farmers' perceptions of postharvest vegetable losses and identifies the socioeconomic, institutional, and market-related determinants that influence the severity of losses in eThekwini Municipality, KwaZulu-Natal. A cross-sectional survey of

238 smallholder vegetable farmers was conducted using structured questionnaires. Data were analysed using descriptive statistics, Likert-scale perception analysis, and an Ordered Probit Model. The findings reveal that postharvest losses are pervasive throughout the value chain, with harvesting (79.8%), packaging (68.1%), and transportation (60.1%) identified as the stages where losses are most pronounced. Econometric results indicate that market distance significantly increases postharvest loss severity, while education, extension services, household labour availability, farming experience, training, and financial support substantially reduce losses. These findings demonstrate that postharvest losses are driven not only by technical deficiencies but also by human capital, institutional support, and market accessibility. The study contributes to the postharvest loss literature by integrating farmers' perceptions with econometric evidence to identify stage-specific determinants of loss severity among South African smallholder vegetable producers. The results highlight the need for integrated value-chain interventions that strengthen extension services, improve rural transport and market infrastructure, expand access to training and finance, and promote improved postharvest management practices to enhance smallholder competitiveness, reduce food losses, and strengthen food system resilience.

Keywords: Smallholder farmers; Postharvest losses; Vegetable value chains; Ordered Probit Model; Agricultural extension; Food security.

31. Investigating the extent to which private Animal Health Technicians bridged the rural animal health service gap.

Matli MW, Khubeka P, Mamabolo M and Shiba W.

Access to basic animal health services remains a challenge for smallholder livestock farmers in rural South Africa. Following the December 2022 legislative reform (Notice 1493 of 2022) permitting Animal Health Technicians (AHTs) to register Private Animal Health Care (PAHC) facilities and practise independently, this study employed a cross-sectional quantitative design to investigate the extent to which AHT training and PAHC establishment have bridged the animal health service delivery gap in seven provinces. Data from 19 AHTs and 91 farmers were collected using questionnaires administered vis the Kobo Toolbox platform. The data was analysed using the Animal Health Service Coverage (AHSC) Index which measured Accessibility, Utilization, Service Quality, and Economic Impact. The AHSC Index showed a score of 82.15/100, indicating the service gap has been substantially bridged. Accessibility scored 71.0 (65% of farmers receive AHT service within six hours; 77% of AHTs serve >90% communal farmers). Utilization scored 89.5. Quality scored 90.0 (90% farmer satisfaction). Economic impact scored 88.5 (lamb production increased by 2.87 lambs, p=0.008; cattle

weight +46%; broiler weight doubled). The overall AHSC score was 82.15 out of 100, indicating that AHTs and PAHC facilities have substantially improved access to animal health services and livestock productivity in underserved rural areas. However, Accessibility remained the lowest-scoring component, suggesting that while significant progress has been made, spatial and logistical barriers persist.

Keywords: Animal Health Technicians, PAHC facilities, animal health service coverage index, legislative reform, livestock productivity.

32. Assessing the Relationship Between Non-Tariff Barriers and South Africa's ability to Access and Compete in Export Markets.

Simphiwe Mlotshwa

Non-tariff measures have become some of the most influential tools in shaping global agricultural trade policies in recent decades. These NTMs have evolved into some of the most restrictive policy instruments, hindering the free flow of international trade in the agricultural sector by affecting traded volumes and trade patterns. For exporters, especially when partner countries impose strict requirements, these measures can limit access to premium markets and reduce competitive opportunities. Hence, this study aimed to examine the effects of non-tariff measures (NTMs) on South Africa's ability to access and compete in major table grape export markets. Using a balanced panel of 30 trading partners from 2001 to 2023 and a gravity modelling framework estimated through Poisson Pseudo-Maximum Likelihood (PPML), the analysis evaluates how Sanitary and Phytosanitary Measures (SPS), Technical Barriers to Trade (TBT), and Pre-Shipment Inspections (PSI) influence export performance. The model controls for demand-side characteristics, distance, exchange rates, and multilateral resistance factors. Results show that SPS and PSI measures significantly impede South Africa's table grape exports, while TBT measures are unexpectedly associated with increased export flows, suggesting a potential quality-signalling effect. These findings highlight the dual nature of NTMs, both restrictive and supportive, which emphasise the need for targeted compliance capacity, and harmonisation of standards with key markets. Based on these findings policymakers should focus on strengthening certification systems and improving the efficiency and cost structure of pre-shipment inspections to ensure sustained competitiveness of the industry.

Keywords: Table grape, non-tariff measures, SPS, TBT, PSI.

33. Awareness and Perception of Digital Payment Platforms Among Small-Scale Vegetable Farmers: Evidence from Vhembe and Mopani Districts, Limpopo Province.

Nevhutalu T, Ledwaba L. J and Baloi V.A.

Digital payment platforms are increasingly recognised as important instruments for promoting financial inclusion, improving transaction efficiency, and strengthening agricultural market participation among small-scale farmers. Despite their growing availability, little is known about farmers' awareness and perceptions of these technologies, particularly within South Africa's smallholder farming sector. This study examined awareness and perceptions of digital payment platforms among small-scale vegetable farmers in the Vhembe and Mopani districts of Limpopo Province, South Africa. A quantitative cross-sectional survey was conducted among 401 farmers selected through snowball sampling. Descriptive statistics, Chi-square tests, independent-samples t-tests, reliability analysis, and an ordered probit model were employed to analyse the data. The results revealed high levels of awareness of digital payment platforms in both districts, with more than 79% of farmers reporting awareness; however, actual use of digital payments for agricultural transactions remained considerably lower. Significant district differences were observed in smartphone ownership, digital payment use, and perceptions of usefulness, ease of use, and security, with Vhembe farmers reporting more favourable perceptions than their counterparts in Mopani. The ordered probit model further indicated that age was negatively associated with perceived usefulness, whereas internet access, smartphone ownership, and district location positively influenced farmers' perceptions. Although awareness was widespread, the findings demonstrate that awareness alone is insufficient to promote adoption of digital payment. Instead, farmers' perceptions and the broader institutional and infrastructural context play a critical role in shaping technology acceptance. The study contributes to the growing literature on digital financial inclusion by demonstrating that awareness and perception represent distinct stages within the digital payment adoption process. The findings provide important policy insights for designing targeted extension, digital literacy, and financial inclusion interventions aimed at increasing the effective utilisation of digital payment platforms among small-scale farmers in South Africa.

Keywords: Digital payment platforms; awareness; perception; financial inclusion; small-scale vegetable farmers; Limpopo Province; Technology Acceptance Model.

34. Economywide effects of Foot-and-Mouth Disease outbreaks and livestock health investments in South Africa: A computable general equilibrium analysis.

Bhekani Zondo, Bernard Manganyi, Moses Lubinga, Nokuthula Khulu, Lesedi Mokoena, Phelelani Sibiya, Bonani Nyhodo, Solly Molepo, Victor Thindisa, and Heinrich Bohlmann.

Foot-and-mouth disease (FMD) remains a persistent threat to South Africa's livestock sector, with significant implications for agricultural productivity, trade, and economic growth. This study quantifies the macroeconomic and sectoral impacts of recurring FMD outbreaks. Furthermore, it evaluates the effectiveness of a government-led livestock vaccination programme using a dynamic Computable General Equilibrium (CGE) model calibrated to the South African economy. The analysis simulates a set of policy-relevant scenarios over the period 2025–2032. The vaccination programme is modelled as a fiscal intervention amounting to R1.8 billion over two years, implemented as a Valued Added Tax (VAT) subsidy to veterinary services. Results indicate that FMD outbreaks generate negative but heterogeneous economywide effects. Real GDP declines in the short term (by approximately 0.04%) and remains slightly below baseline in the long run, reflecting persistent losses in productivity and export competitiveness. Household consumption and investment decline, while exports of cattle and beef decline sharply due to trade restrictions. Although the vaccination programme partially offsets these losses through supporting temporary gains in employment and moderating GDP contraction, the results shows that this is insufficient to fully restore pre-outbreak economic performance. At the sectoral level, cattle production, live animal exports, and meat processing industries experience the largest and most sustained declines, while relatively less-affected sectors such as dairy processing and services show modest gains due to resource reallocation. The findings highlight significant structural adjustment within the agricultural economy, with spillover effects extending beyond primary livestock industries. The study concludes that while investment in vaccination is economically justified and plays a critical role in mitigating short-term losses, it must be complemented by broader biosecurity reforms, improved livestock traceability systems, and rapid restoration of export market access. A coordinated and proactive animal health strategy is essential to enhance the resilience, competitiveness, and long-term sustainability of South Africa's livestock sector.
Keywords: FMD; Biosecurity control; Total factor productivity; Animal health; Export bans; Economywide analysis; South Africa; Livestock sector; TERM CGE model.

35. Determinants of agricultural e-commerce adoption among fresh produce smallholder farmers in Gauteng Province, South Africa: An integrated technology acceptance model and diffusion of innovation perspective.

D.N. Sithole, L.S. Gidi and J.J. Hlongwane

The Fourth Industrial Revolution has accelerated digital transformation across agricultural systems globally, with agricultural e-commerce platforms offering promising opportunities for

smallholder farmers to overcome persistent market access constraints. Despite South Africa's status as a continental digital economy leader and widespread mobile connectivity, South African smallholder farmers continue to face well-documented obstacles to formal market, suggesting that barriers extend beyond physical access to technology. This study addresses the critical gap in empirical evidence on the determinants shaping fresh produce smallholder farmers' willingness to adopt agricultural e-commerce in South Africa. Using an integrated Technology Acceptance Model (TAM) and Diffusion of Innovations (DOI) theoretical framework, the study examines how socio-economic characteristics, institutional factors, digital capability, and awareness interact to shape adoption decisions. A quantitative cross-sectional survey was conducted among 120 fresh produce smallholder farmers across Gauteng Province. Data was collected through structured face-to-face interviews between September 2022 and March 2023. Binary Logistic Regression was employed to estimate the probability of farmers' willingness to adopt agricultural e-commerce. The results reveal that agricultural e-commerce awareness is the strongest predictor of adoption intention, supporting DOI's proposition that knowledge constitutes the gateway to innovation adoption. Gender, marital status, occupation, source of market information, transport arrangements, and willingness to pay for platform services were also significant at the 10% level. Notably, internet access, device ownership, and education were not significant determinants, confirming that in digitally connected regions, the second-level digital divide differences in awareness and digital capability outweighs infrastructure constraints. The study demonstrates the value of integrating TAM and DOI frameworks for understanding technology adoption in smallholder agricultural contexts and contributes evidence-based insights for promoting inclusive participation in digital agricultural markets.

Keywords: Agricultural e-commerce, technology adoption, smallholder farmers, Technology Acceptance Model, Diffusion of Innovations, digital agriculture, South Africa.

36. Smallholder Farmer Perceptions and Technology Adoption Determinants for Avocado Biomass Bioenergy in Limpopo Province, South Africa: A Systematic Literature Review.

Mabatha Sekedi Prudence, Jan Hlongwane; M.A. Nkoana; R. Nengovhela.

Despite the growing global evidence base on agricultural bioenergy, no published study has systematically assessed the baseline awareness, perceptions, or adoption behaviour of small-scale avocado farmers in Limpopo Province, South Africa, toward bioenergy valorisation of avocado waste streams. This evidence gap is consequential: Limpopo farmers face a farmer-

to-extension-officer ratio estimated at 1,200:1, far exceeding the recommended 400:1 benchmark, and the average avocado farmer age of 55–60 years creates specific communication and adoption challenges that extrapolation from other provinces, crops, or countries cannot address. Without baseline perception data grounded in the Limpopo smallholder context, interventions designed to promote avocado biomass bioenergy risk misalignment with actual farmer concerns, knowledge levels, and motivational structures. This paper presents a systematic literature review of published evidence on smallholder farmer perceptions of and attitudes toward bioenergy, and the determinants of technology adoption, with application to avocado biomass bioenergy in Limpopo. Following the PRISMA 2020 framework, 54 sources were synthesised across comparable smallholder farming contexts globally. The review is grounded theoretically in the Technology Acceptance Model (Davis, 1989) and Diffusion of Innovation Theory (Rogers, 1981), integrated with a Circular Economy lens (Kirchherr et al., 2017) to situate bioenergy adoption within broader waste valorisation and sustainability goals. Key findings reveal that baseline awareness of fruit waste-to-energy potential remains below 20% across most smallholder contexts globally, with significant methodological sensitivity to how awareness is measured. Cooperative membership predicts awareness rates of 54% among members versus 12% among non-members, underscoring the potential of SAAGA cooperative structures as information conduits. A social proximity effect is among the most robust findings in the literature: having a neighbour with any bioenergy system increases adoption likelihood by 4.8 times. The persin misconception the widespread incorrect belief that all avocado waste is universally toxic, significantly inflates perceived risk of engagement. Seven thematic perception dimensions are identified and discussed.

Keywords: smallholder farmer perceptions; technology adoption; avocado biomass bioenergy; Limpopo Province; Technology Acceptance Model; Diffusion of Innovation; awareness; South Africa.

37. Assessment of the Quality and Usability of Agricultural Statistics in South Africa: A Systematic Review.

Bernard Manganyi, Kayalethu Sotsha, Victor Thindisa, Khathutshelo Rambau, and Matume Maila.

Agricultural statistics are essential for informing policy, monitoring food security, and guiding investment decisions. In South Africa, data collection involves a wide range of actors, including industry associations, trusts, state entities, private firms, commodity organisations

and banks. This diversity marks a shift from early censuses and marketing board records to a post-deregulation context. However, decentralisation has led to fragmentation, raising concerns about data quality, accessibility and coverage. This study systematically reviews domestic agricultural data platforms to map the ecosystem, evaluate data quality and assess platform usability. Following the PRISMA 2020 guidelines, 107 institutions were screened, and 38 met the inclusion criteria for recurring, policy-relevant agricultural data. Each platform was assessed across four dimensions: (i) intrinsic quality covering metadata, codebooks and limitations, (ii) usability covering free access, filtering, analysis-ready formats and support, (ii) content coverage covering production, trade, prices, labour, gender, smallholders, environment and climate variables and (iv) technical performance including speed, accessibility, best practices and SEO. The findings reveal a diverse but fragmented ecosystem of agricultural statistics. Industry associations are the most prevalent, accounting for 55.3% of platforms and offering broad sectoral coverage with an average time series of 15.7 years. State entities maintain the longest historical records, averaging 19.3 years, but show lower web performance with a score of 47.3. Private platforms demonstrate high update frequency (100%) and strong user experience, achieving an accessibility score of 87.0, though their coverage averages only 9.0 years. Across platforms, intrinsic quality is limited, with metadata available in only 14%, codebooks in 2.6%, and limitation statements in 5.3%. Most platforms (86.8%) provide free access, but machine-readable formats are available on only 39.5% and analysis-ready formats on 47.4%. Data mainly focus on production (73.7%) and prices (60.5%), with notable gaps in gender variables (7.9%), smallholder farmers (13.2%), environmental indicators (10.5%), and climate-related indicators (10.5%). Despite the diversity of providers and historical depth, South Africa's agricultural data ecosystem is constrained by inconsistent documentation, limited adoption of open data practices and uneven platform usability. Strengthening data governance, modernising public platforms, and prioritising machine-readable, interoperable, and socially inclusive datasets are critical to developing an integrated, evidence -based agricultural statistics system that advances sustainable development and food security.

Keywords: Agricultural data, accessibility, usability, policy, and data source.

38. Agricultural intensification and forest conservation: A dynamic panel analysis.

Prince Nketiah, Herbert Ntuli and Edilegnaw Wale.

Global deforestation translates to about 7.6 million hectares loss of forests per annum, especially in the tropics. The African continent is of no exception as the encroachment of forest lands persist. This study examines the role of agricultural intensification on deforestation within the Guinea-Congo tropical forest belt of Africa. System-GMM model for a panel of

seventeen countries is employed based on annual data that spans 2003 to 2023. We provide strong evidence that agricultural intensification impacts forest conservation efforts positively in the tropics of Africa whilst agricultural extensification has a significant impact on forest depletion. As the world pushes toward the achievement of the Sustainable Development Goals (SDGs) 2, 8, 12, and 15, this study highlights the multi-dimensional role of agricultural intensification in sustaining forest livelihoods and ecosystems while ensuring food security in Africa.

Keywords: forest, intensification, conservation, agriculture, system-GMM model.

39. Effect of climate change adaptation strategies on food security amounts Cameroonian households.

Foudjo SI

Climate change poses a long-term threat to households' livelihoods and undermines progress towards Sustainable Development Goal 2. This study assesses the impact of the adoption of agricultural and financial adaptation strategies, and their combination, on food security in Cameroon, based on data from ECAM5. Using the endogenous switching multinomial regression (MESR) model, the results show, firstly, that adoption decisions are primarily influenced by households' socio-economic characteristics, notably the gender of the head of household, marital status, level of education, exposure to climate shocks, standard of living, employment status, access to basic infrastructure and access to markets. Secondly, the treatment effects reveal that combinations of agricultural strategies – in particular the use of improved seeds, compost and crop diversification – significantly reduce the experience of food insecurity. Similarly, access to credit, social transfers and combinations of the two improve food security more than financial inclusion does on its own. Finally, the results show that approaches which simultaneously integrate agricultural and financial strategies deliver the greatest gains in terms of food security. These findings highlight the need to promote integrated adaptation policies combining agricultural and financial innovations in order to sustainably strengthen households' resilience to climate change.

Keywords: Climate change, Adaptation, Food security

40. Who Benefits Most? The Resilience Dividend: Using a Fractional Response Approach to Financial Inclusion in Africa.

Tesfay G.B.

This study examines the distributional impact of financial inclusion on financial resilience across six Sub-Saharan African countries using Global Findex data (2014–2024). Employing

a two-stage Principal Component Analysis to construct a Financial Inclusiveness Index (FII), we apply fractional response panel models and Seemingly Unrelated Regression to evaluate progressive, neutral, or regressive effects on emergency-fund mobilization. Results reveal a robust resilience dividend; high inclusion increases predicted resilience from 0.541 to 0.888. While aggregate effects are distributionally neutral, country-specific dynamics vary: Kenya and Ghana exhibit progressive, pro-poor effects, while Ethiopia and Nigeria show catch-up dynamics. Crucially, inclusion reduces reliance on distress asset sales by 2.3 percentage points without displacing traditional support channels, driving convergence between the poorest 40% and richest 60%. We conclude that financial inclusion delivers an equalizing resilience dividend past critical market thresholds, highlighting targeted inclusion strategies as essential for equitable shock absorption.

Keywords: Financial inclusion, resilience, distributional effects, fractional response models, Sub-Saharan Africa, emergency funds.

41. Local Food-System Resilience through African Leafy Green Vegetables in South Africa: A Systematic Review of Consumer Practices, Value Chains and Policy Pathways.

Qhelile Ntombikayise Bhebhe, Hennie Fisher and Richard Hay.

African leafy green vegetables (ALGVs), commonly known as morogo or imifino, are locally adapted foods with potential to diversify diets, strengthen rural value chains and reduce dependence on narrow food-supply channels. Yet their economic and policy relevance is often discussed separately from the geopolitical pressures that shape food prices, agricultural inputs, energy costs and supply-chain reliability. This policy-oriented systematic review synthesised South African evidence published from 2020 to 2025 on culinary and consumer practices, nutritional value, production, processing, market access and food-system integration. Searches of Google Scholar, Web of Science, Scopus, PubMed, ScienceDirect and selected grey literature identified 451 records. After duplicate removal and screening, 48 studies were included in a thematic narrative synthesis and recoded across value-chain functions. Thirty-two studies addressed consumption and culinary practices, 27 nutritional composition, 19 health-related evidence, 28 market access and food-system context, and 15 production or agricultural potential; categories were not mutually exclusive. ALGVs were commonly sourced through home gardens, wild harvesting, smallholder production and informal markets, and were prepared as relishes, stews, soups, dried products, powders and fortified foods. Their wider integration was constrained by seasonality, short shelf life, weak seed systems, limited

processing capacity, fragmented market coordination, low formal-retail visibility and uneven consumer familiarity. Although the reviewed studies rarely examined geopolitics directly, the synthesis shows that stronger local seed, production, preservation, procurement and knowledge systems could broaden South Africa's food portfolio and reduce exposure to external shocks. The paper contributes an agricultural-economics interpretation of ALGVs as food-system assets whose value depends on coordinated demand creation, market development and inclusive policy support rather than nutritional promotion alone.

Keywords: African leafy green vegetables; agricultural economics; food-system resilience; local value chains; morogo; policy; South Africa.

42. Potential financing of land purchases for emerging farmers in South Africa.

Euan Chew and Beatrice Conradie.

This paper re-examines the relationship between farm prices and the associated rent flows to determine the net margin per hectare of farmland for land reform beneficiaries in the Pro-active Land Acquisition Strategy (PLAS) programme. Using data for commercial livestock farms the net margin per hectare is estimated using commercial bank interest rates for 2018. The maximum proportion of mortgage financing for each quintile of farm size is estimated, with farms in the range of 430 – 832 ha generating the largest land rents and able to accommodate up to 80.2% of the purchase price as mortgage financing.

Keywords: Finance, land purchases, emerging farmers and South Africa.

43. The gender gap in the National Red Meat Development Programme: Measuring the performance of smallholder beef cattle farmers in uMzimkhulu, South Africa

Nonhlanhla Gwamanda, Simphiwe Ngqangweni, Petronella Chaminuka.

The performance of beef cattle smallholder farmers has been a major concern for policymakers and relevant stakeholders for the past three decades. Since the dawn of democracy numerous initiatives have been implemented to improve productivity of smallholder livestock enterprises. However, there is little evidence on the performance of smallholder beef cattle farmers that focus on gender differences. This study seeks to contribute to ongoing research on factors that influence performance of beef cattle among smallholders, by measuring production performance of the beef cattle smallholder farmers from a sample of 229 participants from the KwaZulu-Natal province. The findings revealed that female farmers achieved higher gross margins on average compared to male farmers. However, the gross margin per Livestock Stock Unit (LSU) was higher for male farmers compared to female farmers. This indicates that male farmers are using resources efficiently compared to female farmers. Additionally, the estimated

Ordinary Least Squares (OLS) regression revealed that several variables pertaining to gender, market orientation and herd performance influence the performance of the farmers enterprises.

Keywords: women's empowerment; productivity; livestock; South Africa

44. Mapping the Transformation of the Eastern Cape Red Meat Value Chain: Historical Evolution, Contemporary Structure and the Position of Communal Cattle Farmers in South Africa.

Keka Vuyolwethu

The Eastern Cape Province possesses one of South Africa's largest communal cattle populations, accounting for a substantial proportion of the national herd while simultaneously exhibiting one of the lowest levels of formal market participation among communal livestock producers. Despite numerous government and private-sector interventions over the past three decades, communal cattle farmers continue to face persistent institutional, infrastructural and market barriers that constrain their integration into profitable formal red meat value chains. This study presents a preliminary mapping of the Eastern Cape red meat value chain by comparing its historical configuration during the early 1990s with its contemporary structure. Particular attention is given to locating communal cattle farmers within the evolving value chain, identifying the institutional actors that shape market participation, and documenting the emergence of active communal cattle farmers' associations. The study adopts a mixed-methods case study design grounded in New Institutional Economics, particularly Williamson's institutional framework, to examine governance structures, transaction costs and institutional arrangements affecting value chain participation. Primary data were collected through semi-structured interviews, focus group discussions, key informant interviews and field observations conducted across communal livestock-producing areas of the Eastern Cape. Secondary information was obtained from government reports, policy documents, municipal Integrated Development Plans, Statistics South Africa, the Department of Agriculture, Land Reform and Rural Development, the National Agricultural Marketing Council, industry reports and published literature. Geographic Information Systems (GIS) techniques, institutional mapping, thematic analysis and comparative value chain analysis were employed to reconstruct the historical value chain and develop the contemporary value chain map. Preliminary findings indicate a substantial transformation of the Provincial red meat value chain since the democratic transition. Historically, communal cattle farmers were largely isolated from formal markets owing to homeland policies, weak infrastructure and fragmented institutional support. The contemporary value chain exhibits increased participation by private auctioneers, feedlots,

abattoirs, producer organisations and public extension services. However, communal farmers continue to occupy peripheral positions characterised by high transaction costs, limited bargaining power, poor infrastructure, inadequate market information and constrained access to formal procurement systems. Active cattle farmers' associations have emerged as important intermediaries that reduce information asymmetry, facilitate collective marketing and strengthen institutional coordination. The paper concludes that improving the competitiveness of communal cattle producers requires strengthening producer organisations, expanding rural infrastructure, improving market information systems, enhancing institutional coordination and investing in local value-adding facilities. The study contributes an integrated historical and contemporary value chain map that provides an evidence base for policy interventions aimed at inclusive agricultural commercialisation in South Africa.

Keywords: Red meat value chain; communal cattle farmers; Eastern Cape; value chain mapping; New Institutional Economics; transaction costs; market participation; communal livestock.

45. Economic Impacts of a Potential Southern African Customs Union-India Preferemtial Trade Agreement: A Computable General Equilibrium Analysis.

Sibiya P, Simola A, Zondo B, Khulu N, Molepo S, Lubinga M and Bohlmann H.

The proliferation of regional trade agreements has transformed the global trading system, with developing economies increasingly using trade integration as a mechanism for market diversification, industrial development and economic growth. This study evaluates the potential economic impacts of a Southern African Customs Union (SACU)-India Free Trade Agreement (FTA) using a Computable General Equilibrium (CGE) framework based on the Global Trade Analysis Project (GTAP) model. The study examines the economy-wide implications of tariff liberalization and reductions in non-tariff measures, focusing on welfare, trade flows, production and sectoral adjustment effects. The study contributes to the limited empirical literature on SACU-India trade integration by providing an updated assessment of the potential effects of deeper South-South economic cooperation. Using the Standard GTAP Model framework, the analysis captures interactions between households, firms, government and international markets. Results indicate that trade liberalization can generate welfare improvements through trade creation, improved resource allocation and enhanced market access. However, benefits are unevenly distributed across sectors, highlighting the importance of adjustment policies for sensitive industries.

Keywords: Southern African Customs Union; India; Free Trade Agreement; Computable General Equilibrium; GTAP; Preferential Trade Agreements; Trade Liberalisation; Non-Tariff Measures.

46. Agrekon and South Africa's Land Reform Debate: A Review of Agricultural Economics Scholarship, 1994–2025.

Siphe Zantsi

Land reform remains one of the most important and contested policy issues in post-apartheid South Africa. Agricultural economists have played a significant role in shaping debates on redistribution, restitution, tenure reform, agricultural productivity, and rural livelihoods. This article reviews the contribution of *Agrekon*, the flagship journal of the Agricultural Economics Association of South Africa (AEASA), to South Africa's land reform debates between 1994 and 2025. A scoping literature review methodology was employed to synthesise 33 peer reviewed articles published in *Agrekon* that focused on land reform and related agrarian issues. The review analysed the main research questions, thematic focus, and key contributions of these studies. The findings show that redistribution dominated the scholarly agenda, while tenure reform and restitution received comparatively limited attention. Major themes included farm viability, institutional arrangements, land markets, poverty reduction, governance, and post settlement support. These reviewed studies consistently demonstrated that land transfer without adequate institutional, financial, and technical support is unlikely to generate sustainable livelihoods and productive farming systems. The review further reveals that many implementation weaknesses later identified by the 2019 Presidential Advisory Panel on Land Reform and Agriculture had already been highlighted in the agricultural economics literature over several decades. The article concludes that *Agrekon* has provided an important intellectual platform for understanding the evolving challenges of agrarian transformation in South Africa.

Keywords: land reform; agricultural economist; AEASA.

47. A Meta-Analysis of MAP Act Section-7 Investigations Conducted by the National Agricultural Marketing Council (NAMC).

B Manganyi, V Thindisa, K Sotsha, S Molepo and B Zondo.

This study presents a qualitative meta-analysis of eleven (11) Section-7 investigations conducted by the National Agricultural Marketing Council (NAMC) between 1998 and 2024 as per the Marketing of Agricultural Products Act, Act 47 of 1996 as amended (MAP Act). Section-7 investigations are the principal statutory mechanism through which the NAMC investigates market failures, governance weaknesses, and structural inefficiencies across agricultural value chains. Consequently, the report is shared and advises the Minister of

Agriculture on appropriate policy interventions. Although these investigations span diverse commodities, including fresh produce, wheat-to-bread, dairy, red meat, ostrich, wildlife ranching, sorghum, and goat, to the best knowledge of the authors, no prior study has systematically synthesised findings to assess implementation of the policy interventions over time. The study investigates the knowledge gap using a standardised extraction framework applied across the eleven (11) reports to identify common structural and temporal challenges, governance and regulatory gaps, competition issues, and the stakeholders responsible for implementing past recommendations. The meta-analysis finds that the same structural problems, including market concentration, dualistic value chains that exclude smallholder farmers, infrastructure deficits, weak institutional coordination, and unreliable data systems, recur across commodities and decades, indicating systemic rather than commodity-specific causes. Equally important, many recommendations first proposed in the late 1990s, such as separating market ownership from management, improving real-time price information, strengthening veterinary services, and removing VAT anomalies on staple foods, reappear largely unchanged in investigations conducted twenty or more years later. The pattern points to a persistent gap between diagnosis and implementation, suggesting that Section-7 investigations have functioned effectively as analytical exercises but inconsistently as instruments of policy intervention and sustainable development. Based on these findings, the study develops a set of recommendations organised into three categories: (i) legislative reforms to close regulatory and statutory gaps; (ii) strategic interventions to strengthen institutional coordination and accountability; and (iii) operational measures to build capacity and address infrastructure constraints on the ground. The study argues that the NAMC, as the creature of statute, is well placed to break this cycle of recurrence by institutionalising monitoring, evaluation, learning, and embedding follow-up reviews, and ensuring that future Section-7 investigations translate diagnosis into measurable, time-bound implementation outcomes.

Keywords: Section-7 investigations; agricultural marketing policy; meta-analysis; market failure; NAMC.

48. Analysis of the South African Potato Industry's Competitive Advantage Using The Relational-Behavioural Embedded Porter's Diamond.

Sibonelo Zwane, Stuart Ferrer, and Melissa van der Merwe.

Porter's Diamond Model remains one of the most widely cited frameworks for analysing competitive advantage and national competitiveness. Despite its enduring influence, the model has been criticized for its limited ability to explain how interactions among industry

actors shape competitive outcomes. This study extends Porter's Diamond Model by introducing a Relational-Behavioural condition, which captures the quality of relationships and behavioural dynamics among industry participants. The proposed extension enhances the explanatory power of the original framework by enabling a more comprehensive and context-sensitive assessment of competitiveness at both industry and national levels. Using a mixed-methods approach, the study investigates the determinants of competitiveness in the South African potato industry. The findings reveal that competitiveness is influenced not only by traditional structural determinants but also by the nature of relationships and behaviours among actors throughout the industry. Trust, cooperation, communication, and inclusive governance emerged as critical factors shaping resource utilization, innovation, market responsiveness, and strategic coordination. The results demonstrate that relational and behavioural dynamics condition the effectiveness of the traditional determinants identified in Porter's Diamond Model and therefore play a central role in explaining industry competitiveness. This study contributes to the competitiveness literature by proposing a Relational-Behavioural Embedded Porter's Diamond Model, which integrates interpersonal and inter-organizational dynamics into the analysis of competitive advantage. The framework provides a more comprehensive understanding of competitiveness and offers practical insights for policymakers and industry stakeholders seeking to strengthen coordination, collaboration, and long-term competitiveness within agricultural industries.

Keywords: Porter’s Diamond Model, Competitiveness, South Africa, Potato Industry, Relational-Behavioural.

49. Assessing South Africa's Wheat Import Dependency: Trends and Geopolitical Implications.

Lungwana Mamakie, Dube Buhlebemvelo, Kau Joseph and Molepo Solly.

Due to shortages in domestics production and increasing consumption of wheat, South Africa has been mostly dependent on wheat imports. This reliance on international markets increases concerns regarding the countries long-term resilience of wheat supply more especially with factors such as climate-related production shocks, geopolitical tensions and disruptions to global grain trade. This study examined trends in South Africa's wheat production, consumption, imports and import dependency over the of period 1994 – 2024 using annual data. In the analysis, descriptive statistics, trend analysis and simple linear regression was employed. An Import Dependency Ratio (IDR) was also calculated in order to assess the changes in the country's reliance on imported wheat. The results revealed that South Africa is

a wheat deficit country, with average annual production of 1.97 million tonnes compared to average consumption of 2.88 million tonnes, which results average annual imports of 1.29 million tonnes. The trend regression analysis showed that wheat production revealed no statistically significant long-term trend ($p > 0.05$), while wheat consumption and wheat imports increased significantly by approximately 42,181 tonnes and 17,453 tonnes per year, respectively ($p < 0.001$). Furthermore, the Import Dependency Ratio increased significantly by approximately 1.20 percentage annually ($p < 0.001$), rising from about 32% in 1994 to nearly 60% in 2024. The findings reveal that the domestic wheat production has not been able to keep pace with the increasing demand, which results in the countries growing dependence on international wheat markets. The study concludes that strengthening the resilience of South Africa's wheat supply system requires improvement in domestic wheat productivity while diversifying import sources. Investments in climate-resilient wheat production, technological innovation, producer incentives and efficient trade logistics should be prioritised by policy interventions so to reduce vulnerability to external shocks and strengthen long-term supply security.

Keywords: Geopolitics, Trend analysis, Wheat consumption, Wheat production.

50. South Africa's citrus export diversion away from the US and EU towards BRICS-plus, Amidst Geopolitics: Panel Corrected Standard Error analysis approach.

Papi Kubeka, Joseph Sello Kau, Cindy Chokoe, Azola Msezeni, Tebogo Derick Manenzhe, **Sandile Mahlangu** and Odirilwe Selomane.

Amidst escalating geopolitical tensions and rising non-tariff barriers, South Africa's citrus export sector faces mounting pressure to diversify beyond its traditional European and US markets. Yet robust empirical evidence quantifying actual trade redirection remains scarce. The objective of the study was to analyze how South Africa alternate export destinations towards Bricks-Plus in relation to its traditional markets, which happens to be the US and the EU. Secondary monthly data covering the period 20025-2026 was sourced from ITC Map. The exportation of South African citrus to five destination blocks, comprising of BRICS, the EU, the US, the Middle East, and Africa, were analyzed using descriptive analyses and Panel Corrected Standard Error. Descriptive results show that the EU during the period under review, retains overwhelming dominance (87% of total value), but grows sluggishly at just 2.82% annually. In contrast, Africa (14.02% CAGR) and BRICS nations (12.60% CAGR) emerge as the fastest-growing frontiers, while the United States exhibits extreme volatility. The PCSE estimates confirm BRICS as a structurally significant alternative market ($\beta = 1.6385$, $p < 0.001$) with the highest model fit among non-European destinations. Critically, however, a strong

negative residual correlation between BRICS and Europe (ρ = -0.557) exposes a supply-constrained reallocation dynamic. South Africa currently enjoys counter-seasonal advantage and its affiliation in the BRICS affiliation offers added advantage in the face of less non-tariff barriers as compared to Europe. Policy recommendations include for South Africa to invest in innovative technology and infrastructure and strengthen trade relations with BRICS-plus countries and Africa.

Keywords: South Africa Citrus Exports, geopolitics, BRICS, export market diversification.

51. Weaponizing wheat, Russia's Strategic Export Diversion to the Global South, Implications for Africa: Panel-Corrected Standard Error Analysis Approach.

Joseph Sello Kau, Papi Kubeka, Azola Msezeni, Tebogo Derick Manenzhe, Sandile Mahlangu

Anecdotal suggests that Russia uses wheat as a weapon against Ukraine while also creating new allies, yet the effects of this behaviour on Africa, has never been studied sufficiently. The objective of the paper was to analyse Russia's diversion of wheat exports away from its enemy Ukraine, in favour of Global South countries, and the effects this has on the African continent. Secondary data spanning a period of 1998-2021, was sourced from FAO Metada. Two methods were used for analyses, namely descriptive and Panel Correction Standard Error (PCSE). The descriptive analysis results, shows that for the period 2001-2021, Egypt is by far the largest recipient, of wheat exports from Russia, followed by Turkey (1998-2021) and Sudan (2012-2021). South Africa for the period 2003-2021, comes at position 8, overcoming Morocco (1998-2021). For Ukraine for a period between pre and post sanctions it registered a decline of 95.2% in terms of wheat imports from Russia. For the empirical analyses, for sanctions-post 2014, and along the three models, the following results are noteworthy model 1 (ß =-8413, $p < 0.01$); model 2 (ß =-0.6939, $p < 0.05$); model 3 (ß =-1.0785, $p < 0.05$). These results statistically prove the hypothesis that Ukraine suffered repression from Russian Wheat exports. The dummy variable for creation of new allies, is quite substantial M1 ($\beta = 4.3516$, $p < 0.001$) and M2 ($\beta = 4.2144$, $p < 0.001$). The study recommends import-dependent countries to build local capacity to produce wheat and for the WTO to streamline its policies to counter-act weaponization of food in geopolitics.

Keywords: Wheat, Export Diversion, Geo-politics, Africa, Food Security

52. Beyond Adoption: A Double-Hurdle Analysis of Participation and Intensity in Agricultural Insurance-Input Bundles in South Africa.

Mafirakurewa Tariro, Bontsa Nasiphi V and Mushunje Abyssinia.

Smallholder farming has been very vital in the development of the economy in Sub Saharan Africa. The challenges affecting smallholder farming in Africa include those related to climatic conditions, limited access to productivity-enhancing technology, and limited access to financial services. In order to address the challenges affecting smallholder farming in Africa, the insurance input bundles, which is a new support mechanism for smallholder farming, has gained significant interest. Despite the increasing interest in these bundled support tools for smallholder agriculture in Africa, little is known about the underlying drivers of smallholder farmers' participation in these bundled support tools. This study aims to examine the underlying drivers of smallholder farmers' participation in the Ukhanyo Farmers Development (UFD) insurance-input bundles in South Africa's Eastern Cape Province. The research is based on primary data collected from 185 farmer group leaders in four districts, both from participants and non-participants of the scheme. The double hurdle regression model was used to incorporate the two-step decision-making process, which involves participation and the extent of participation. Tests were conducted to ensure that the model adheres to critical econometric properties, making the results reliable. The results suggest that participation is mainly driven by institutional and information factors rather than demographic or farm-level factors. Agricultural training, location, and farming experience were proven to have a significant influence on participation. This implies that information plays a major role in promoting participation. Although access to agricultural training was proven to have a significant positive influence on participation, long training hours were proven to reduce the likelihood of farmer participation. Variables such as age, gender, education level, and farm size were proven to have an insignificant effect on the likelihood of farmer participation in the scheme. On an overall note, the research points out the significance of differentiating between participation and intensity in assessing agricultural interventions. Interventions that focus on increasing participation may not be fully effective without considering other challenges that influence intensity. Improving extension services, infrastructure, and ensuring time-efficient programs are essential in increasing the effectiveness of such interventions. The research provides empirical evidence for the debates on agricultural risk management and smallholder development in developing countries by shedding light on the underlying drivers of participation in insurance-input bundles.

Keywords: Smallholder farmers; Agricultural Insurance-input bundles; Technology adoption; Double-hurdle regression model; Risk management; Eastern Cape; South Africa; Farmer participation; Rural development.

53. Protection or Distortion? Welfare and Political Economy Effects of Variable Import Levies in South Africa's Sugar Industry.

TS Mkhabela and B Nyhodo.

South Africa's sugar industry is vital for rural livelihoods, employment, manufacturing, and exports. However, it faces challenges from low-priced imports, volatile markets, rising production costs, and global competition. To address these issues, the government uses a variable import tariff through the Dollar-Based Reference Price (DBRP) to protect domestic producers. This policy has sparked debate over the balance between protecting producers and consumer welfare. This study evaluates the economic effects of South Africa's sugar import protection policy using monthly data from 2007 to 2025. It employs descriptive statistics, an Autoregressive Distributed Lag (ARDL) model, an Error Correction Model (ECM), and a welfare framework to analyse the relationships between domestic sugar prices, world prices, import tariffs, and exchange rates, as well as the effects of tariff protection. The ARDL model captures long-run and short-run market dynamics, while the welfare analysis measures changes in producer surplus, consumer surplus, government revenue, and deadweight losses. The results indicate the existence of a stable long-run relationship between domestic sugar prices, international prices, import tariffs, import volumes, and exchange rate movements. Variable import tariffs are found to significantly increase domestic sugar prices and reduce the effects of low-priced imports, thereby supporting domestic producers and contributing to greater market stability. However, these producer gains are accompanied by higher domestic prices, reduced consumer welfare, and modest efficiency losses. The findings suggest that while the DBRP mechanism has been effective in shielding the domestic sugar industry from distorted international competition, tariff protection alone cannot guarantee long-term competitiveness. The paper concludes that border protection should be complemented by investments in productivity enhancement, technological innovation, climate resilience, value-chain diversification, and support for small-scale producers. Such a balanced policy approach would strengthen the competitiveness and sustainability of South Africa's sugar industry while minimising adverse welfare effects on consumers.

Keywords: Sugar imports; tariff protection; agricultural trade policy; economic welfare; ARDL; partial equilibrium analysis; South Africa.

54. Access to Government Agricultural Financial Interventions and Its Determinants Among Smallholder Farmers in South Africa.

Matume Maila

Smallholder agriculture remains central to rural livelihoods and food security in South Africa despite persistent challenges associated with limited access to finance, markets, infrastructure, and technology. The South African government has implemented various financial intervention programmes, including grants, subsidized credit, production support, and extension services, aimed at improving agricultural productivity and reducing rural poverty. Nevertheless, evidence regarding the effectiveness of these interventions in improving farmers' income remains mixed. The study investigated the probability of smallholder farmers to receive financial intervention and its influence on household income. The logit model was used as the analytical tool for this study. The results revealed that smallholder farmer who are aware of different government financial interventions are more likely to receive financial intervention. Furthermore, the study revealed that the more farmers receive the financial interventions, the better their income. The study recommended that awareness campaigns should be enhanced to ensure a significant number of farmers are benefiting from financial interventions.

Keywords: Smallholder farmers, Government financial interventions, Agricultural finance.

55. Why land redistribution has not delivered commercial agriculture: Evidence from institutional access in South Africa.

Buhlebemvelo Dube, Melusi Sibanda, Nolwazi Khumalo and Abenet Belete.

Land redistribution remains central to South Africa’s rural development agenda, yet many beneficiaries continue to operate outside commercial agricultural markets despite extensive post-settlement support. This study examines why land transfer has not translated into sustained commercial agriculture and inclusive rural transformation. Using survey data from 105 land redistribution beneficiaries in northern KwaZulu-Natal, the analysis applies an ordered logistic regression model to assess how access to markets, credit, production inputs, extension services, and policy support influences post-redistribution progress. Marginal effects, predicted probabilities, and ordered probit robustness specification are used to evaluate the distribution and stability of institutional effects. The results show that market access is the strongest determinant of productive progress, followed by extension services, credit, input access, and policy support. Institutional improvements substantially reduce the probability of poor post-redistribution outcomes but generate comparatively limited movement into the highest levels of commercial performance. This suggests that existing interventions are more effective at reducing exclusion than at establishing commercially viable farming enterprises. The findings point to institutional fragmentation as a central constraint: credit, inputs, and technical support

generate limited returns when beneficiaries remain disconnected from reliable markets and coordinated value chains. The paper contributes to debates on agricultural commercialisation and inclusive rural transformation by showing that land transfer alone cannot deliver productive transformation. Policy should prioritise complementary market, financial, technical, and institutional systems that enable beneficiaries to participate sustainably in commercial agriculture.

Keywords: Agricultural commercialisation, Agrarian transition, Land reform, Market access, Rural development.

56. Global Sustainability Governance and the ESG Patient Capital Gap: Financial Subordination and Smallholder Exclusion in Southern Africa's Horticultural Export Sector.

Precious Chinanga

International premium agricultural markets are increasingly shaped by stringent, capital intensive sustainability governance emanating from European environmental, social, and governance (ESG) regulatory frameworks. Instruments such as the Corporate Sustainability Reporting Directive (CSRD), the Corporate Sustainability Due Diligence Directive (CSDDD), the European Union Deforestation Regulation (EUDR), and the United Kingdom Modern Slavery Act of 2015 function as extra-territorial governance shocks that cascade down global agricultural supply chains into structurally constrained developing economies. While Southern African countries rely on high-value horticultural exports to drive rural transformation and foreign currency earnings, their integration into premium global markets is threatened by a three-level governance mismatch operating at the global, national, and value-chain scales. To retain Western market access, African producers must invest in eco-efficient infrastructure (solar cold chains, digital traceability systems, soil-health monitoring and worker welfare) requiring 'patient capital' with three to- ten-year payback horizons. However, domestic banking sectors in countries such as Zimbabwe offer only short-tenor, high-interest, collateralised credit, rendering ESG regulatory compliance structurally unachievable for smallholder producers. This geopolitical dynamic enforces 'financial subordination,' obliging African out-growers to absorb uneven compliance costs while receiving zero value premiums from global buyers. Consequently, green trade mandates function as de facto non-tariff barriers that deepen agrarian exclusion rather than enabling sustainable development. Drawing on documentary analysis, global value chain theory, financial subordination theory, and multilevel governance frameworks, this paper diagnoses the governance failure across three scales and proposes a

sequenced, multi-scalar policy framework. The framework features a reformed international blended finance architecture, an African ESG Agricultural Compliance Index, co-designed regulatory implementation pathways, central bank green credit mandates, collateral governance reform, and the scaling of smallholder compliance collectives. The findings contribute directly to the sub-themes of Governance, Policy and Political Economy of Food Systems; and Markets, Value Chains, Labour and Inclusive Rural Transformation.

Keywords: sustainability governance, patient capital gap, financial subordination, ESG mandates, non-tariff barriers, blended finance, smallholder farmers, horticultural exports, governance failure, Southern Africa

57. Smallholder farmers' decisions to cultivate hemp in South Africa: An agent based modelling approach.

Mailula LP, Zantsi S and Mushunje A.

Hemp has emerged as a promising industrial crop with significant potential to support rural livelihoods, economic diversification and sustainable agricultural development in South Africa. Despite recent regulatory reforms, adoption among smallholder farmers remains limited due to institutional, economic, and behavioural constraints. Therefore, this study developed an Agent-Based Modelling framework to model smallholder farmers' decisions to cultivate hemp under different support interventions. The model incorporated heterogeneous farmer agents characterised by socio-economic, behavioural and institutional attributes derived from survey data and econometric results. Key variables included education level, hemp knowledge, training, access to permits, risk preferences, and social influence.

The simulation evaluated three support interventions, namely permit subsidies, seed subsidies, and area-based subsidies, under baseline (0%), partial (50%), and full (100%) subsidy scenarios. The results show that higher subsidy levels consistently increased hemp adoption over time, with the 100% subsidy scenarios producing the highest and most stable adoption curves. Among the interventions, seed subsidies generated the strongest adoption outcomes, followed by permit subsidies, while area-based subsidies showed the lowest adoption rate. The findings further demonstrate that adoption dynamics are shaped by the interaction between policy incentives, behavioural heterogeneity, and social learning. Sensitivity analysis confirmed the robustness and stability of the simulation results. The study, therefore, concludes that targeted input support, combined with behavioural and institutional interventions, can significantly improve inclusive hemp adoption among smallholder farmers.

Keywords: Hemp, Subsidies, Smallholder farmers, Agent-based model, Scenarios.

58. Evidence- Based Opportunities and Challenges in Food Systems Across SADC countries: A triangulation synthesis.

Portia Mdwebi

Food systems underpin social and economic wellbeing through natural resource, production, value chain and nutrition, yet across the SADC (Southern Africa Development Community) they are increasingly destabilised by climate change, inequality and structural inefficiencies that can allow high national production to coexist with household food insecurity. The study aimed to address gaps in comparative analysis by characterising food systems across South Africa, Namibia, Zimbabwe and Eswatini and mapping evince-based opportunities for transformation and cross-sectional policy lessons using triangulation synthesis. The paper is based on a research project conducted in the four countries, and systemically applies three evidence strands via national statistics, grey literature and peer-reviewed publications (2010-2024) using convergence matrix to assign confidence interval to findings. Six themes showed full three strand convergence across all four countries; climate change as primary threat (e.g 50% projected maize decline in Namibia by 2030, Eswatini 80,000 livestock deaths). Entrenched dual agricultural structures with smallholder market exclusion, a triple burden of malnutrition (Stunting 21.6-33%), systemic post -harvest losses (>15% everywhere), land degradation and water stress (e.g., ~40% degradation in SA, 80% in Namibia) as well as widespread food insecurity. Import dependence and digital/ICT opportunities showed partial-to-moderate convergence, with South Africa relatively self-sufficient in staples (7.2% import dependence in 2024) but exposed via imported inputs, contrasted with higher exposure in Eswatini/Zimbabwe (~peaking 21%) and emerging digital platforms (e.g EHIS/AMIS in Eswatini). Overall, the synthesis indicates that SADC food-system transformation is chiefly a scaling and implementation challenge, supporting regional coordinated investment in post-harvest infrastructure, climate smart agriculture, inclusive inputs and market reforms. In addition, nutrition-sensitive interventions, cautiously evaluated digital systems and strengthened cross-border standards and trade integration.

Key words: Food system, SADC, Food insecurity, Sustainable agriculture.

59. The Impact of Food Loss on Household Food Insecurity among Smallholder Vegetable Farmers in Capricorn District of Limpopo Province, South Africa.

Milicent M Thokolo and Isaac B Oluwatayo.

Food loss remains a major threat to global food systems, and food insecurity remains a persistent challenge among households, particularly in developing and emerging economies.

However, limited research has focused on how losses occurring during the early production stage impact the food security of primary food producers. The aim of the study was to examine the extent of the impact of food loss on household food insecurity among smallholder vegetable farmers. The study was conducted in Capricorn district of Limpopo Province, South Africa. Quantitative research design was employed to examine how food losses influence food security outcomes. A sample of 230 smallholder vegetable farmers were interviewed using a multistage random sampling method. While descriptive statistics were employed to analyse respondents' socioeconomic characteristics; the Household Food Insecurity Access Scale (HFIAS) tool was used to ascertain the food security status of the respondents, and Ordered Probit Model (OPM) was also employed to explore the nexus between food loss and food insecurity. The results of the HFIAS show that 70% of the respondents experienced food insecurity, with only 30% food secure. The results obtained from the OPM revealed a positive relationship between food loss and food security ($p=0.000$; $\beta= 0.594$). The major causes of food loss include poor market access, pests and disease infestation, and unfavorable weather conditions. The study provides empirical evidence on how food loss affects food security among smallholder vegetable farming households in Capricorn district thereby advising policymakers and development organizations on interventions to improve livelihoods.

Keywords: Capricorn district, Food loss, Food security, HFIAS, Smallholder farmers, Vegetable production.

60. Policy and Institutional Drivers of Climate-Smart Agriculture Transition in Sub-Saharan Africa: A Scoping Review of Governance, Regulation, and Institutional Support with Implications for South Africa.

Adetomiwa Kolapo, Melusi Sibanda and Nolwazi Z.

Climate change continues to intensify agricultural vulnerability in Sub-Saharan Africa (SSA), threatening food security, rural livelihoods, and sustainable agrifood systems through increasing droughts, floods, land degradation, and erratic rainfall patterns. Although Climate-Smart Agriculture (CSA) has emerged as a strategic approach for improving agricultural productivity, resilience, and environmental sustainability, its implementation across SSA remains uneven and constrained by weak governance systems, fragmented policies, inadequate institutional support, and limited stakeholder coordination. Existing studies have largely focused on technological and agronomic dimensions of CSA, with insufficient attention given to the governance and institutional factors influencing CSA transition. This study, therefore, conducted a scoping review to examine the policy and institutional drivers of CSA transition

in SSA, with emphasis on governance systems, regulatory frameworks, and institutional support mechanisms. The study adopted the PRISMA-ScR scoping review framework and systematically reviewed 21 eligible studies obtained from major academic databases and institutional repositories published between 2010 and 2026. Thematic content analysis was employed to synthesize evidence on governance systems, institutional arrangements, policy coherence, climate finance, extension services, and stakeholder partnerships influencing CSA implementation. The findings revealed that effective CSA transition depends significantly on coherent policies, institutional coordination, extension systems, climate financing, land governance, and inclusive multi-stakeholder partnerships. However, institutional fragmentation, weak policy integration, inadequate financing, poor extension services, and insecure land tenure systems remain major barriers constraining CSA adoption in SSA. The study recommends strengthening policy coherence, institutional capacity, decentralized governance systems, climate financing mechanisms, and participatory governance approaches to enhance climate-resilient agricultural transformation across Sub-Saharan Africa.

Keywords- Climate-Smart Agriculture, Agricultural Governance, Institutional Support Mechanisms, Climate Policy Frameworks, Sub-Saharan Africa.

61. Geopolitics, Regional Integration and Food Security: Do Trade Costs Still Bind under the AfCFTA?

Buhlebemvelo Dube, Azola Msezeni, Solly Molepo, Joseph Kau, Mamakie Lungwana.

Agricultural trade has become increasingly shaped by geopolitical fragmentation, supply chain disruptions, and food security concerns, placing regional integration at the centre of Africa's agricultural policy agenda. The African Continental Free Trade Area (AfCFTA) seeks to strengthen intra-African agricultural trade and improve regional food security, yet it remains unclear whether policy integration has reduced the structural barriers constraining trade. This study examines whether trade costs continue to limit South Africa's maize exports to African markets despite the implementation of the AfCFTA. Using panel data for selected African trading partners from 2006 to 2023, the study estimates a gravity model using pooled OLS, fixed-effects, random-effects and Poisson pseudo-maximum likelihood (PPML) estimators to evaluate the effects of geographical distance, market size and the post-AfCFTA period on bilateral maize exports. The findings show that geographical distance remains the dominant determinant of export performance, indicating that structural trade costs continue to constrain regional agricultural trade. In contrast, market size variables do not consistently explain export flows, while the post-AfCFTA period is associated with higher exports but without a

statistically significant structural shift. The results suggest that early regional integration has not yet translated into meaningful reductions in trade friction.

Keywords: Agricultural trade; AfCFTA; trade costs; gravity model; regional integration; African markets; trade facilitation.

62. Why Do Some PLAS Farms Succeed While Others Fail? An Empirical Assessment of South Africa's Proactive Land Acquisition Strategy.

Thulasizwe S, Mkhabela and Siphe Zantsi.

In response to persistent implementation challenges, the government introduced the Proactive Land Acquisition Strategy (PLAS) in 2006 to accelerate land acquisition and improve beneficiary support. However, evidence regarding the determinants of PLAS farm success remains limited. This study investigates the factors influencing the productivity and financial performance of PLAS farms using a nationally representative dataset of 1,956 PLAS farms. Descriptive statistics were used to characterise beneficiary and farm attributes, while Ordered Logistic Regression, Ordinary Least Squares (OLS) and Binary Logistic Regression were employed to identify the determinants of farm productivity and net farm income. The findings demonstrate that land redistribution alone is insufficient to achieve sustainable agricultural transformation. Rather, successful land reform depends on an integrated system of post-settlement support that combines secure land access with finance, extension services, mentorship, infrastructure, climate resilience and effective market integration. The study argues that South Africa's land reform policy should evolve from a narrow focus on land transfer towards a comprehensive agricultural enterprise development approach aligned with the Agriculture and Agro-processing Master Plan. Such a transition would enhance the productivity, profitability and resilience of redistributed farms while contributing to inclusive agricultural growth, rural employment and national food security.

Keywords: Land reform; PLAS; agricultural productivity; farm income; post-settlement support; agricultural policy; econometric analysis; South Africa.

63. Production incentives for commercial organic fertilizer markets in Africa amidst geopolitical tensions.

Nate Makoae

Food security exists when people have access to “enough” safe and nutritious food, while food insecurity is the lack thereof. Given the geopolitical unrest, fertilizers exports have caused logistical disruptions affecting 10-30% of selected key mineral fertilizers. The development of infrastructure to scale organic manure-based fertilizer manufacturing and blending capacity

and tracking farmers' application of organic manure in response to geopolitics, remain limited relative to the demand gap. To address this gap, the study conducted a desktop comparative case study to examine African countries' progress in establishing organic fertilizer processing plants and types of organic fertilizer produced. Most African countries are net importers of mineral fertilizers. The study reveals manure applications are relatively higher than NPK use over time among smallholder farmers. Spotlighting, Western and Eastern Africa as the forerunners of infrastructure development for organic fertilizer production, with an average manure application of 1.45 and 1.78 tons/ha respectively. Secondly, investigates the support provided to commercialize organic manure, Ghana's government noted its need for an organic fertilizer subsidy programme. While attraction among Kenya's farmers is slow, farmers with integrated crop-livestock systems make use of manure to as a strategy to reduce production costs. Based on the results, recommendations to public and private stakeholders include commercializing organic manure-based fertilizers through subsidies, infrastructure development (manure depot and production plants) and conceptualizing a regional fertilizer infrastructure index by fertilizer-centric initiatives and institutions.

Keywords: food security; geopolitics; organic fertilizer; Africa; regional infrastructure

64. Monetary governance and the political economy of agricultural price stability in South Africa.

Buhlebemvelo Dube, Solly Molepo, Joseph Kau, Mamakie Lungwana, Khethiwe Mnguni.

Agricultural price stability is increasingly shaped by global food-market volatility, exchange-rate fluctuations, energy-price shocks, and broader geopolitical disruptions. Understanding how these forces are transmitted into domestic food systems is therefore critical for effective governance and policy design. This study examines the role of monetary governance in agricultural price stability in South Africa by assessing whether agricultural producer prices respond primarily to the policy interest rate or to broader transmission mechanisms operating through exchange rates and the global commodity market. Using annual data for 1991–2025 and an Autoregressive Distributed Lag (ARDL) framework, the study analyses the long-run and short-run relationships between agricultural producer prices, the repo rate, exchange rates, global food prices, oil prices, and rainfall. The results confirm a stable long-run relationship among the variables. Exchange-rate movements emerge as the dominant determinant of agricultural producer prices, followed by global food prices and rainfall, while the policy interest rate is statistically insignificant. The findings indicate that agricultural prices are influenced more by the transmission of external shocks through exchange-rate and commodity-

market channels than by direct changes in the policy rate. The study contributes to the political economy of food systems by demonstrating that agricultural price stability depends not only on sector-specific interventions but also on the broader governance of monetary and market institutions. The results highlight the importance of exchange-rate stability and resilience to external shocks in supporting food-system stability in a small open economy. These findings provide policy-relevant evidence on the interaction between macroeconomic governance and agricultural market outcomes in an increasingly uncertain global environment.

Keywords: Agricultural price stability; Bank of Amsterdam; Exchange-rate pass-through; Inflation targeting; Monetary policy; Monetary propagation mechanisms; South Africa; Transmission mechanisms.

65. Macroeconomic Drivers of Maize Prices in South Africa: Vector Error Correction Model.

Lungwana Mamakie, Kau Joseph, Molepo Solly, Dube Buhlebemvelo.

Maize is one of South Africa's most important staple crop which plays a key role in ensuring food security, contributing to the national economy and supporting rural livelihoods. However, maize prices are increasingly influenced by macroeconomic factors, creating uncertainty for producers, consumers, and policymakers. The study examined the effects of macroeconomic factors, namely the Consumer Price Index (CPI), exchange rate, and fuel prices, on maize prices in South Africa using monthly time-series data covering the period 2000–2024. The study employed the Augmented Dickey–Fuller (ADF) unit root test, Johansen cointegration test, and a Vector Error Correction Model (VECM) to examine both the long-run equilibrium relationship and short-run dynamics among the variables. Diagnostic tests, including the Lagrange Multiplier (LM) test, Jarque–Bera normality test, and eigenvalue stability test, were conducted to assess the adequacy of the estimated model. The findings indicate that all variables are integrated of order one, I(1), and are cointegrated which confirms the existence of a long-run equilibrium relationship. The VECM results reveal that maize prices are primarily driven by short-run dynamics. Specifically, lagged maize prices and fuel prices showed positive and statistically significant effects on current maize prices, while the Consumer Price Index revealed a significant negative short-run relationship. In contrast, exchange rate movements do not have a statistically significant short-run effect on maize prices. Furthermore, the error correction terms in the maize price equation are statistically insignificant, suggesting that maize prices do not significantly adjust to restore long-run equilibrium following short-run shocks. The diagnostic tests confirm that the estimated model is free from serial correlation, shows normally distributed residuals, and is dynamically stable. The study concludes that fuel prices remain the most important macroeconomic driver of

short-run maize price movements in South Africa. The findings underscore the need for policies aimed at reducing production and transport costs, improving supply chain efficiency, and strengthening market resilience to support maize price stability.

Keywords: Consumer Price Index, Exchange Rate, Fuel price, Grain Sector

66. Assessing the impact of formalisation on employment: The case of Micro, Small, and Medium Enterprises in South Africa.

Sukoluhle Mazwane, and Siphokazi Ngcinela

This study examines the impact of formalisation on employment among micro, small, and medium enterprises (MSMEs) in South Africa, a country facing persistently high unemployment alongside a large informal sector. Using data from the FinScope MSME Survey South Africa 2020 (N = 4,897; 1,739 formal and 3,158 informal enterprises), the study applies propensity score matching (PSM) to address non-random selection into formal status. A binary logit model estimated the propensity score using owner age, gender, province, business sector, business age, and educational attainment as covariates, followed by one-to-one nearest-neighbour matching without replacement (caliper = 0.271). Matching yielded 1,739 pairs, with covariate balance achieved for 40 of 41 indicators (standardised mean differences below 0.10). Formal enterprises differed significantly from informal ones across owner age, gender, education, business age, and location, justifying a matching-based identification strategy. The average treatment effect on the treated (ATT) for ln (Employment) was 0.807 (SE = 0.031, $p < 0.001$, 95% CI [0.747, 0.866]), implying formal enterprises employ approximately 124% more workers than matched informal counterparts, equivalent to seven employees compared to three. Education emerged as the strongest predictor of formalisation, with university-educated owners 14 times more likely to be formal than those without matric. These findings suggest formalisation substantially expands enterprise employment capacity in South Africa, even after accounting for observable selection on owner and firm characteristics. The results support policies that reduce barriers to business registration and complement formalisation efforts with human capital development, as both may jointly enhance employment outcomes among South African MSMEs.

Keywords: Formalisation, Propensity score matching, Employment, MSMEs, South Africa.

67. Effects of farm size, on selected macro-economic variables towards export competitiveness among selected Southern Hemisphere countries: Panel Data Analysis approach.

Kau, J.S, Molepo, S, Mabhunu, N, Lungwana, M, Dube, B, Agbuba, I and Moswane, L.

The world over, the issue of farm size and its impact towards welfare of society is a subject of scholarly interest. This is because farm size impacts on farmer's decision to make investments on the farm which then leads to positive ripple effects in the entire economy, such as in the form of FDI. The world over, there is death of literature looking at the effect of farm size on agricultural exports and other macro-economic indicators, such as FDI and Gross Capital Formation. The objective of the paper is to analyse the relationship between farm size, gross capital formation, FDI and exchange rate with export competitiveness among the four Southern Hemisphere countries, comprising of Brazil, Peru, Chile and South Africa. Secondary data spanning 52 years, from 1970 to 2021 was sourced from World Bank. Panel data analysis using Hausman test was employed as Empirical model. The results for a variable of interest, which is farm size, shows that for Brazil (β = 1.510, P =0.001), Chile (β = *1.179 P =0.004), Peru* (β = *0.730 P =0.000),* there is a positive association between farm size and agricultural exports. The results are different for South Africa (β = *-2.681 P =0.000),* where farm size is negatively associated with exports. Poor land reform policy where huge tracks of land are no longer in production, and exploitation of agricultural land for industrial use, impacts negatively on exports. It is recommended for South Africa to improve effectiveness of Land Reform, Peru to review its policy on currency devaluation and Chile to improve local consumption of fruits.

Keywords: farm size, gross capital formation, CPI, exchange rate, Southern Hemisphere countries.

68. To secure, or not to secure: Foot and Mouth Disease and Biosecurity in South Africa's Commercial Beef Value Chai.

Annandale, D.L, Jooste, A. and Rich, K.M.

Foot and Mouth Disease (FMD) remains a primary threat to South Africa's agricultural economy, yet the persistence of outbreaks despite technical interventions suggests a critical gap in biosecurity compliance. This study investigates the socio-psychological determinants of biosecurity adoption within the commercial beef value chain using an Integrative Model of Behavioural Prediction (IMBP). Data were collected from 121 stakeholders, including primary producers, stud breeders, livestock agents, feedlot operators, and abattoir operators. Multiple Linear Regression (MLR) analysis of the primary production cohort (stud breeders and primary producers) (N=100) reveals that personal attitude (β=0.61, $p<0.001$) is the sole significant direct predictor of biosecurity intention, explaining 39.7% of the variance. However, a belief-based model suggests that normative beliefs, specifically the perceived expectations of veterinarians and technical advisors, are the strongest indirect drivers (β=0.56, $p<0.001$).

Notably, perceived environmental constraints, such as financial costs and resource access, did not significantly hinder the formation of biosecurity intentions, indicating a high degree of psychological autonomy among the primary producer cohort. A significant "attitudinal fracture" was identified across the value chain ($\chi 2=23.35$, $p<0.001$), with livestock agents demonstrating lower Perceived Behavioural Control (PBC) compared to producers. These results suggest that South Africa's 10-year FMD strategy should foster internalised value-based convictions and leverage the influence of private veterinary networks. Policy interventions must address the "Knowledge-Intention Gap" by aligning individual attitudes with collective industry standards to ensure value chain integrity.

Key words: Human behaviour, integrative model of behavioural prediction, disease control, determinants of human behaviour.

69. Determinants of smallholder farmers' participation in agricultural water management pathways: Evidence from Limpopo and Gauteng Provinces, South Africa

B.Serote , G. M. Senyolo, L. S. Mudau and E. J. Mwendera.

Previous studies have examined multiple agricultural water management (AWM) pathways within smallholder farming but have largely focused on smallholder irrigation schemes or remained restricted to a single province. This study analyses the determinants of smallholder farmers' participation in four AWM pathways: rain-fed farming, farmer-led irrigation, smallholder irrigation schemes and wastewater irrigation across the Limpopo and Gauteng provinces.

Primary data were collected from 264 smallholder farmers using structured questionnaires. Descriptive statistics were used to summarise and compare key characteristics across pathways, while a multinomial logit (MNL) model was employed to estimate the likelihood of participation in each pathway, with rain-fed farming specified as the reference category.

The results indicate that participation is significantly influenced by age, gender, farm size, land ownership, labour availability and institutional factors such as access to extension services and membership in farm organisations. These factors do not influence participation uniformly; instead, they differentiate farmers' ability to access and sustain specific AWM pathways.

These findings demonstrate that participation in AWM pathways is not random but conditioned by structural and institutional factors that vary across pathways. Interventions aimed at improving AWM should therefore focus on addressing barriers to pathway entry while strengthening institutional support systems that enable farmers to transition to more water-secure, resilient production systems.

Keywords: agricultural water management, smallholder farmers, multinomial logit model, South Africa

70. An Assessment of Participation in Climate Smart Agricultural Practices Among Urban Women Farmers in Mbarara City Western Uganda.

Kidist Abebe Mersha, David Osiru, Tumwesigye Wycliffe, and Rebecca Kalibwani.

Urban farming integrated with Climate-Smart Agriculture (CSA) practices offers a pathway to enhanced food security and climate resilience in rapidly urbanising Uganda. However, the extent of women's engagement with CSA practices and the factors influencing their participation is not well understood and it is not clear in empirical literature. This study focused on urban women farmers in Mbarara City, Western Uganda. Specifically, it identifies practices currently used, establishes the extent of participation, and determines the factors influencing the adoption of CSA practices. Data were collected from 150 women farmers using a cross-sectional survey. Descriptive statistics and a Likert scale were used to assess the extent of participation, while a Multivariate Probit (MVP) model was employed to identify influencing factors. Results indicated that 74.15% of women farmers had adopted at least one CSA practice, with most being low adopters (0–2 practices) or medium adopters (3–5 practices). Intercropping and mulching were the most commonly adopted practices, while integrated pest management, irrigation, and high yielding varieties had very low adoption rates. The MVP model revealed that age, membership in social groups, farming experience, farm size, income, access to credit, access to weather information, and marital status positively influenced women's participation, while family size had a significant negative effect. This study recommends that donors, development institutions, and government agencies consider these factors when designing programs targeting women farmers. Collaborative efforts among agricultural extension services, financial institutions, and community-based organisations are essential to promote inclusive and sustainable adoption of CSA practices in urban settings.

Key words Climate-smart agriculture, Women, Urban farming, Adoption, Determinants.

71. Causal Effects of Climate-Smart Agriculture Adoption on Smallholder Welfare in Zambia: Evidence from Endogenous Switching Regression, Double Machine Learning, and Bayesian Estimation.

Evans K. Chinembiri, Munyaradzi Mutenje and Nkele D. Malahlela.

Climate-smart agriculture (CSA) is promoted widely across sub-Saharan Africa as a strategy to simultaneously enhance smallholder productivity, strengthen climate resilience, and improve household welfare. Yet rigorous causal evidence on its income and yield effects in Zambia

remains limited, particularly for settings where adoption is heterogeneous and potentially subject to community-level spillover. This study estimates the causal effects of CSA adoption on agricultural income and crop yield among 2,116 smallholder farming households in Zambia, drawn from the Water and Soil Accelerator (WASA) Project Survey. Two complementary identification strategies are employed: Multinomial Endogenous Switching Regression (MESR), which accounts for selection into four ordered adoption regimes (T0-T3) and yields stratum-specific average treatment effects on the treated (ATTs); and Double Machine Learning (DML), which estimates population-average treatment effects via Neyman-orthogonal, cross-fitted semi-parametric regression using LASSO and Random Forest nuisance learners. A Bayesian DML extension corroborates the frequentist estimates, with posterior means within 0.05 of the DML point estimates and P(effect > 0) = 1.00 for all outcomes. A Stable Unit Treatment Value Assumption (SUTVA) sensitivity test using camp-level adoption rates confirms that spillover contamination is below the 10% materiality threshold. MESR estimates reveal positive and significant income ATTs across all adoption regimes and strata, with subsistence farmers realising proportionally larger returns than commercial farmers. DML confirms an approximate 33% income premium and 48% yield premium for adopters. Results support targeted CSA promotion for subsistence households and caution against universal multi-practice mandates.

Keywords: climate-smart agriculture; causal inference; double machine learning; endogenous switching regression; smallholder farmers; Zambia; treatment effects.

72. Global-Domestic Volatility Dynamics in South African Maize and Wheat Markets: Evidence from T-DCC-GARCH Models.

Langenhoven, C. and Jooste, A.

The increasing frequency and severity of global crises have contributed to heightened commodity market volatility, a trend that is expected to persist. The extent to which this volatility affects South African maize and wheat markets depends on the degree of market integration and interdependence. Global commodity price fluctuations transmitted into domestic markets increase price risk for consumers and producers, complicate production decisions, and increase the cost and reduce the effectiveness of derivative-based risk management. Considering these risks, this study examined price volatility dynamics between the global and South African maize and wheat markets from January 2005 to December 2024. It extends the results of Sayed and Auret (2020) by incorporating global commodity prices and extending the study period to encompass major global shocks. The study used Student-t Distributed-Dynamic Conditional Correlation-Generalized Autoregressive Conditional

Heteroskedasticity (T-DCC-GARCH) models to assess time-varying volatility interdependence between these markets. The T-DCC-GARCH model, which assumes a student's t-distribution, proves a good fit when price series exhibit high kurtosis, extreme values, or non-normality. Between 2020 and 2024, volatility interdependence between global and South African wheat markets increased, while interdependence between global yellow maize and domestic yellow and white maize markets decreased slightly. Overall, conditional correlation between domestic and global markets were positive over the study period. Therefore, recommendations include strengthening domestic supply stability; reducing wheat import dependence and diversifying suppliers; improving import tariff and risk-management mechanisms; enhancing market transparency; investing in logistics; and strengthening market information systems.

Keywords: Volatility Interdependence, Volatility Dynamics, Agricultural Commodity Markets, Student's t-Distributed-Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity.

73. The Relationship Among Oil Prices, Agricultural Output, And Food Prices in South Africa (2000–2023): Ardl-Ecm Approach.

Zolule Filane, Jan Hlongwane, Kingsley Thaba.

Oil price volatility remains a major source of macroeconomic instability in energy-importing economies, with significant implications for agricultural production and food price dynamics. This study investigates the relationship among oil prices, agricultural output, and food prices in South Africa over the period 2000–2023 using an Autoregressive Distributed Lag–Error Correction Model (ARDL–ECM) framework. The exchange rate and inflation used as macroeconomic control variables to capture broader transmission channels through which external energy shocks affect domestic agricultural and food systems. Phillips–Perron unit root tests reveal that all variables are integrated of order one, validating the application of ARDL bounds testing techniques. The bounds test confirms the existence of a stable long-run cointegrating relationship among the variables. ARDL-ECM findings indicate that oil prices exert a statistically significant positive effect on food prices in both the short run and long run, suggesting that energy cost shocks are transmitted into domestic food markets through production, transportation, and distribution channels. Exchange rate depreciation also emerges as a major long-run driver of food inflation, reflecting South Africa's dependence on imported fuel and agricultural inputs. Agricultural output responds positively to food prices, consistent with supply response theory, but is negatively affected by inflation and exchange rate instability. However, oil prices do not directly influence agricultural output significantly,

implying that their effects are transmitted indirectly through macroeconomic conditions rather than through immediate production responses. Toda–Yamamoto causality results reveal that exchange rate movements Granger-cause food prices, while inflation Granger-causes agricultural output. Please add a line for recommendation as you close your abstract.

Keywords: Oil prices; Food prices; Agricultural output; ARDL–ECM; Toda–Yamamoto causality.

74. Demand side shifts and strategic responses in South African wine value chains.

Melissa Van Der Merwe

Changes in wine consumer behaviour are driving structural transformation on the supply side The industry is facing slowing demand in mature markets and heightened sustainability pressures. The purpose of this study is to examine how South African wineries are responding to these demand-side shifts and whether these responses contribute to resilience or whether they reinforce vulnerabilities. We adopt a systems thinking approach to explore these strategic responses. Drawing on in-depth qualitative interviews with wineries across key producing regions, complemented by industry stakeholder engagements, we employ causal loop diagramming to identify reinforcing and balancing loops that shape strategic decisions. The results indicate that demand-side shifts do not trigger uniform strategic decisions among wineries. Instead, the different business models of these wineries mediate these effects. Some wineries are drawn into reinforcing loops of discounting and break-even, eroding margins. Others rely on premium brand reinforcement, tourism-based experiential strategies, and market diversification to protect margins. Shareholder-governed wineries demonstrate operational flexibility and pricing discipline to stabilise profits. The study concludes that strategic reliance in the South African wine industry is a function of structuring positioning within the reinforcing and balancing loops, rather than reacting to declining consumption.

Key Words: Demand-side shifts, causal loop diagrams, wine value chain, strategic resilience, South African wine industry

75. Contrasting Avocado Export Market Dynamics of South Africa, Spain and Mexico from 1990-2024 using ARDL-ECM Approach.

Chivenge Wilson, Mushunje Abbyssinia, and Zuwarimwe Jethro.

Global export avocado markets are increasingly subjected to impulsive risk factors that aggravate potentials for optimising fiscal gains. Among technical and agronomic factors are economic threats to the value chain emanating from price volatility and fluctuations, due to inflation. Thus, sustainability and market resilience are compromised at the expense of export-

induced productivity and growth. This study, therefore, investigates export market resilience trajectories, essential for risk reduction and elimination of unhealthy competition. The study adopts a comparative design, contrasting export avocado markets for South Africa, Spain, and Mexico using performance data from 1990 to 2024. The principal objective is to employ an ARDL-ECM approach, to establish the export avocado market dynamics guided by the probe; does global demand for avocados and its products support existence of a long-run relationship with export-induced economic growth and productivity in South Africa, Spain, and Mexico? Findings revealed that responsiveness of fiscal investments in export avocados for all 3 countries evidently has positive trade value for producers due to significant volumes and widespread market access. Yet in the long run, there is a stand-off between cost structures and strength of local Mexican currency resulting in inherent fiscal risks, while Spain is tangled by intersectoral spillovers. South Africa manifests diminishing trade-offs, due to influx of substitute or alternative export products in the markets. The paper recommends customised policy initiatives and support mechanisms for enhancing agricultural export market collaboration through trade forums, partnerships and linkages.

Keywords: Value Chain, Error Correction Model, ARDL, Export Avocado, Spain, South Africa, Mexico.

CONTRIBUTED POSTERS

1. Evaluating factors influencing youth participation in agricultural enterprises: implications for food security and agribusiness.

Ongama Giwu, Lelethu Mdoda, Samuel S. Ntlanga and Olwethu Loki.

Youth participation in agricultural enterprises is increasingly recognised as an important strategy for addressing unemployment, promoting food security and stimulating rural economic development. Despite agriculture's significant contribution to economic growth and livelihoods, youth involvement in the sector remains low because of socio-economic, institutional and behavioural constraints. This study evaluated factors influencing youth participation in agricultural enterprises in Umzimvubu Local Municipality, Eastern Cape Province, South Africa. A cross-sectional survey was conducted among 210 youth respondents aged 18–35 years using a structured questionnaire and stratified random sampling technique. Descriptive statistics and a univariate Probit regression model were employed for data analysis. Findings revealed that education level, access to extension services, social group membership, farming skills, farm size and water availability positively influenced participation in agricultural enterprises. Conversely, gender and access to credit negatively influenced participation. Major constraints affecting youth participation included inadequate finance, limited access to agricultural inputs, insufficient land and inadequate agricultural information and advisory services. The study recommends strengthening youth-oriented agricultural policies, enhancing access to agricultural finance and extension services, promoting

agricultural education and skills development and facilitating access to productive resources. These interventions are essential for increasing youth participation, enhancing agribusiness development and improving food security in rural South Africa.

Keywords: Youth participation, agricultural enterprises, food security, agribusiness, rural development, South Africa.

2. The role of agro-processing in translating sweet potato varieties into food security gains: lessons from African countries.

Portia Mdwebi, Manana Mamabolo, Charles Machethe, Sunette Laurie and Mamakgana Mashitoa.

Sweet potato (*Ipomoea batatas L.*) is a drought-tolerant, low-input staple ranked seventh globally and central to food and nutrition security in sub-Saharan Africa (SSA). Despite growing demand driven by nutrition policy, changing consumer preferences, and expanding agro-processing markets, sweet potato remains underutilised in several SSA countries due to weak seed systems, and limited processing infrastructure. This study aimed to assess how effectively government-led breeding programmes translate varietal gains into FAO-measurable food security outcomes via a Five-node value chain bridge from in vitro clean seed to agro processed products. A systematic scoping review enhanced with PRISMA screening was conducted between (2000-2025). Records were screened in Rayyan, AI tools supported search and extraction, and 90 studies were synthesised comparatively across South Africa, Uganda, Tanzania, Mozambique, Ghana, Malawi, and Kenya. Results show substantial cross-country variation in production profiles large research-to-farm yield gaps and divergent institutional capacity. South Africa has the most advanced infrastructure, yet among the lowest household reach reported. Programmes with stronger household reach (e.g., Tanzania, Uganda, Mozambique) combined vine distribution with training, decentralised multipliers, informal diffusion (often through women's networks), school feeding channels, and market-oriented processing. Notably OFSP purée enabled 40-50% wheat substitution in bread without major quality loss. The strongest FAO outcomes clustered where downstream nodes (smallholder adoption/agro-processing), where VAD reductions/improvements were documented in Mozambique and Kenya, while South Africa's comparatively lower HDDS (5.2) and MAHFP (7.5) aligned with concentration in upstream nodes (gene bank/clean seed) and limited downstream integration. Overall, integrating breeding, seed systems, adoption and processing supported by private-sector engagement, vine preservation and post-harvest loss reduction is decisive for converting varietal innovation into sustained gains in availability, access, utilisation and stability., These provide with actionable lessons for strengthening ARC-VIMP through commercial purée partnerships, decentralised certified multipliers, gender-responsive breeding and institutional demand anchors.

Keywords: sweet potato; agro-processing; food security; gene-banks; value chains; smallholder farmer; technology transfer; orange-fleshed sweet potato

3. What are the implications of farmers' transitioning from conventional farming to agroecological based farming in Sub-Saharan Africa? A systematic review.

Qwabe CN, Zantsi S, Phali LE, and Walker S.

Agroecology is increasingly promoted as a pathway to strengthen the resilience and sustainability of smallholder farming systems in Sub-Saharan Africa. However, the evidence base remains uneven, fragmented, and still limited in its treatment of production, profitability, and transition risk, particularly in South Africa. This systematic review synthesises ecological, economic, social, and institutional evidence on agroecological transition to clarify not only the potential benefits but also the constraints and trade-offs that shape adoption and performance. Guided by PRISMA principles, the review screened literature published between 2015 and 2026 and retained 28 studies for thematic analysis. The findings indicate that agroecological practices such as intercropping, mulching, composting, agroforestry, conservation tillage, and tied ridging can improve soil fertility, water retention, biodiversity, and climate resilience. However, these gains are frequently counterbalanced by labour intensification, delayed productivity responses, and weak market incentives, making transition particularly difficult in commercially oriented farming environments. Socially, agroecology can support food sovereignty and local knowledge systems; however, its promise of inclusion is constrained by persistent inequalities in land, finance, training, and decision-making, raising questions about who can participate in and benefit from the transition. The review also shows that institutional support through cooperatives, extension systems, seed networks, and enabling policy frameworks remains essential, yet this support is often partial or underdeveloped. Overall, the evidence suggests that agroecology should be understood less as a technical substitute for conventional farming than as a contested socio-ecological transition whose outcomes depend on broader political, market, and institutional conditions, especially in South Africa where implementation frameworks remain incomplete.

Keywords: agroecology, smallholder farming, transition, Sub-Saharan Africa, systematic review

4. Psychological capital and climate-smart agriculture: insights into awareness and adoption among smallholder farmers in Limpopo.

Ramakgasha Molobe Joyce, Chipfupa Unity and Tshilowa Phathutshedzo Fancy.

Smallholder farmers in Limpopo are adversely impacted by climate change through extreme weather events (high temperatures, drought, floods, hailstorms), increased pest infestation and disease outbreaks, which reduce productivity and income. To assist farmers in overcoming these challenges, climate-smart agriculture (CSA) methods offer sustainable strategies for reducing climate risks and building household resilience. This study aimed to investigate the link between farmers' non-cognitive behavioural factors and their climate change adaptation decision-making. To achieve this, principal component analysis (PCA) and generalized structural equation modelling (GSEM) were employed using data from 367 observations. The findings indicate that farmers with high levels of PsyCap are considerably associated with the adoption of a diverse range of CSA technologies, including improved seeds and manual cultivation. They further suggest that more resilient farmers are inclined to adopt practices that are more productive. Socio-demographic characteristics were strongly associated with the adoption of CSA practices, with age and farm size shaping the transition from labour-intensive

practices to technology-driven practices. In addition, income enhanced the adoption by enabling investment in more management-intensive practices. These results demonstrate that PsyCap serves as a critical yet understudied psychological mediator enhancing farmers' adaptive capacity and promoting more equitable and sustainable CSA adoption. The study recommends integrating structural and behavioural strategies into CSA adoption by combining economic incentives with efforts to build PsyCap, thereby empowering marginalised groups.

Keywords: Adoptive behaviour; Climate change; Cognitive resources, Decision making; Smallholder farmers

5. GM maize and yield performance in South Africa from 1995 to 2024: evidence from structural break analysis.

Siphokazi Ngcinela, Sukoluhle Mazwane and Sibongile Sylvia Tekana.

South Africa commercialised genetically modified (GM) maize in 1998 and has since achieved adoption rates exceeding 90% of national maize area. While numerous farm-level studies have documented the yield effects of GM maize adoption, limited attention has been given to how national maize yield performance evolved throughout successive phases of GM maize adoption. This study examined changes in South Africa's national maize yield performance between 1995 and 2024 using the Hodrick Prescott (HP) filter to separate long-run yield trends from short-term fluctuations, and Bai–Perron multiple structural break analysis and Chow tests to identify statistically significant shifts in the national maize yield trajectory. The results identified two statistically significant structural breaks in 2003 and 2013, dividing the study period into three distinct productivity regimes with mean trend yields of 2.868, 3.951 and 4.812 t ha^{-1} respectively. Chow tests confirmed structural changes at all four documented adoption transition years, and period analysis revealed that average yield declined from 4.797 t ha^{-1} during the rapid expansion phase to 3.603 t ha^{-1} during the post-peak Bt period despite continued increases in GM adoption, before recovering to 4.942 t ha^{-1} under stacked-trait technologies. These findings demonstrate that the productivity effects of GM maize were not static but evolved progressively as technologies, production systems, and climatic conditions changed over time. The study concludes that evaluating agricultural biotechnology solely on adoption-impact evidence provides an incomplete understanding of long-run productivity dynamics and recommends that technology evaluation frameworks adopt long-term national monitoring approaches, that insect resistance management frameworks be strengthened with mandatory post-marketing compliance, and that investment in new GM trait generations with novel modes of action be treated as a national agricultural priority.

Keywords: GM maize; structural break analysis; maize yield performance; HP filter; South Africa; adoption phase

6. Should South Africa encourage farmers to produce high oil content in order to safeguard the sunflower industry in the face of climate change challenges?

Thabile Nkunjana and Siphe Zantsi.

Millions around the globe are already facing food shortages and a looming hunger crisis is projected if climate change is not addressed accordingly. Part of the hunger problem results from skyrocketing prices and shortages of essential food, including the vegetable oils which are used in everyday cooking and in livestock production. In recent years, the rising food prices has been the results of the war in the Black Sea region which involves Ukraine and Russia countries that provide some 75% of the world's sunflower, climate issues that caused Canadian farmers to shift in producing canola, dramatic declines in soybean oil production due to historic droughts across South America in recent years. This background underscores the importance of self-sufficiency by countries globally. While South Africa is a net exporter on many agricultural products or food commodities, in certain crops like sunflower seed, palm oil or rice it is not. The sunflower industry is threatened by global competition because of many challenges including perverse incentives – i.e. to prioritise higher yields over oil seed content. In this article we used trial data from Agricultural Research Council Grain Institute to amplify this perverse incentive and to make a case for incentivising farmers to prioritise oil seed content to protect and expand the local sunflower industry.

Keywords: Sunflower seed, sunflower seed yields, oil content, climate change, self-sufficiency.

7. Climate determinants and cattle supply in South Africa: A timeseries investigation (2000-2024).

Tjebane BM, Gidi LS and Muchopa LC.

Climate change poses a significant threat to cattle output, particularly in developing countries where agricultural systems are highly dependent on climatic conditions. In South Africa, rising temperatures, variable rainfall patterns, and increasing environmental pressures have raised concerns about the sustainability of Cattle Output and food security. This study assessed the impact of climate change variables on cattle output in South Africa from 2000 to 2024. Descriptive statistics were employed to examine central tendency in the variables, while the Augmented Dickey-Fuller test was used to determine stationarity of the variables. The Autoregressive Distributed Lag model was applied to investigate both short-run and long-run relationships between climate variables and cattle output. Granger causality tests were further conducted to examine the direction of causality among the variables. The findings revealed that temperature exerts a significant negative effect on cattle output, indicating that rising temperatures reduce Cattle output. Rainfall effects cattle output with lagged short-run and long run effects, while greenhouse gas emissions showed a mixed effects with cattle output. Granger causality results revealed a unidirectional causal relationship running from cattle output to greenhouse gas emissions. The study recommends the promotion of climate-smart livestock production systems, improved pasture management, and strengthened climate adaptation policies to enhance the resilience and sustainability of South Africa's cattle sector.

Keywords: Cattle output, climate change, climate variables and South Africa.

8. Double-edged impact: The positive and negative consequences from Private Animal Health Technicians (AHTS) interventions.

Tribute Jabulile Mboweni, Walter Shiba, Mamakie Lungwana and Noluthando Ngcobo.

Reforms to South Africa's veterinary regulatory framework in 2022 enabled Animal Health Technicians (AHTs) to establish private primary animal healthcare practices and operate with greater autonomy. This policy aimed to expand access to essential animal health services in underserved rural areas, improve livestock productivity, and reduce disease-related losses. This study examines the unintended consequences of private AHT interventions, considering both positive and negative outcomes within the evolving animal health system. A qualitative research design was employed, drawing on 35 semi-structured key informant interviews with government officials, private veterinarians, professional bodies, pharmaceutical suppliers, and farmer representatives. Data were analysed using an inductive thematic analysis approach to identify key patterns related to the changing role of AHTs. Findings show that private AHTs have strengthened primary animal healthcare delivery by improving disease surveillance and early warning systems through closer engagement with farming communities. They have also enhanced farmer empowerment via knowledge transfer and increased adoption of preventive practices, contributing to improved livestock management in smallholder systems. However, challenges have emerged, including heightened professional tensions between AHTs and veterinarians, which have weakened collaboration and referral systems. Additionally, instances of scope-of-practice overreach were identified, driven by high service demand in areas with limited veterinary access, raising concerns about quality assurance and regulatory compliance. The study concludes that while private AHTs improve access to care, their long-term effectiveness depends on strengthened collaboration, clearer regulation, and enhanced professional support to ensure a balanced and sustainable animal health system.

Keywords: Veterinary regulation, rural development, livestock health, thematic analysis, South Africa

9. A review of community-based learning models for rural agricultural entrepreneurship in Sub-Saharan Africa.

Zowie Mbatha, Loki and Zantsi.

10. A systematic review and structural design of the maize value chain in South Africa: market and transformation implications.

Malebati LV, Hlongwane JJ, Mmbengwa VM , Nkoana MA and Dlamini BB.

Maize is the most vital culinary engine of South Africa, driving daily meals and playing a central role in the country's food security and economy. It serves as a staple food and a critical input for animal feed and agro-industrial processes. However, challenges persist due to the lack of a clear, comprehensive depiction of maize product flows, particularly regarding the dual consumption of white and yellow maize. This results in poor coordination, supply-demand mismatches, and missed opportunities for value addition. This study aimed to identify, describe, and design maize value chains in South Africa, focusing on human and animal consumption pathways. A systematic literature review guided by PRISMA 2020 was conducted, sourcing peer-reviewed journals, institutional reports, and grey literature from 2020 to 2025. From 103 initial records, 28 high-quality studies met the inclusion criteria. Data were

synthesized using Excel, and nine distinct maize value chains were identified based on the findings. A comprehensive visual maize value chain model was then developed using diagrams.net, mapping product flows, actor roles, and transformation points across the chain. Results revealed that white maize is mainly processed into maize meal, samp, and flour, while unmixed yellow maize supports human consumption through maize rice, maize grits, and cereals. However, a high quantity of yellow maize, once mixed, is directed toward livestock feed. Market concentration in milling and feed sectors restricts smallholder participation and equitable value distribution. Understanding these patterns is vital to improving value chain governance, enhancing sustainability, and shaping inclusive agricultural policies.

Keywords: maize value chain, white maize, yellow maize, human consumption, animal feed, market segmentation

11. Assessing personal transformation of Pfumvudza climate change adaptation project beneficiaries in Mutare District.

Mashayamombe B and Mushunje A.

Climate change is a complex process that is threatening food production to unprecedented levels. Climate smart agriculture has been suggested as an adaptation strategy against climate change. Pfumvudza is a climate change adaptation project that was introduced to offset the effects of climate change on drought prone rural farmers in Zimbabwe. The Pfumvudza climate change adaptation project uses the top-down approach to extend knowledge and skills to farmers. This linear method has resulted in the delivery of technologies that have failed to alleviate farmers' problems nor address rural development goals and transformation. Pfumvudza climate change adaptation project was introduced to bring transformation to the rural farmers in Mutare District. Since the introduction of the Pfumvudza project in 2020 transformation of the Pfumvudza participants has not been assessed. Therefore, it is not known if the project has brought about any changes to the farmers in terms of increases in yields, income or quality of life. This research seeks to assess if the Pfumvudza project has transformed and changed the lives of farmers in Mutare District, Zimbabwe. A descriptive research design was selected for this study. A cross-sectional design was used to collect quantitative and qualitative data from 10 wards. Data was collected using individual questionnaires, focus group discussions and observations on the farmers and their households. Transformation was assessed by looking at farmers' household income levels and sources, types of farming implements owned, housing structures, toilet facilities, water sources, asset endowment and access to credit and markets. Data analysis was done using descriptive analysis, thematic analysis, Interpretative Phenomenological Analysis and Weighted Average Index (WAI) analysis technique. Pearson Product Moment Correlation (PPMC. Results showed a positive and statistically significant relationship between farmers' empowerment and average income. This suggests that as farmers' empowerment increases, their income also tends to rise. A strong and significant positive correlation between farmers' personal transformation and the size of farmland suggests that farmers with larger farms tend to have higher incomes. It was also evident that while farmers' transformation from the project were high. factors such as age, gender and farm size also influence the level of empowerment and therefore transformation.

Transformation and development are ongoing processes that farmers will go through over the years. This study recommends that transformation be assessed again after 10 years of the Pfumvudza project to determine the level of transformation that farmers will experience with years of participating in the project.

Keywords: Personal Transformation, Climate change, Zimbabwe, Pfumvudza

12. Assessing agtech innovation ecosystems as a strategy for enhancing agri-sme productivity.

Mashimbyi KG and Das S.

After more than 30 years of democracy, the South African (SA) agricultural sector remains dichotomous in nature, with mostly highly productive White commercial farmers on the one hand and smaller, less productive Black farmers on the other. This persistent productivity gap poses a challenge to inclusive growth within the SA agricultural sector. The purpose of this exploratory qualitative study was to assess whether agricultural technology (AgTech) innovation ecosystems can be used as a strategy to enhance agricultural small-micro enterprises (agri-SME productivity). Data for the study were collected through 12 semi structured interviews with participants with at least five years' experience working with agri SMEs. The interviews elicited perceptions from stakeholders from the input side of the agricultural value chain (AVC) for agri-SMEs and AgTech innovators. Findings confirmed that agri-SME productivity is shaped by a complex interplay of external barriers and internal entrepreneurial factors. While AgTech innovations can increase agri-SME productivity, adoption is constrained by cost, complexity and perceived value. Strategic alliances among AVC stakeholders facilitated through AgTech innovation ecosystems have the potential to enhance operational efficiencies and strengthen agri-SMEs' bargaining power. The study contributes to the literature by positioning AgTech innovation ecosystems as a strategic mechanism to reduce the cost to serve agri-SMEs, thereby supporting inclusive growth within the South African agricultural sector.

Keywords: Innovation ecosystem, small-scale farming, productivity, inclusion, exploratory qualitative study, South Africa

13. Understanding food systems resilience: A systematic review of theory, practice and assessment with insights from Malawi.

Mercy Bwanaisa, Odirilwe Selomane and Colleta Gandidzanwa.

Food systems resilience has become a central concept in food security policy and research amid recurrent shocks, including climate extremes, economic crises, the COVID-19 pandemic and geopolitical trade disruptions. In smallholder-dominated agrarian systems across Southern Africa, the question of resilience is especially urgent because these shocks disproportionately threaten food security and shared prosperity. However, it remains unclear how well the growing language of resilience within food system connects with the interventions used to build it and the methods used to assess it. This systematic review synthesises how food systems resilience is conceptualised, operationalised, and assessed in the global literature, while using Malawi as

a case study to draw policy and governance implications for vulnerable contexts. The review analysed 84 studies identified through Scopus, Web of Science and Google Scholar. It employed thematic analysis to examine definitions and framings, proposed strategies and barriers and assessment methods. Globally, food systems resilience is framed through capacities, socio-ecological system properties and normative concerns. Common operationalisation strategies include governance strengthening, diversification, sustainable agriculture, social protection and human/social capital development, although significant barriers, particularly governance failures and power imbalances, hinder implementation. Assessment relies heavily on qualitative and participatory methods globally, with quantitative and econometric approaches more prominent in Malawi. Also in Malawi, the literature is more household- and food-security focused, emphasising adaptive capacity and interventions such as extension, subsidies and social protection. The review finds that theory, practice and measurement are not well aligned. It recommends clearer definitions focused on "resilience of what, to what and for whom," stronger links between household and system-level actions and more research on supply chains, politics of resilience, compound shocks and equity issues. Greater coherence across these areas, especially through strengthened governance and policy, is essential for resilience efforts to support food security and shared prosperity.

Keywords: food system resilience; shocks and stresses; geopolitics of food systems; Malawi; systematic review

14. Determinants of the commercialisation of underutilised leafy vegetables in Sekhukhune District, South Africa.

Mishal Trevor Morepje and Oladimeji Idowu Oladele.

This study analysed the determinants of the commercialisation of underutilised leafy vegetables (ULVs) in the Sekhukhune District, Limpopo Province, South Africa, where crops such as jute mallow, amaranth, spider plant, and citron melon remain central to rural livelihoods but are marginal in formal markets despite their nutritional and cultural importance. Using a descriptive design, data were collected from 266 smallholder households and analysed through descriptive statistics, a household commercialisation index, and Bayesian multivariate probit regression. Results show an overlapping nature of the ULVs value chain: 91% of households produce ULVs, 95.9% consume ULVs, but only 41% market ULVs; 79.3% are subsistence-oriented, and less than 1% achieve medium or high commercialisation. Gender significantly influenced marketing ($\beta = 0.499$, SE = 0.230), while income showed mixed effects across production and consumption, and extension services reduced participation in production and consumption but had variable effects on marketing. These findings highlight ULVs' multifunctional role in food security and informal livelihoods, but they also reveal structural barriers, including poor infrastructure, limited credit, and weak institutional support. The study concludes that ULVs remain subsistence crops, contributing more to household nutrition than to income generation, and it contributes to the literature by applying a multivariate probit framework to ULV commercialisation. Recommendations include strengthening extension services, improving market infrastructure, expanding credit access, and implementing gender-

sensitive interventions and awareness campaigns to enhance demand and integrate ULVs into formal markets, thereby supporting rural livelihoods and food system resilience.

Keywords: Indigenous foods, Market access, rural livelihoods, South Africa, African leafy vegetables, Indigenous Knowledge Systems

15. The impact of input support program on household food security: the case of Pesi for Smallholders in North West, South Africa.

R Moipolai, E Wale and R Baloyi.

Food insecurity remains a challenge among many smallholder farmers in Sub-Saharan Africa. This challenge was worsened by the aftereffects of the COVID-19 pandemic, which affected access to resources, jobs, and markets. As part of the recovery strategy, the South African government introduced the Presidential Employment Stimulus Initiative (PESI), an input voucher-based support initiative, to assist the recovery of smallholder farming practices. This study evaluates the impact of this initiative on household food security. A total of 231 farmers were interviewed for the study. Propensity Score Matching (PSM) and Average Treatment Effect on the Treated (ATT) were employed to analyse the data. The results revealed significant improvements in food access, dietary diversity, and access to agricultural inputs among PESI beneficiaries. Beneficiaries exhibited higher Food Consumption Scores (FCS) and lower levels of food insecurity. Key factors influencing program participation included access to production resources, social media usage, and registration in the departmental farmer database. While PESI has demonstrated short-term effectiveness in enhancing household food security, its sustainability as a long-term intervention is not feasible. Therefore, a gradual transition strategy is recommended, integrating capacity-building measures and promoting beneficiaries' self-reliance.

Keywords: Average Treatment Effect on the Treated, Household Food Security, PESI, Propensity Score Matching, Smallholder Farmers, South Africa

16. Governance and policy support in informal food systems: An integrated sustainable livelihood framework for informal food traders.

Motsatsi Morwatshehla, Mapula Hildah Lefophane and Mzuyanda Christian.

Governance and policy support play an important role in shaping access to livelihood capitals, influencing vulnerability conditions, and structuring livelihood strategies and outcomes within informal food systems. However, existing literature remains fragmented because these components have largely been examined in isolation, limiting understanding of their

interrelationships and implications for livelihood sustainability and resilience. This study addresses this gap by developing an integrated sustainable livelihood framework for informal food traders through a systematic narrative review guided by PRISMA procedures and based on peer-reviewed literature. The synthesis shows that informal food traders operate within multidimensional vulnerability contexts characterised by economic, environmental, infrastructural, and institutional constraints that interact with financial, physical, human, social, and natural capital to shape livelihood strategies. The review demonstrates that governance and policy support function as central institutional determinants influencing vulnerability conditions, access to livelihood capitals, and the mobilisation of these capitals into livelihood strategies through formal and informal institutional arrangements. These strategies shape outcomes such as income generation, food security, and welfare, although persistent structural constraints and inadequate institutional support continue to undermine resilience. The study concludes that strengthening livelihood sustainability and resilience requires governance approaches that are integrated, inclusive, and responsive to the realities of the informal economy. The proposed framework provides a holistic perspective on the relationships among governance, vulnerability, livelihood capitals, livelihood strategies, and livelihood outcomes, offering a conceptual foundation for future empirical research and evidence-based policy interventions.

Keywords: Informal food systems; Sustainable livelihood framework; Governance; Policy support; livelihood capitals

17. Telecoupled export markets and price-signal transmission in the South African wine value chain: implications for certification.

Petri de Beer, Willem Hoffmann and Kandas Cloete.

South African wine production is strongly connected to distant export markets, yet the market signals reaching primary grape producers are incomplete. This study combines time-series regressions, price-transmission analysis and a telecoupling framework. Nine wine-trade indicators derived from a 52-country database were related to South African wine production, export volume and export value for 1995–2024, followed by country-level models for the twelve largest export destinations. Domestic price transmission was examined with SAWIS and Vinpro data for 2001–2023. The full global models produced adjusted R^2 values of 0.8200 for production, 0.9211 for export volume and 0.9344 for export value. Reduced models retained adjusted R^2 values of 0.5811, 0.9144 and 0.9218 respectively. Market size alone did not determine association: Australia, despite receiving the smallest recorded volume among the

twelve destinations, produced adjusted R^2 values of 0.9504 for South African export volume and 0.9633 for export value. Within the domestic chain, combined local and export bulk prices were closely associated with producer income (adjusted R^2=0.92; transmission coefficient=0.85), whereas transmission from domestic packaged-wine prices to bulk wine and grape prices was weak (coefficients 0.18 and 0.16). The telecoupling interpretation support modelling that represents trade, governance and information flows jointly, while treating the reported regressions as exploratory associations rather than causal estimates.

Keywords: wine exports; price transmission; telecoupling; value chains; certification; South Africa

18. Analysis of the relationship between exchange rate fluctuations and export competitiveness in the South African potato industry (2000-2024).

Mahlangu LN, Mabote RR, Shiloane JT and Mmbengwa VM

The agricultural sector is vital to South Africa's economy, contributing to food security, employment, economic growth, and international trade. The potato industry is an important agricultural sub-sector due to the crop's widespread consumption and contribution to agricultural production. However, its performance is influenced by various economic and financial conditions, particularly exchange rate fluctuations. These fluctuations can affect export competitiveness through their effects on export prices, production costs, profitability, and access to foreign markets. Although existing research examines exchange rates and agricultural export performance, limited industry-specific evidence exists on the South African potato industry. The study assessed the relationship between exchange rate fluctuations and export competitiveness in the South African potato industry from 2000 to 2024. Secondary annual time-series data for 2000–2024, comprising 25 observations, were obtained from the South African Reserve Bank, World Bank, FAOSTAT, and Statistics South Africa. The Revealed Comparative Advantage (RCA) index was used to measure export competitiveness. The explanatory variables were the exchange rate and total potato yield. Descriptive statistics examined trends and patterns of exchange rate fluctuations and export competitiveness, while the Augmented Dickey-Fuller test determined stationarity of the variables. The Autoregressive Distributed Lag (ARDL) model and bounds testing approach examined short- and long-run relationships. Where a long-run relationship existed, the Error Correction Model was applied, while the Granger causality test assessed the direction of causality. The study provides empirical evidence on the relationship between exchange rate fluctuations and potato export competitiveness. The findings are expected to inform policymakers about the trade-offs

associated with strengthening export competitiveness amid exchange rate volatility. The study also highlights measures to mitigate the adverse effects of exchange rate fluctuations on the potato industry. Ultimately, it contributes to evidence-based strategies for enhancing South Africa's competitiveness in regional and international potato markets.

Keywords: Exchange rate fluctuations; Export competitiveness; Potato production; Autoregressive Distributed Lag; South Africa

19. Concerns over the sustainability of marketing intermediaries sourcing fresh produce from small-scale farmers in the western cape province of South Africa

B Grwambi and VM Mmbengwa.

The marketing of fresh produce from small-scale farmers in developing countries is dominated by intermediaries. While these intermediaries have delivered in marketing the fresh produce, empirical evidence regarding their unethical business practices is inconsistent. This paper follows an explanatory multiple-case study research design. It applies the people, planet and profit manifesto to analyse the procurement strategies of four marketing intermediaries sourcing fresh produce from small-scale farmers. The objective is to establish the extent to which they create shared value in small-scale farming businesses. Results showed that intermediaries were considerate of the planet, as they mainly sourced from farmers who practised organic farming. Some intermediaries also considered people's well-being as they assisted with certain farmers' functions, such as administration, while paying them a fair price. While these intermediaries contributed to the creation of shared value, the high costs of collecting, grading, packing, and distributing fresh produce to markets increased transaction costs, thereby affecting intermediaries' profits. As a result, most intermediary businesses closed down. The paper concludes that the sustainability of intermediaries' businesses lies in their ability to first create value for their own businesses by maximising profits before investing in others. The paper also questions the suitability of social enterprises as vehicles for small-scale market access.

Key words: People; Planet; Profit; Exploitation; Shared value; Transaction costs

20. An assessment of the department of rural development and agrarian reform's procedures in funding smallholder farmers agricultural projects in Buffalo City Metropolitan Municipality.

Babalwa and STC Mdletshe.

Access to agricultural funding is vital for rural development, yet many South African smallholder farmers struggle to navigate government support systems. This study identified the procedures utilised by the Department of Rural Development and Agrarian Reform (DRDAR) to facilitate farmers in accessing funding and examined the factors hindering in accessing funding within the Buffalo City Metropolitan Municipality (BCMM) in the Eastern Cape. Adopting a mixed method case study research design, the research first employed Process Swimlane Mapping to delineate administrative procedures across DRDAR programs. This mapping revealed a rigorous, document-intensive, and multi-layered approval process. Empirical data were collected from 347 smallholder farmers and 16 extension officers. To control sample selection bias, the study utilised the Heckman Two-Step Selection Model to analyse the determinants of funding participation and eventual success. Estimates from the Selection Equation revealed that the decision to apply for funding was significantly and positively influenced by formal education level, land tenure security, and awareness disseminated through extension services, whereas perceived procedural complexity and stringent documentation requirements acted as primary deterrents. Conversely, the Outcome Equation indicated that funding success was highly contingent upon application completeness, timely submission, and continuous institutional support from extension officers. The findings highlight a critical systemic mismatch: while extension officers are experienced and capable of facilitating funding applications, the target demographic of older farmers with limited literacy levels struggles to navigate these complex administrative mandates. Furthermore, prevalent reliance on communal land tenure systems directly conflicts with the formal property ownership requirements mandated for funding eligibility. This study concludes that enhancing funding accessibility necessitates simplifying administrative procedures and aligning institutional frameworks with the socio-economic realities of smallholder farmers, rather than prioritizing bureaucratic compliance over inclusive agrarian development

Keywords: Department of Rural Development and Agrarian Reform (DRDAR); funding procedures; smallholder farmers; agricultural projects; agricultural funding access

21. Factors influencing the profitability of soybean and maize among emerging farmers in Newcastle Local Municipality, Kwazulu-Natal Province.

Azola Msezeni, Jabulile Z. Manyike, Abbyssinia Mushunje.

Emerging farmers in South Africa face pressure to improve profitability to support food system security, yet evidence on optimal land allocation between maize and soybean systems remains limited. This study examined the profitability of soybean and maize production among

emerging farmers in the Newcastle Local Municipality, KwaZulu-Natal. Data were collected from 32 farmers using a census sampling method, and semi-structured questionnaires were used to collect data. Profitability comparisons using gross margin analysis showed that soybeans (R3326.03/ha) generally produced average higher returns per hectare than maize (-R3812.8/ha), although varied with access to credit, input availability, and production experience. Multilinear regression analysis further indicated that farming experience (β=.010039 and P=0.006) and secure land tenure (β=.0809906 and P=0.006), and Maize/Soybean selling price/tons (β=.0000161 and p=0.077 enhanced maize profitability, while educational level (β=0593159 and P=0.018) reduced maize profitability. For soybeans, years in farming (β=.0037469 and P=0.082) and total soybean income (β= 1.69e 07 and P=0.081) were also positively associated with profitability. Therefore, the study concludes that household characteristics, institutional support, and economic incentives significantly shape crop choices and profitability among emerging farmers. Strengthened extension services, improved input access, market development, and crop diversification are recommended to enhance sustainable soybean and maize production systems.
Keywords: Emerging Farmers; Land Allocation; Profitability; Soybean; Maize; KwaZulu-Natal

22. Analysis of potato output and macro-economic factors influencing the export competitiveness of the potato industry from 2000 to 2024 in South Africa

Mlangeni AP, Seabela RV, Mashabela NR and Mmbengwa VM

The agricultural sector is a broad sector in South Africa; it plays an essential role in promoting global trade, economic growth, and development. Potatoes are widely consumed and are among the most consumed crops in the world and in South Africa. However, the agricultural sector is negatively affected by several factors, from production to the distribution of commodities. The potato industry is constrained by a monetary crisis, the pandemic, shocks, and changes in market dynamics, which have contributed to a decline in export competitiveness. Although previous studies have documented factors influencing the potato industry, there is limited research evidence on potato output and the influence of selected macroeconomic factors on the export competitiveness of the potato industry in South Africa. The study aimed to examine potato output and the macroeconomic factors influencing the export competitiveness of the potato industry in South Africa from 2000 to 2024. Secondary, annual time-series data from 2000 to 2024 were collected from the Food and Agriculture Organization Statistics (FAOSTAT), Statistics South Africa (Stats SA), UN Com-trade, and the South African Reserve

Bank (SARB), generating 25 observations for the analysis. The Normalized Revealed Comparative Advantage (NRCA) index measured export competitiveness; the explanatory variables were the producer price index, production yield, area harvested, import quantity, and exchange rate. Trend analysis and descriptive statistics were used to examine patterns in potato output, export competitiveness, and the selected macroeconomic factors. The Augmented Dickey-Fuller test was applied to determine variable stationarity, followed by the ARDL model to examine short-run and long-run relationships. The study provides empirical evidence on the factors influencing the export competitiveness of the South African potato industry and contributes to evidence-based strategies for improving productivity, market access, export performance and the long-term sustainability of the potato industry. The findings will help policymakers, producers, and exporters strengthen South Africa's position in regional and international potato markets.

Keywords: Potatoes, market, export, competitiveness, performance; macro-economic factors; south Africa

23. Factors contributing to the success of land redistribution policy: A case study of land reform beneficiaries in Capricorn District, Limpopo Province.

Shaku Emmanuel, Gidi Lungile Sivuyile and Senyolo Mmapatla Precious

Land redistribution is a key policy instrument for addressing historical land inequalities, promoting inclusive agricultural development, and improving food security in South Africa. However, the success of redistributed land projects is often constrained by governance and institutional challenges, including inadequate post-settlement support, limited market access, and weak coordination among support agencies. In Limpopo Province, where agriculture plays an important role in rural livelihoods, these challenges continue to affect the sustainability of land reform projects. This study examined the socio-economic and institutional factors influencing the success of land redistribution projects in the Capricorn District of Limpopo Province. Primary data were collected from 45 land redistribution beneficiaries using structured questionnaires. Purposive and simple random sampling techniques were employed, while descriptive statistics and a binary logistic regression model were used to identify determinants of project success. The results revealed that post-settlement support, agricultural training, market participation, and productive land use significantly increased the likelihood of successful project outcomes. Although education was statistically significant, governance and policy support factors had a greater influence on project success than demographic characteristics such as age and gender. The findings indicate that sustainable land redistribution depends more on effective institutional support than land access alone. The study recommends strengthening post-settlement support, expanding farmer training

and mentorship, improving access to markets and finance, and enhancing monitoring and evaluation systems. The findings contribute to debates on land governance and agricultural transformation in South Africa.

Keywords: Land Redistribution; Success of Land Redistribution; Land Redistribution Beneficiaries; Capricorn district, Limpopo province

24. Agricultural knowledge systems and behavioural determinants of smallholder farmers' adoption of underutilised crops in South Africa: a KAP-based analysis

Glen Themba Mendi, Jan Willem Swanepoel, Siphe Zantsi and Oluwasogo David Olorunfemi.

Underutilised indigenous crops (UICs) are increasingly recognised for their potential to contribute toward climate-resilient agriculture, dietary diversification, and household food security among smallholder farmers in South Africa. However, evidence regarding farmers' knowledge, attitudes, and practices (KAP) toward these crops remains limited. This study examined the KAP of smallholder farmers toward UICs and assessed factors influencing their adoption in selected municipalities of South Africa. A quantitative cross-sectional survey was conducted using a structured questionnaire, and data were analysed using descriptive statistics and econometric techniques. Results showed that smallholder farmers generally possessed positive knowledge and attitudes toward UICs, particularly regarding their nutritional value, adaptability to local climatic conditions, and contribution to household food security. However, utilisation practices remained uneven across households. Farming experience, water availability, extension support, and market access significantly influenced adoption. Farmers associated UIC cultivation with improved food availability, dietary diversity, and resilience under climate variability. The findings further revealed that agricultural extension systems may not yet be fully prepared to support the large-scale promotion and commercialisation of UICs. The study concludes that UICs possess significant potential to contribute toward food security and climate adaptation, but stronger institutional support, extension services, and market development are required for wider integration into South Africa's food systems.

Keywords: Underutilised indigenous crops; Smallholder farmers; Food security; Climate resilience; Agricultural extension; KAP

25. Artificial intelligence and the changing agriculture and food security landscape: a nuanced review of emerging concerns and prospects in Sub-Saharan Africa.

Munyai T, Oluwatayo IB and Belemu V.

Artificial Intelligence (AI) is increasingly shaping the way agriculture and food systems operate across the world. Its growing presence offers new possibilities for improving productivity, enhancing efficiency, and strengthening sustainability within food systems. This paper provides a critical and balanced review of how AI is being applied across agricultural value chains and what this means for food security outcomes. Drawing on recent literature, the review highlights both the opportunities and the emerging concerns linked to AI adoption. While AI can support better decision-making, reduce losses, and optimize resource use, it also raises important issues such as unequal access, data ownership, labour displacement, and environmental implications. The paper argues that the impact of AI is shaped largely by policy choices, institutional capacity, and inclusiveness. It concludes by emphasizing the need for people-centered approaches that ensure AI contributes meaningfully to equitable and sustainable food systems.

Keywords: Artificial intelligence; Food security; Agriculture; Digital Divide; Smallholder Farmers, Sub-Saharan Africa

26. Technology adoption and smallholder market participation: evidence from maize farmers in the Eastern Cape Province, South Africa

Aneza Madini, Sibusisiwe Mchani, Thembalethu

Technology adoption, particularly the use of digital tools and precision agriculture, is widely recognized as a key driver of improved agricultural productivity, resource efficiency, and food security. However, among small-scale farmers in South Africa, uptake of such technologies remains limited, constraining productivity and the ability to engage effectively in markets. This study examines the determinants of technology adoption among small-scale maize farmers in the Eastern Cape Province and explores the implications of adoption for market participation and integration. A mixed-methods research design was employed, combining quantitative and qualitative approaches. Primary data were collected from 200 small-scale maize farmers through structured questionnaires administered in isiXhosa and English. A binary logistic regression model was used to analyse the socioeconomic and institutional factors influencing technology adoption. The findings reveal a substantial gap between the perceived importance of agricultural technologies and their actual use. Farmers reported low adoption rates, limited access to training, and weak extension support. Education and employment status emerged as significant determinants of technology adoption, underscoring the role of human capital and

financial capacity. The results further suggest that while technology adoption can enhance farmers' ability to participate in markets, adoption alone is insufficient to ensure meaningful integration into higher-value or more formalized value chains. The study concludes that improving technology uptake requires an integrated approach that combines capacity building, improved access to finance, strengthened extension services, and better market linkages. These findings highlight the need for coordinated policy interventions to address structural and institutional barriers, thereby enabling small-scale farmers to leverage technology for improved market participation and integration.

Keywords: Technology adoption; small-scale maize farmers; Market participation; Eastern Cape province