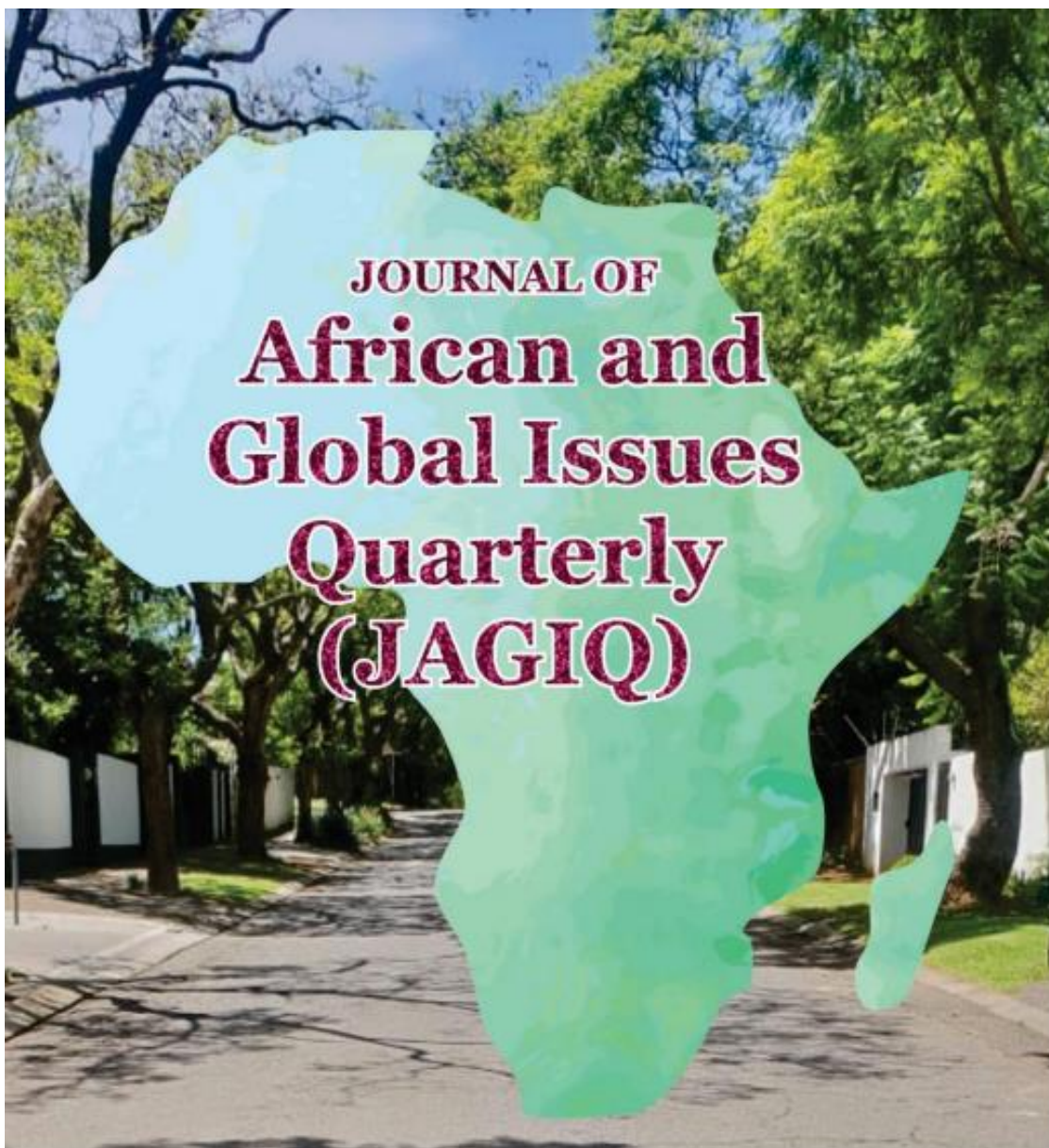




ISSN: 2709-8478 (PRINT)
2710-0073 (ONLINE)

EDITORIAL NOTE

This volume represents concerted calls within and outside Africa on the need for multidisciplinary collaboration and research output. Specifically, papers were drawn from all disciplines and research focuses, which has further increased the quality of research and collegial engagement. Hence, topics covered in this volume cut across the areas of economics, politics, security, ICT, indigenous knowledge, development studies, finance, trade, youth engagement, agriculture, democratization, and nation-building, among others.

For instance, Thizwilondi Josephine Mudau in *African Youths and the Promotion of Sustainable Development through the Lens of Indigenous Knowledge (IKS) in the 21st Century* employed qualitative desktop research methodology in synthesizing existing literature to argue that IKS represents a dynamic body of wisdom encompassing sustainable agriculture, natural resource management, and community resilience and offers proven, contextually grounded solutions to modern challenges like climate change and food insecurity. The analysis highlights youth-led initiatives across the continent that are revitalizing indigenous crops, integrating traditional ecological knowledge with climate adaptation strategies, and using digital platforms for cultural preservation. Mudau concluded that for Africa to achieve authentic and sustainable development, a concerted effort is needed to empower youth through inclusive education, supportive policy frameworks, and intergenerational dialogue, thereby transforming indigenous knowledge from a cultural heritage into a living toolkit for a resilient future.

Masila Joshua Masipa in *Beneficiaries of Corruption? An analysis of the function of South African banks in handling and making money from crime proceeds* adopted institutional theory and the political economy of corruption and a qualitative research design that combines semi-structured interviews with compliance officers, financial regulators, and civil society actors with document analysis of Zondo Commission and Financial Intelligence Centre (FIC) reports, legal statutes, and policy papers in examining how, in spite of strict anti-money-laundering (AML) and anti-corruption laws, South African banks may profit from, handle, or ineffectively stop the flow of monies associated with corruption. Specifically, with an emphasis on whether banks directly or indirectly benefit from the proceeds of crime, Masipa investigated the relationship between financial institutions and illegal financial flows within the following objectives: (1) assess the regulatory framework that oversees AML compliance; (2) examine high-profile cases of corruption in which banks are implicated; (3) evaluate due diligence and institutional accountability; and (4) suggest changes to improve ethical banking governance.

Then Sipho Patrick Bhengu-Mancosa & Andrisha Beharry-Ramraj in *Advancing Small, Medium, and Micro Enterprise Growth through Digitalized Enterprise and Supplier Development in South Africa* examined the current state of Enterprise and Supplier Development (ESD) in South Africa, investigated the role of digitalization in enhancing ESD, identified the challenges and opportunities in digitalizing ESD, and provided recommendations for policymakers, corporates, and Small, Medium, and Micro Enterprises (SMMEs). A qualitative secondary data approach was employed, drawing on thematic analysis of existing literature, reports, and industry initiatives. For key findings, Bhengu-Mancosa & Beharry-Ramraj indicated that ESD adoption remains limited; digitalization (Mancosa) significantly enhances market access and supplier diversity; infrastructure and skills gaps persist; and strategic digital integration can unlock growth opportunities for SMMEs.

Lere Amusan & Ebenezer O. Oni, in their study, *Disinvestment of Multinational Corporations (MNCs) in Developing Areas: An Assessment of Shoprite Disengagement in Nigeria, started by reflecting on why*, at the global level, many MNCs have started to disengage from their host states. In a bid to respond to the possible reasons, Amusan & Oni pushed further into examining possible reasons that could explain why Shoprite, a large South African retailing

company, disinvested from Nigeria after operating in the country for about 15 years, using secondary sources supported by primary data and personal observations. For them, the reasons range from political, economic, marketing, and legal to civil society attitudes towards their business. Employing the twin theories of neoliberalism and oligopoly that facilitate globalization, Amusan & Oni concluded that, aside from losing litigation to its erstwhile Nigerian business partners, competition from domestic and foreign retail companies contributed in no small measure to why Shoprite exited the Nigerian market.

In A sober teacher is a problem”: Unpacking Political Ideology and Emancipatory Struggles Within teacher unionism, Zwane Theminkosi Trevor & Matsepe David adopted the grounded postcolonial theory in examining how teacher unions embody and deploy political stances and ideologies to promote the emancipation and freedom of education, as well as the broader communities they aim to serve. Clearly, Trevor and Matsepe employed a qualitative interpretivist approach to analyze data from narrative interviews with unionized educators, along with further examination of public union discussions. Key findings of their research indicated four interrelated themes: (1) political consciousness as both a threat to order and a driver of democratic emancipation; (2) teacher unions functioning as a counter-hegemonic force challenging neoliberal geopolitics and political norms; (3) the ideological repositioning of teacher unions as intellectual activists rather than compliant officials; and (4) tensions between political agency and professional identity.

Douglas Nyath in Rural Youth and the Future of Farming in Sub-Saharan Africa: Revisiting the Abandonment Debate explored whether rural youth are truly abandoning agriculture or are instead redefining their involvement through diversified livelihood strategies. It examines the socio-economic, institutional, and cultural factors influencing youth decisions and analyzes how emerging hybrid forms of engagement—such as agripreneurship and part-time farming—are reshaping rural economies. A systematic desktop synthesis of peer-reviewed literature (2000–2025) was conducted using databases like Google Scholar, Scopus, and Web of Science. Nyaath observed that youth disengagement from agriculture is not uniform but context-specific, and the key determinants to such disengagement include land scarcity, education, labor market structures, gender norms, and limited access to finance and technology.

Then, in ***Equal Ideals, Unequal Realities: Gender Dynamics in the Workplace of an International Religious Non-governmental Organisation in Eswatini***, Thembumenzi Jomo Ntshalintshali & Innocent Simphiwe Nojiyeza examined attitudes, experiences, and organizational practices regarding gender roles, power dynamics, and inclusivity by drawing on in-depth interviews and focus groups with 20 employees from a range of departments and hierarchical levels. The results of their findings show that male participants, who were primarily ideologically devoted to gender equality, showed conflicted feelings about shifting power dynamics. Unconscious bias, policy implementation gaps, and organizational culture were equally identified as the primary obstacles to change. The results emphasize that in order to guarantee changes in gender equality, context-specific solutions are required that go beyond the adoption of policies.

In Indigenous Knowledge Systems and Environmental Conservation Ngugi’s Petals of Blood, Thabo Prince Zondo started by reflecting on members of the impoverished and socio-economically disadvantaged community who are distressed by incessant drought and who consult a seer and offer sacrifices to seek solutions. Using this as a point of departure, Zondo explored how text gestures and Indigenous Knowledge Systems (IKS) address the real dilemmas faced by Africans following the extensive and cross-generational crises that accompany coloniality. In this, Zondo provided an ecocritical reading of the text, drawing on relevant postcolonial/decolonial ideas to illustrate the ways in which indigenous African

epistemologies can indeed boost efforts at environmental conservation and poverty alleviation in rural communities today.

Also, **Rendani Tshifhumul** in *Exploring the Role of African Indigenous Knowledge Systems in Healing Practices and Resilience During the COVID-19 pandemic in Thohoyandou*, presented a narrative inquiry into the experiences of individuals who survived COVID-19 without requiring hospitalization, based on in-depth interviews with three respondents. For Tshifhumul, among the identified practices were the inhalation of steam treated with stones and salt, as well as the application of various herbal concoctions, including *Tshiumbeumbe*, *Musese*, *Mufula Musudzungwane*, *Miora*, and *Mubomo*, guava leaves, and lemon grass tea, including a mixture that comprises onion, ginger, lemon, honey, and garlic. Therefore, Tshifhumul concludes that these findings not only shed light on the adaptive strategies employed by individuals in response to the pandemic but also underscore the significance of traditional healing practices in the context of contemporary health crises. **Khulisile Judith Nkuna & Sikhumbuzo Sibuso Khoza**, in their work, *Capturing Cultural Heritage: Exploring the Poetic Elements of Domesticated Animal Praise*, carried out an analytical analysis of the lyrical components found in the praises of Siswati domestic animals. Nkuna & Khoza observed that expressing gratitude to animals for their contributions to human life remains a significant goal of animal praise. Reflecting on case studies, they noted that the Nguni people view domestic animals as very close environmental companions, particularly for those who live in rural areas. Praise poetry's primary goal is to commemorate great men's accomplishments. However, the reverse is the case for the Swati people, who have a tradition of honoring non-human animals in their poetry, including the wild animals they encounter in their environs as well as the domestic livestock they raise.

Intaher M. Ambe, Ellsworth C. Jonathan, Phathutshedzo D. Lavhelani,* and David H. Selby, in their study, *Exploring the landscape of demand management practices in the public health sector in the Gauteng Province, South Africa: An Empirical Analysis*, employed secondary sources in determining what demand management practices are employed within Gauteng, South Africa, and public health sector institutions. Findings in their study revealed substantial obstacles in organizational structure, demand management techniques, budget, and alignment between demand planning and strategic goals, as well as supply chain management (SCM) rules, regulations, and specifications. They conclude that the paucity of demand management implementation in public sector organizations reveals a misalignment between strategic goals, demand management, and demand planning, resulting in a loss of value for public sector organizations.

Aderinsola E. Kayode, Shalini Sing, & Patricia P. Badenhorst's research, *ICT for Indigenous Knowledge Dissemination and Education in Africa: A Systematic Review*, conducted a systematic review of literature published between 2015 and 2025 to examine how ICT tools and platforms have been deployed to support indigenous knowledge dissemination and education in African contexts. The findings of their research indicated that ICT can enhance indigenous knowledge preservation, improve youth engagement, facilitate intergenerational learning, and broaden global visibility of African knowledge systems when implemented with community participation. However, challenges remain regarding digital access, cultural sensitivity, intellectual property rights, and the sustainability of technology-driven initiatives.

In *Donald Trump-Twitter Diplomatic Disruptions And Impact On The Post-World War II International Order.*, **Ndivhoniswani Aaron Tshidzumba & Puseletso Nthate** examine how President Donald Trump's unprecedented use of Twitter as a direct channel for foreign policy communication disrupted established diplomatic norms inherited from the post-World War II

international order. Through content analysis of Trump's social media communications, examination of foreign policy outcomes, and comparative analysis with traditional diplomatic practices, Tshidzumba & Nthate demonstrated that Trump's social media presidency constituted a significant departure from institutional diplomacy and contributed to broader challenges facing the established international order. Further findings reveal that digital direct engagement by heads of state bypasses institutional constraints, undermines multilateral consensus-building, and creates new vulnerabilities in international relations.

Furthermore, in ***Determinants And Effect Of Small-Scale Livestock Production On Household Income In Malawi: Evidence From Fifth Integrated Household Survey***, Gladson Andrew Chipala, Christopher Chombo & Hannah Dunga examined the determinants and effects of small-scale livestock production on household income among farmers in Malawi, using cross-sectional data from the Fifth Integrated Household Survey (IHS5) with a sample of 8,795 households. Their key findings indicate that household size, access to credit, access to extension services, landholding size, distance to the market, and location in the Northern region significantly increase the likelihood of participation in livestock production. Notably, households engaged in livestock production earned, on average, an additional MWK 36,405.76 compared to non-producing households, demonstrating its important role in improving economic welfare.

In ***Navigating Artificial Intelligence Personalization and Consumer Privacy in Digital Marketing across South Africa and Global Contexts***, Suraksha Moothura and Andrish Beharry-Ramraj critically examined how AI-driven hyper-personalization in digital marketing influences consumer privacy, with a specific focus on its ethical implications and regulatory challenges in South Africa in comparison to global standards using desktop literature review methodology. Moothura & Beharry—Ramraj observed that ethical concerns such as manipulation, algorithmic bias, and reduced consumer autonomy were found to be inadequately addressed in South Africa, where legal instruments like POPIA lack the specificity and enforcement capacity evident in global standards like the GDPR. Taleat, Bisiriyu Abiodun & Lukamba, Muhlya Tshombe's article, ***Energy Sustainability and Sustainable Development Agenda: The Role of Public-Private Partnership in South Africa***, investigated the role and effectiveness of Public-Private Partnerships (PPPs) in South Africa's energy development towards sustainability using a qualitative desk research methodology to analyze secondary data from policy documents, scholarly literature, and government publications. For Abiodun & Tshombe, key findings demonstrate that PPPs have attracted a substantial amount of private investment and benefited the economy through job creation and community development. However, institutional and systemic barriers, e.g., Eskom monopoly, regulatory uncertainty, grid integration constraints, and institutionalized dependency on coal, impede the full implementation of PPPs in accelerating the energy transformation. Hence, they recommend policy stability, energy regulation reform, enhancing financial methods, and ensuring that social equity consideration is factored into PPP structures.

For Olukayode Idris Lasisi in ***The Governance–Development Nexus in Nigeria: A Conceptual Synthesis of Good Governance and Policy Discourse Theories***, a qualitative, conceptual, and desk-based review approach was employed, relying on the literature, policy documents, and theoretical frameworks in reevaluating the governance development interface in Nigeria in terms of the role of institutional weaknesses, the inconsistency of policies, and discursive framing in the determination of sustainable development outcomes. Findings revealed that weak institutions, corruption, bureaucratic inefficiencies, low accountability, and marginalization in policymaking processes bedeviled Nigeria's sustainable development, thereby distorting policy implementation and weakening effective service delivery. Lasisi concludes by calling for the need to strengthen institutions, improve transparency, guarantee policy sustainability, encourage civic participation, and apply digital governance solutions, which is essential to attaining sustainable development.

Eyitayo Francis Adanlawo & Mpho Chaka in *The Effect of Ethnicity And Politics on the Democratization of African Nations* examined the theoretical challenge that ethnicity poses to the African state and the challenges it poses for democratization on the continent. To guide the discourse, critical questions are raised: What kind of connection exists in Africa between politics and ethnicity? Under what conditions may ethnicity either support or undermine democracy? Can citizenship rights be reconciled with ethnicity? . Furthermore, Adanlawo & Chaka explored the evolution of ethnicity from the viewpoints of development communication and provided it with a psycho-social meaning. In their conclusion, Adalanwo & Chaka posited that, if ethnicity has an informative component, we should anticipate that voters' reliance on ethnic cues will decrease when certain forms of higher-quality information become available.

Lindokuhle Senamile Ntuli & Innocent Simphiwe Nojiyeza in ***Does Resource Scarcity Constrain Rural Women's Entrepreneurial Performance in KwaZulu-Natal, South Africa?***, examined whether resource scarcity significantly constrains the entrepreneurial performance of rural women in KwaZulu-Natal (KZN), South Africa. Anchored in the Resource-Based View (RBV), the study adopts a quantitative research design using survey data collected from 273 rural women entrepreneurs across uMhlabuyalingana, Big5Hlabisa, and eJozini municipalities. **Ntuli & Nojiyeza** revealed statistically significant relationships between entrepreneurial performance and seven resource-based constraints: leadership skills, financial institutional barriers, entrepreneurial experience, regulatory constraints, access to financial resources, technological limitations, and limited training opportunities. Lastly, in ***Transformative Governance Frontiers: Relational Public Administration for Smart City Inclusivity***, Melvin Diedericks examined the conceptualization of informal systems in the context of South African smart city initiatives. By repositioning informal systems as co-creators in urban governance, this study advocates for a paradigm shift from technocratic optimization to relational inclusion. This reframing aligns with South Africa's constitutional and developmental goals, enabling transformative governance and the effective localization of SDGs in sustainable cities.

It is expected that these works compiled in this volume will further enrich the discourse and provide policy options to individuals, governments, and countries, particularly in Africa.

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DETERMINANTS AND EFFECT OF SMALL-SCALE LIVESTOCK PRODUCTION ON HOUSEHOLD INCOME IN MALAWI: EVIDENCE FROM FIFTH INTEGRATED HOUSEHOLD SURVEY

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ABSTRACT

This paper investigates the determinants and effects of small-scale livestock production on household income among farmers in Malawi, using cross-sectional data from the Fifth Integrated Household Survey (IHS5) with a sample of 8,795 households. A probit model is employed to identify socio-economic and institutional factors influencing participation in small-scale livestock production, while propensity score matching assessed the effect of this participation on household income. Key findings indicate that household size, access to credit, access to extension services, landholding size, distance to the market, and location in the Northern region significantly increase the likelihood of participation in livestock production. Notably, households engaged in livestock production earned, on average, an additional MWK 36,405.76 compared to non-producing households, demonstrating its important role in improving economic welfare. These results underscore the significance of livestock production as a means to reduce poverty and promote economic stability. Policymakers can leverage these insights to promote livestock development through enhanced credit access, land tenure reforms, and targeted support for smallholder farmers, particularly in rural areas, to foster sustainable agricultural growth in Malawi.

Keywords: *Small-scale livestock production; Household income; Fifth Integrated Household Survey (IHS5); Probit regression; Propensity Score Matching.*

INTRODUCTION

Agriculture continues to play a fundamental role in supporting livelihoods and reducing poverty in many developing countries, particularly in Sub-Saharan Africa

where rural households depend heavily on natural resource-based activities. The sector contributes substantially to employment and national economic output while serving as a primary source of food and income for millions of

smallholder farmers (Langyintuo, 2020). However, agricultural systems across the region remain highly vulnerable to climate variability and environmental stress, particularly in contexts where livelihoods depend largely on rain-fed farming systems (McCarthy et al., 2021). These challenges are especially evident in Malawi, where recurrent droughts, floods, and erratic rainfall patterns have negatively affected crop productivity and contributed to persistent rural poverty and food insecurity (Mkungula, 2021; Twinomugisha & Mushy, 2021).

Within this context, smallholder livestock production has increasingly emerged as an important strategy for income diversification and poverty reduction among rural households (Ngigi et al., 2021; Nicolli et al., 2018; Nyathi et al., 2025; Singh & Singh, 2023). Compared with crop farming, which is often highly seasonal and vulnerable to climatic variability, livestock production provides a wider range of livelihood benefits. These include income from the sale of animal products, manure for crop cultivation, opportunities for asset accumulation, and a form of financial liquidity that households can draw upon to smooth consumption during periods of income shortfall or climatic shocks (Barry, 2021). As climate-related risks continue to intensify, understanding the role of livestock production in improving household welfare, particularly among smallholder farmers, has become increasingly important for rural development policy. Reflecting this growing recognition, Malawi's national development frameworks including the National Agriculture Policy, the Farm Input Subsidy Programme, and Malawi Vision 2063 identify livestock commercialization as a key pathway

for transforming rural livelihoods and strengthening agricultural resilience (NPC, 2020).

Beyond its direct income effects, livestock production plays a broader role within rural livelihood systems, functioning as a mechanism for asset accumulation and economic empowerment. For many smallholder farmers, livestock ownership facilitates investments in education, health, and further agricultural activities (Alders et al., 2021; Garwi, 2022; Kaumbata et al., 2021). During periods of climatic or economic stress, livestock can be sold quickly to meet urgent cash needs or used directly for household consumption, thereby enhancing household resilience (Barry, 2021; Faraz et al., 2023). Empirical evidence from developing countries, including Malawi, suggests that livestock contributes positively to income diversification, poverty reduction, and food security (Abu Hatab et al., 2019; Chirwa et al., 2017; Smith, 2018). Such outcomes align with the Sustainable Development Goals (SDGs), especially SDG 1, which targets poverty eradication, and SDG 2, which focuses on ending hunger (Delgado et al., 2001; Schneider and Tarawali, 2021).

Despite this potential, the livestock sector in Malawi remains underdeveloped. Existing studies point to low participation rates, widespread reliance on low-input and low-output production systems, and limited adoption of improved husbandry practices (Bhatti et al., 2021; DAHLDD, 2021; Van Campenhout and Nabwire, 2022). However, much of the existing literature tend to emphasize broad patterns like overall ownership rates,

aggregate regional distributions, and descriptive associations while giving relatively limited consideration to the household-level socioeconomic and institutional factors that shape household participation decisions and income outcomes. Importantly, participation and welfare effects are often analysed separately, without explicitly accounting for potential selection bias. This is problematic because households that choose to engage in livestock production may differ systematically from non-participants in ways that also affect income, leading to biased estimates of livestock's true welfare effects.

This study addresses the gaps in the literature by examining the factors that determine smallholder participation in small-scale livestock production and its effects on household income in Malawi. Specifically, it investigates how household-level socioeconomic and institutional characteristics influence participation decisions and how these decisions translate into income outcomes. Using nationally representative survey data and econometric techniques that account for selection bias, the study provides evidence on the contribution of small-scale livestock production to household welfare. By focusing on both determinants and income effects, the paper contributes to the literature on rural livelihoods, agricultural development, and climate adaptation, offering insights for designing targeted interventions to promote inclusive and resilient rural livelihoods. The rest of the paper is organized as follows: methodology, followed by results and discussion, and concluding on policy implications.

MATERIALS AND METHODS

Description of the Study Area

Malawi is a landlocked country in Southern Africa, located between latitudes 9° and 17° South, and longitudes 33° and 36° East. The country covers an area of approximately 118,484 square kilometres, of which about 61 percent is arable, 20 percent is covered by water bodies, and the rest comprises human settlements, forests, and protected areas (NSO, 2019). Malawi shares its borders with Tanzania to the north and northeast, Mozambique to the east, south, and southwest, and Zambia to the west.

Malawi's climate is predominantly tropical continental, with a single rainy season that lasts from November to April, followed by a dry season from May to October. Annual rainfall varies considerably across the country, ranging from 700 mm to 2,500 mm. Temperatures also vary by altitude, with mean annual values ranging from 12°C in highland areas to over 32°C in low-lying regions (Department of Climate Change and Meteorological Services, 2023).

Agriculture forms the backbone of Malawi's economy and serves as the main source of livelihood for most rural households. The sector is largely composed of smallholder farmers who depend on rain-fed production systems and have limited access to irrigation, mechanisation, and formal markets. These conditions make rural livelihoods highly sensitive to climatic shocks such as droughts, floods, and erratic rainfall. In this context, small-scale livestock production provides an important complementary livelihood strategy, contributing to income diversification, asset accumulation, and a buffer against agricultural risks.

Sample and Sampling Design

This study uses data from the Fifth Integrated Household Survey (IHS5), conducted by Malawi's National Statistical Office (NSO) between 2019 and 2020. The IHS5 is a nationally representative survey designed to provide reliable estimates of poverty, agricultural production, labor participation, and household welfare indicators across the country. The survey employed a stratified two-stage sampling design. In the first stage, enumeration areas (EAs) identified during the 2018 Malawi Population and Housing Census were selected as primary sampling units. These EAs represent the smallest operational geographic units with clearly defined boundaries. In the second stage, households within each enumeration area were chosen using a systematic sampling approach, starting from a randomly selected household (NSO, 2020).

The original target sample size was 12,000 households drawn from 750 EAs. However, data collection was affected by disruptions related to the COVID-19 pandemic, and ultimately 11,434 households were successfully interviewed, yielding a response rate of 94.5 percent. The survey design allowed the replacement of households when originally selected households were unavailable, with approximately 5 percent of the final sample consisting of replacement households (NSO, 2020). For the purpose of this study, the analysis is restricted to 8,795 households that reported engagement in agricultural activities. This restriction is necessary because the study focuses on the determinants and welfare effects of small-scale livestock production, which is primarily relevant within agricultural households. Limiting the

sample in this way enhances the internal validity of the analysis by ensuring that comparisons are made among households with similar livelihood structures.

Outcome and Treatment Variables

Outcome Variable

The main outcome variable used in this study is household income, proxied by real annual household consumption expenditure. This measure is constructed by aggregating food and non-food consumption expenditures at the household level. Using consumption expenditure as a proxy for income is standard practice in empirical studies in developing-country contexts, where income is often irregular, seasonal, and subject to substantial measurement error, particularly among smallholder and self-employed households (Neglo et al., 2021; Subedi and Kattel, 2022; Taruvinga et al., 2022a; Tenrisanna and Kasim, 2021). Unlike reported income, which may fluctuate widely over short periods, consumption expenditure better reflects long-term welfare and permanent income, making it a more reliable indicator of household living standards.

To ensure comparability across households, all expenditure values were adjusted for inflation and expressed in real terms. The natural logarithm of real household expenditure was used in the econometric analysis to reduce skewness and improve the normality of the distribution.

Treatment Variable

The treatment variable is participation in small-scale livestock production, measured as a binary indicator. Households that owned at least one

livestock species during the reference period are coded as 1, while those without any livestock are coded as 0. Livestock ownership is used as a proxy for participation in small-scale livestock production because it captures households' active engagement in livestock-related livelihood activities, including animal husbandry, breeding, and marketing. This measure aligns with previous studies examining livestock's welfare effects in smallholder settings (Acosta et al., 2024; Chiwaula et al., 2022; Tesfaye and Gutema, 2022; Xu et al., 2023).

Probit Model for Participation Decision

To analyse the determinants of smallholder participation in small-scale livestock production, this study employs a probit regression model. The probit model is appropriate because the dependent variable livestock ownership is binary, taking a value of 1 if a household owns livestock and 0 otherwise. This model estimates the probability that a household participates in livestock production as a function of observed household, demographic, and institutional characteristics (Greene, 2012; Long & Freese, 2001).

Formally, the participation decision is modelled as:

$$P(L_i = 1 | X_i) = \Phi(X_i\beta)$$

where:

- L_i represents a binary variable indicating livestock participation for household i ,
- X_i is a vector of explanatory variables,
- β denotes the parameters to be estimated, and

- $\Phi(\cdot)$ refers to the cumulative distribution function of the standard normal distribution. The empirical specification is given by:

$$L_i^* = \beta_0 + \beta_1 \text{Age}_i + \beta_2 \text{Gender}_i + \beta_3 \text{HHSize}_i + \beta_4 \text{Education}_i + \beta_5 \text{Credit}_i + \beta_6 \text{Extension}_i + \beta_7 \text{Land}_i + \beta_8 \text{MaritalStatus}_i + \beta_9 \text{MarketDistance}_i + \beta_{10} \text{North}_i + \beta_{11} \text{South}_i + \varepsilon_i$$

where:

- $L_i = 1$ if $L_i^* > 0$, and $L_i = 0$ otherwise.
- Gender = 1 for male-headed households, 0 otherwise;
- Age = age of the household head in years;
- Household Size = number of members in the household;
- Education = educational attainment of the household head;
- Credit = 1 if the household has access to formal credit, 0 otherwise;
- Extension = 1 if the household can access to extension services, 0 otherwise;
- Land = total landholding size (acres);
- Marital Status = 1 if married, 0 otherwise;
- Market Distance = distance to the nearest market (km);
- North and South are regional dummy variables (Central is the base category);
- ε_i is the error term.

Marginal effects are reported to facilitate interpretation, as they show

how a one-unit change in each explanatory variable affects the probability of livestock participation (Cameron and Trivedi, 2005)..

2.3.2 Propensity Score Matching

Following Acosta et al., (2024), Chiwaula et al., (2022), Tesfaye and Gutema, (2022), and Xu et al., (2023), this study uses Propensity Score Matching (PSM). This estimation technique has been widely used in impact evaluation for observational data to estimate causal effects (Dehejia and Wahba, 1999; Rosenbaum and Rubin, 1983). PSM constructs a comparison group by estimating the probability of treatment based on observed characteristics, thereby balancing covariates between treated and control groups (Khandker et al., 2009).

PSM was applied to address potential selection bias arising from observable differences between households, which could confound the relationship between livestock production and income (Misomali and Chirwa, 2025). Such bias occurs when households that participate in livestock production systematically differ from non-producing households in characteristics that also influence income outcomes, leading to non-random treatment assignment.

In this model, under PSM, $Livestock\ production_i = 1$ represents a household producing livestock and $Livestock\ production_i = 0$ represent livestock non-producing households. The treatment effect for household i is defined as the difference in income outcomes between having and not having livestock, expressed as:

$$TE_i = Y_i(1) - Y_i(0)$$

Where $Y_i(1)$ represents a livestock-producing household and $Y_i(0)$ represents a livestock non-producing household.

Since the counterfactual outcome $Y_i(0)$ for treated households is unobserved, PSM constructs a comparable control group based on the propensity score, which is defined as the conditional probability of participating in livestock production given a set of pre-treatment characteristics X_i :

$$P(X_i) = \Pr(Livestock_i = 1 | X_i)$$

The propensity scores were estimated using a probit model that included household and farm characteristics such as age, gender, education level of the household head, distance to the nearest market, access to credit, extension services, marital status, and region. These variables are assumed to influence livestock participation and household income jointly but are not affected by the treatment itself.

Households were matched using different matching algorithms, including nearest neighbor, caliper, and kernel matching, with kernel matching (bandwidth = 0.1) chosen as the preferred estimator based on balance diagnostics.

The average treatment effect on the treated (ATET) was then calculated:

$$ATET = E[Y(1) - Y(0) | Livestock = 1]$$

This estimator captures the average income effect attributable to livestock production among households that engage in small-scale livestock farming.

Data Collection and Analysis

The IHS5 data were collected using four structured questionnaires: Household, Agriculture, Fisheries, and Community questionnaires. These instruments captured detailed information on household demographics, agricultural activities, livestock ownership, access to services, income sources, and community-level characteristics. Following the initial data cleaning procedures conducted by the National Statistical Office (NSO), this study conducted additional checks to identify and correct duplicates, missing values, and extreme outliers to ensure data quality, consistency, and reliability.

To explore differences between livestock-producing and non-producing households, descriptive statistics were computed, including means, frequencies, percentages, and standard deviations. Independent sample t-tests were used to assess differences in continuous variables, while chi-square tests were applied for categorical variables (Field, 2013). These preliminary analyses provide insights into the basic socioeconomic characteristics of the sample and inform the subsequent econometric modelling.

To address the study’s objectives, two econometric approaches were applied. First, a probit regression model was estimated to identify the

socioeconomic, demographic, and institutional factors associated with participation in small-scale livestock production. Second, the PSM was used to estimate the effect of livestock participation on household income by constructing a counterfactual comparison group of non-participating households with similar observable characteristics.

All statistical analyses were conducted using STATA version 17. Robust standard errors were applied where necessary to account for heteroskedasticity. The quality of matching was evaluated using balance diagnostics, including standardized mean differences, pseudo- R^2 , and visual inspection of propensity score distributions before and after matching.

RESULTS AND DISCUSSION

Socio-demographic Characteristics of the Households

The analysis focuses on households that owned livestock during the 2018/2019 agricultural season. A household was classified as a participant if it owned at least one type of livestock and as a non-participant otherwise. This classification allows for a comparative assessment of the socioeconomic characteristics associated with livestock ownership.

Table 1: Livestock participation across regions

Livestock participa	Region								Test of significa
	North		Central		South		All		
	Frequer	Perce	Frequer	Perce	Frequer	Perce	Frequer	Perce	

Participan	1186	54.5	1695	42.9	1141	42.8	4022	45.7	Chi ² =96
Non-Parti	990	45.5	2257	57.1	1526	57.2	4773	54.3	Pr = 0.00

Table 1 presents the regional distribution of livestock participation across Malawi. Overall, approximately 46 percent of smallholder households owned livestock, while 54 percent did not. Participation rates varied significantly across regions ($\chi^2 = 96.67$, $p < 0.001$), with the Northern Region having the highest proportion of livestock-owning households (54 percent), followed by the Central (42.9 percent) and Southern (42.8 percent) regions. These findings are consistent with the IHS5 national report, which also

documents higher livestock ownership in the Northern Region (NSO, 2020). The regional differences likely reflect variations in agroecological conditions, cultural practices, land availability, and market access. In particular, the Northern Region has traditionally placed greater social and economic value on livestock, often using animals as stores of wealth and in social transactions. These contextual factors suggest that geographic location plays a meaningful role in shaping livestock participation decisions.

Table 2: Descriptive statistics for continuous variables

Variable	Participants		Non-participants		P-value
	Mean	Std	Mean	Std	
Age	45.9	15.6	40.9	16.2	0.000***
Household income	12.3	0.6	10.2	0.8	0.0641*
Household size	5	2.1	4.0	2.0	0.000***
Land size	0.5	1.1	0.2	0.5	0.000***
Distance to the M	2.6	0.8	2.9	1.0	0.000***

Note: Significance level: *** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.1$)

Table 2 presents descriptive statistics for key continuous variables between livestock participants and non-participants. On average, household heads who owned livestock were significantly older (46 years) than non-participants (41 years). This suggests that experience, accumulated assets, and long-term engagement in farming may increase the likelihood of livestock ownership. Older farmers may also have more

established social networks and greater access to resources, enabling them to manage livestock-related risks. Livestock-owning households were also significantly larger, with an average household size of five members compared to four among non-participants. Larger households may provide additional family labor for herding, feeding, and general livestock management, reducing

reliance on hired labor and lowering production costs.

Landholding size differed markedly between the two groups. Participants owned, on average, 0.5 acres compared to 0.2 acres among non-participants. This suggests that access to land is a critical enabling factor for livestock ownership, as land provides space for grazing, fodder cultivation, and animal housing. Market access also emerged as an important differentiating factor. Livestock-owning households lived significantly closer to markets (2.6 km) than non-

participants (2.9 km). Proximity to markets reduces transaction costs, improves access to veterinary inputs, and facilitates sales of animal products, thereby encouraging livestock investment. Finally, livestock-owning households reported significantly higher log-transformed income than non-participants. This preliminary evidence supports the hypothesis that livestock production is associated with improved household welfare, a relationship that is formally tested in the impact evaluation section.

Table 3: Descriptive statistics for dummy variables

Variable	Participants		Non-participa		P-value
	Frequency	Percent	Frequency	Percent	
Sex (Male=1)	1380	47.5	3773	40.7	0.000***
Access to cred	1674	51.2	3479	43.1	0.000***
Access to Exte	1207	58.2	3946	42.6	0.001***
Education leve	705	39.6	4448	46.1	0.001***
Marital status	3904	49.1	1249	36.9	0.000***

Note: Significance level: *** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.1$)

Table 3 presents descriptive statistics for dummy variables, comparing livestock participants and non-participants. Male-headed households were more likely to engage in livestock production (47.5 percent) than female-headed households (40.7 percent).

Furthermore, access to credit and extension services was also higher among participants (51.2 and 58.2 percent, respectively), than among non-participants (43.1 and 42.6 percent, respectively). Access to finance enables investment in livestock feed, veterinary care, and breeding, while extension

services provide technical knowledge and management skills. These findings are consistent with Leitch et al., (2020) and Ocran, (2020), who argued that financial and technical support significantly improve smallholder productivity.

Unfortunately, a lower proportion of livestock had better education (39.6 percent) compared to non-participants (46.1 percent). This may suggest that less educated farmers rely more heavily on traditional or livestock-based livelihoods whereas better educated farmers may diversify into non-farm or

<https://journals.glotanjournals.com/index.php/AGIQ/index>

wage employment. Similar observations were made by Kumari and Ramana Murthy, (2024) and Nawi and Saje, (2025), who reported that education often drives occupational diversification away from agriculture. **Finally**, about 49.1 percent of livestock owners were Table 4 presents results from the probit regression model estimating the likelihood of household participation in small-scale livestock production. The coefficients for explanatory variables align with theoretical expectations. Age of household head, household size, access to credit, land holding size (acres), distance to the market, and location in the northern region

married compared to 36.9 percent of non-participants.

Determinants of small-scale livestock participation

significantly affect the participation of farming households in small-scale livestock production. For interpretation, the coefficients are reported as marginal effects. According to Cameron and Trivedi (2005), the main advantage of a binary outcome model is in showing how changes in the explanatory variables influence the probability of the outcome.

Table 4: Results of the probit regression model and marginal effects of determinants of small-scale livestock production

Variable	Marginal effect	Standard error
Age of the household head (years	0.0034***	0.001
Male household head (0/1)	0.0316	0.0302
Household size	0.04578***	0.0054
Access to credit	0.0512***	0.0184
Access to extension services	0.0971***	0.0206
Marital status of the household head	-0.0368	0.0321
Land holding size (acres)	0.0544***	0.0095
Education level of the household head	0.0526	0.0294
Distance to the market	-0.0133***	0.0048
Northern	0.0725***	0.0261
Southern	0.017	0.0199

Significance level: *** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.1$)

The results in

Table 4 indicate that the age of the household head is positively and significantly associated with participation in livestock production. Each additional year of age of the household head increases the probability of owning livestock by 0.34 percentage points, keeping all other factors constant. This may be explained by the fact that older farmers tend have greater farming experience and broader social networks, which enhance their ability

to manage risks, access information, mobilize resources, and make informed production decisions (Kelio, 2022). However, some studies report the opposite pattern, where younger farmers participate more due to greater risk tolerance and market orientation (Eddy et al., 2012). This contrast may reflect structural constraints in Malawi, where livestock ownership depends on gradual asset accumulation.

On the other hand, with an additional member in the household, the probability of the household owning livestock increased by 4.6 percentage points, holding all other factors constant. Labor is a key constraint in livestock production systems, particularly among smallholders, where herding, feeding, cleaning, and disease monitoring require regular labor input. This result aligns with the findings of Taruvinga et al., (2022), who emphasize that larger households can meet the labor demands of livestock management without relying on hired workers. However, other evidence suggests that household size becomes less important when mechanization substitutes for family labor (Rajkhowa and Kubik, 2021). The influence of household size in this study reflects the labor-intensive nature of smallholder livestock systems in Malawi, where mechanized or outsourced livestock systems remain limited.

Credit availability emerged as a key institutional factor influencing small-scale livestock production. Households with access to credit had a 5.12 percentage point higher probability of owning livestock. These results highlight the role of liquidity constraints in limiting entry into livestock production. Livestock investment often requires upfront expenditures for animal purchase, feed, housing, and veterinary care, costs that many rural households cannot meet without external funding (Assan, 2013; De Haan et al., 2016). This shows the importance of policies that strengthen rural financial inclusion through village savings and loan associations, cooperatives, and microfinance institutions (Nowfal et al., 2025).

Similarly, access to extension services was significantly associated with small-scale livestock ownership. Households with extension services support had a 9.7 percentage point higher probability of participating in livestock production compared to households without access. These results underscore the importance of information and technical knowledge in shaping livestock adoption decisions. Livestock production involves management practices such as feeding regimes, disease control, breeding, and housing, all of which require technical guidance (Angello et al., 2016; Ayal and Mamo, 2024). Extension services help reduce information gaps and perceived risk while equipping farmers with the skills and knowledge needed to adopt improved practices, thereby encouraging participation.

On average, an additional acre of land increased the probability of a smallholder farmer's participation in livestock production by 5.4 percentage points, holding other factors constant. This is consistent with Mathewos et al., (2021), who found a positive relationship, indicating that a one-hectare increase in land increased the probability of participation in small-scale livestock by 28 percentage points. The relationship reflects the importance of land as a productive asset that provides space for grazing, fodder production, and livestock housing, thereby supporting livestock rearing activities (Feyissa et al., 2023). This suggests that land constraints may limit participation for smaller farms, highlighting land access as a structural barrier to livestock expansion.

For each additional kilometer in distance to the market, the probability of a household engaging in small-scale livestock production decreased by 1.3 percentage points, holding all other factors constant. Greater distance to markets increases input and transportation costs while reducing the effective price farmers receive for their outputs, thereby discouraging smallholder farmers from actively participating in livestock production (FAO, 2021). In Malawi's rural economy, livestock markets are often informal and dispersed. Greater distances therefore, raise not only transport costs but also transaction uncertainty, including price volatility and limited buyer access (Chilima et al., 2025). This suggests that the market distance reflects structural market inefficiencies rather than simple geographic inconvenience.

Lastly, households in the Northern region were more likely to participate in livestock production compared to those in the Central region. The marginal effect indicates that being located in the Northern region increased the probability of participating in small-scale livestock production by 7 percentage points. This finding aligns with Grishina, (2024), who observed that in many African societies, the practice of

paying livestock as a bride price promotes livestock rearing as both a cultural and economic asset. Consequently, the relatively higher proportion of livestock ownership in Malawi's Northern Region can be partly due to the tradition of lobola, which reinforces the social and economic value of keeping livestock.

The effect of small-scale livestock production on household income

Results for Matching

Figures 1 and 2 present the distribution of estimated propensity scores for livestock-producing (treated) and non-producing (control) households. There is substantial overlap between the two distributions, indicating that the common support condition is met and comparable households exist across the treatment and control groups (Caliendo and Kopeinig, 2008). This overlap allows livestock-producing households to be matched with similar non-producing households based on their propensity scores. Observations lying outside the region of common support were excluded from the analysis to enhance comparability and ensure the credibility of the matching procedure (Austin, 2011; Cerulli, 2015). Overall, the results confirm that the matching process is feasible and that subsequent impact estimates are based on well-balanced samples.

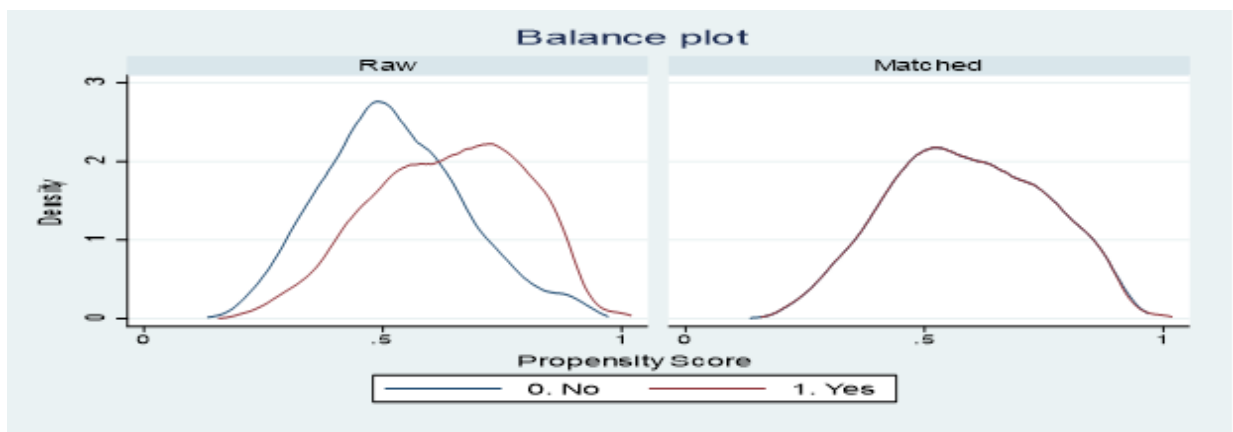


Figure 1: Overlap condition

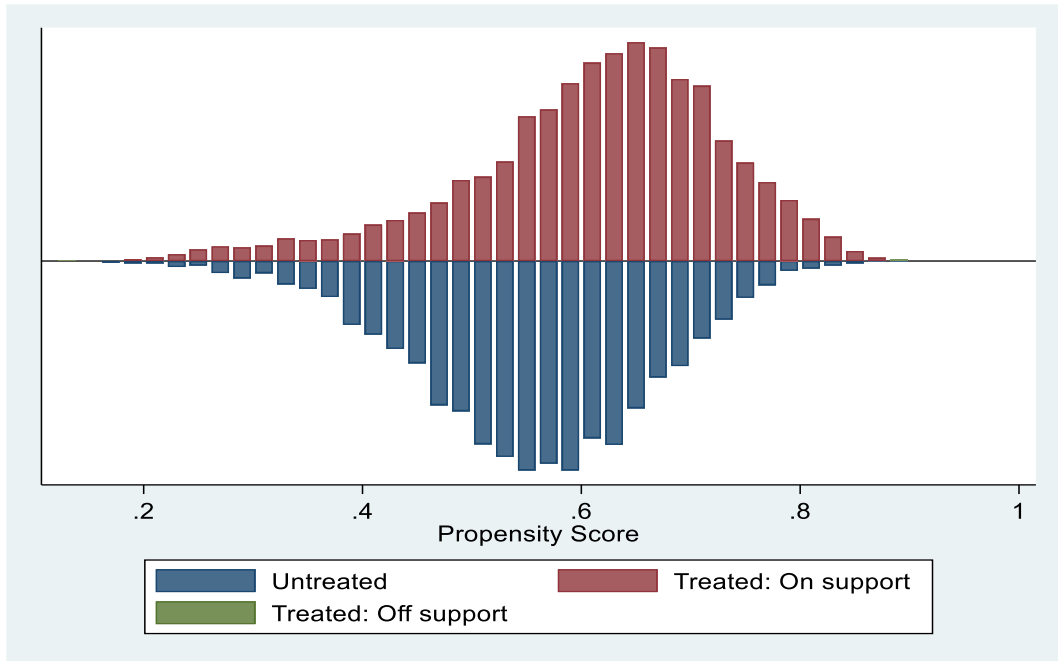


Figure 2: Distribution of the propensity scores

Choosing a Matching Algorithm

Livestock-producing and non-producing households can be matched through several matching techniques, including the kernel matching, caliper (radius) matching, and the nearest neighbor matching. Each method pairs producers with non-producers who have similar propensity scores. Following the recommendations of Table 5, kernel matching with a bandwidth of 0.1 produced the smallest mean bias between livestock-producing and non-producing households after matching. Similar results were obtained using other optimal model selection criteria for each matching procedure, such as the Table 5: Matching methods

Khandker et al., (2009), the preferred matching approach should achieve a large matched sample, a low pseudo- R^2 , a higher number of insignificant variables after matching, and low standardized mean bias.

Various matching algorithms were explored at different bandwidths and radius in the study. As shown in

pseudo- R^2 values and the number of insignificant covariates remaining after matching. Therefore, kernel matching was selected as the preferred method for pairing households and estimating the average treatments effect.

Algorithm	Number of insignificant variables	Pseudo- R^2 square	Mean bias
Kernel			
Bandwidth (0.1)	12	0.004	2.6
Bandwidth (0.25)	8	0.016	5.1

Nearest neighbour

without replacement

At integer 1 10 0.005 4.3

Calliper Matching

Calliper 0.1 8 0.005 4.3

Calliper 0.25 10 0.005 4.3

Radius

Radius (0.1) 6 0.041 8.9

Radius (0.25) 6 0.041 8.9

Average Treatment Effect on the Treated

To evaluate the economic effects of livestock production on household income, this study estimates the average treatment effect on the treated (ATET). After conditioning on observable characteristics and implementing matching, any

remaining statistically significant differences in income between livestock-producing and non-producing households can be attributed to livestock production. These differences are assessed using total household expenditure, which serves as a proxy for household income.

Table 6: Results on Propensity Score Matching

Income	Coef.	St.Err.	t-value	P-value	[95% Conf]	Interval	Sign
ATET	36,404.76	8802.58	4.14	0.000	19152.02	53657.51	***
Livestock production							
Number of Observations						8795	

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 6, presents the estimated average treatment effect on the treated (ATET) obtained using kernel matching with a bandwidth of 0.1. The results indicate that households engaged in small-scale livestock production earn, on average, MWK 36,404.76 more in annual household income than comparable non-producing households, and this difference is statistically significant at 1 percent level. This suggests that livestock production is associated with improved household welfare after accounting for observable differences between the two groups.

This finding is consistent with a growing body of research showing that livestock plays an important role in improving the welfare of smallholder farmers. Evidence from across Sub-Saharan Africa indicates that livestock ownership supports income diversification, helps households cope with agricultural shocks, and strengthens household liquidity through the sale of animals and animal products (Gwaka and Dubihlela, 2020; Ngigi et al., 2021; Weyori et al., 2018). Livestock also serves both as a productive asset and as a form of savings that can be used

during periods of financial difficulty, helping households stabilize consumption and reduce poverty risks (Hirashima et al., 2019). In addition, livestock enterprises generate multiple income sources, including milk, manure, and other by-products, while also supporting crop production through traction and soil fertility improvements (Said, 2021). Because animals can be relocated when shocks occur, they function as a practical buffer that helps households manage risks such as crop failure. The magnitude of the estimated income gain is economically meaningful, suggesting that livestock production is not merely a supplementary activity but can represent a central component of rural livelihood strategies.

Taken together, the results suggest that participation in small-scale livestock production is shaped by a combination of demographic capacity, access to resources, and institutional support, while livestock ownership improves household welfare through income gains. Thus, confirming that livestock production is both an outcome of structural opportunity and a driver of rural economic growth.

CONCLUSION AND POLICY RECOMMENDATIONS

Conclusion

This study examined the determinants and welfare effects of small-scale livestock production on household income among rural farming households in Malawi. Using nationally representative data from the Fifth Integrated Household Survey and applying appropriate econometric techniques, the results show that participation in small-scale livestock production is influenced by a combination of demographic,

socioeconomic, and institutional factors. Specifically, age of the household head, household size, access to credit, access to extension services, landholding size, distance to markets, and location in the Northern Region significantly affect the likelihood of engaging in livestock production. These findings highlight the importance of household resource endowments, institutional support, and market access in shaping participation decisions among smallholder farmers.

The study further finds that livestock ownership has a positive and statistically significant effect on household income, measured through real annual household consumption expenditure. Households engaged in livestock production reported higher income levels compared to non-participating households, suggesting that livestock serves not only as a productive agricultural activity but also as an important pathway for improving rural livelihoods. In this regard, livestock production contributes to income diversification and enhances the economic stability of smallholder households.

Overall, the results indicate that small-scale livestock production plays a crucial role in strengthening rural livelihoods in Malawi. By functioning both as a source of income and a form of financial security, livestock ownership enhances household resilience to economic and climatic shocks. However, the potential benefits of livestock production can only be fully realized if key structural constraints are addressed. These include limited access to credit, insufficient extension services, and high transaction costs resulting from weak rural market infrastructure.

Addressing these constraints through targeted policy interventions will enhance smallholders' ability to invest in livestock enterprises and will contribute to more inclusive and sustainable rural development.

Policy Recommendations

- **Enhance Land Access:** Since landholding size significantly increases participation in livestock production, policies that strengthen land tenure security for farmers are essential. Improving access to land, particularly for women and youth, would support grazing and fodder production.
- **Improve Credit Availability:** Access to credit encourages participation in livestock production. Expanding inclusive financial services through microfinance institutions, cooperatives, and Village Savings and Loans Associations (VSLAs) can help resource-constrained farmers invest in livestock activities. Livestock-specific loan products may further enhance participation.
- **Promote Livestock Adoption Programs:** Given the positive income effects of livestock ownership, livestock pass-on schemes and related adoption programs

should be strengthened and linked with extension and veterinary services. These should be combined with climate-resilient breeds and farmer training to reduce production risks.

- **Address Infrastructure Barriers:** The negative effect of market distance on participation highlights the need to invest in rural roads, local market hubs, and digital platforms for livestock sales. Such investments would reduce transportation costs and improve prices.

Limitations and Future Research

Despite the relevance of the findings, the study has some limitations. First, the analysis relies on cross-sectional data from the IHS5, which limits the ability to capture changes in participation and household income over time, hence ignoring long-term dynamic effects.

Second, although Propensity Score Matching helps reduce selection bias by controlling for observable differences between livestock participants and non-participants, it does not account for unobservable factors such as farmers' risk preferences or motivation. These unobserved characteristics may still influence both participation in livestock production and income outcomes.

Future research could build on these findings by examining the longer-term and dynamic effects of small-scale livestock production on household income and welfare using panel data. Such analyses would offer deeper insights into how income gains from livestock evolve and how households adjust to economic and climatic

shocks. Further studies could also extend the analysis to additional welfare dimensions, such as household resilience, to provide a more comprehensive understanding of the role of livestock production in improving livelihoods, particularly in times of shocks.

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