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The Role of Agriculture Extension in the Development of Agriculture in Luanshya District of Zambia

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Abstract

This study assesses and evaluates the roles of agricultural extension officers in enhancing agricultural development in Luanshya District, Zambia. This study employed a mixed-methods survey case study design, collecting data from 50 purposively selected respondents including Ministry of Agriculture officials, extension officers, and smallholder farmers in Luanshya District, and analyzed the information using descriptive statistics and thematic analysis. The findings reveal that extension officers perform vital roles in technical advisory services, technology transfer, and farmer capacity building, with 90% of farmers receiving crop production advice and 80% benefiting from demonstrations of improved farming techniques, resulting in reported yield increases for 80% of farmers. However, their effectiveness is severely constrained by inadequate transport facilities (reported by 90% of respondents), high farmer-to-extension officer ratios (84%), limited funding (80%), poor rural infrastructure, and a predominantly production-focused service scope that provides insufficient market linkage information (50%) and record-keeping training (40%). The study concludes that while extension officers possess adequate technical competence and contribute meaningfully to agricultural development, systemic constraints hinder their full potential, and recommends increasing investment in extension resources, recruiting additional officers, expanding service scope to include market-oriented advisory, strengthening digital platforms, and enhancing continuous professional development to transform agricultural extension into a more effective driver of sustainable development in Luanshya and similar contexts across Zambia.

Keywords: Agricultural Extension, Extension Officers, Technology Transfer, Farmer Productivity, Luanshya District, Zambia, Smallholder Farmers, Advisory Services

1. Introduction

Globally, agricultural extension and advisory services are recognized as critical engines for rural development, food security, and poverty alleviation. Effective extension systems act as vital conduits for disseminating scientific knowledge, promoting climate-smart technologies, and facilitating the adoption of improved practices among smallholder farmers, who produce a significant portion of the world's food (Swanson & Rajalahti, 2020) [36]. The paradigm of extension has evolved from top-down technology transfer to more participatory, demand-driven, and pluralistic models that engage farmers as co-creators of knowledge, essential for achieving sustainable agricultural intensification and resilience in the face of climate change (Faure *et al*., 2020) [13]. This transformation underscores the extension officer's multifaceted role as a knowledge broker, facilitator, and change agent, whose effectiveness is a key determinant of productivity growth and livelihood improvement in agrarian economies worldwide.

Within the sub-Saharan African region, agricultural extension systems face profound challenges that constrain their potential impact, despite their acknowledged importance. Chronic underinvestment, severe personnel shortages, and inadequate logistical support have resulted in critically high farmer-to-extension officer ratios, often exceeding 1:1000, which drastically limits service coverage and quality (Davis, Babu, & Ragasa, 2020) [11]. These systemic weaknesses are compounded by a frequent disconnect between research institutions and field-level advisory services, poor integration of digital tools, and extension programming that often remains overly focused on staple crop production at the expense of broader advisory on markets, nutrition, and business development (Christoplos, Sandison, & Chipeta, 2023) [10]. Consequently, while evidence confirms that well-functioning extension services can boost productivity by 15-40%, many systems in the region struggle to

translate policy commitments into effective, on-the-ground support for farmers, perpetuating low adoption rates of improved technologies and sustainable practices.

In Zambia, agriculture remains the cornerstone of the economy, supporting over 70% of the population and contributing approximately 20% to GDP, yet productivity lags behind potential, with more than 60% of Zambians living below the poverty line (Ministry of Agriculture, 2023; IFAD, 2021) [25, 18]. The national extension system, coordinated through the Ministry of Agriculture, is constrained by a stark shortage of personnel, with only about 2,600 camps serving millions of smallholder farmers, leading to an unsustainable officer-to-farmer ratio (Alliance of Bioversity International and CIAT, 2024) [4]. This challenge is acutely felt in districts like Luanshya in the Copperbelt Province, where a historical reliance on mining is shifting towards agriculture as a key livelihood strategy. Here, farmers grapple with limited access to quality inputs, climate variability, and soil degradation, while extension officers themselves are hindered by inadequate transport, training, and resources, undermining their capacity to deliver timely, relevant advisory services (Hasimuna *et al*., 2023; Somanje, Mohan, & Saito, 2021) [17, 34]. It is against this backdrop that this study seeks to assess and evaluate the specific roles and effectiveness of agricultural extension officers in Luanshya District, providing empirical evidence to inform strategies for strengthening this vital link in Zambia's agricultural development chain.

1.1 Research Objectives

The study was guided by the following objectives:

1. To assess the roles of extension officers in the development of agriculture in Luanshya District.
2. To evaluate the effectiveness of extension officers' roles in improving smallholder farmers' productivity and agricultural development.

1.2 Research Questions

1. What are the specific roles played by agricultural extension officers in enhancing agricultural development in Luanshya District?
2. How effective are these roles in improving smallholder farmers' productivity, technology adoption, and overall farm outputs?

1.3 Conceptual Framework

This study is guided by a conceptual framework that positions agricultural extension officers as the critical link between institutional support systems and actual agricultural development outcomes in the field. The framework views extension officers' effectiveness as fundamentally shaped by the quality of support they receive from two key sources: government policy and private sector engagement. Government provides the foundational structure, resources, and policy direction that enable extension work, while the private sector contributes innovation, market linkages, and complementary investments that enhance service delivery. Extension officers act as essential catalytic agents who translate this institutional support into practical knowledge and assistance for farmers on the ground.

Their enhanced capacity and effectiveness directly influences improvements in farmer productivity, resilience, and livelihoods. This creates a clear pathway where coordinated investment from multiple stakeholders strengthens extension services, transforming them into a central driver of agricultural development in Luanshya District. The framework thus illustrates how institutional support flows through extension officers to ultimately reach and benefit smallholder farmers in meaningful ways.

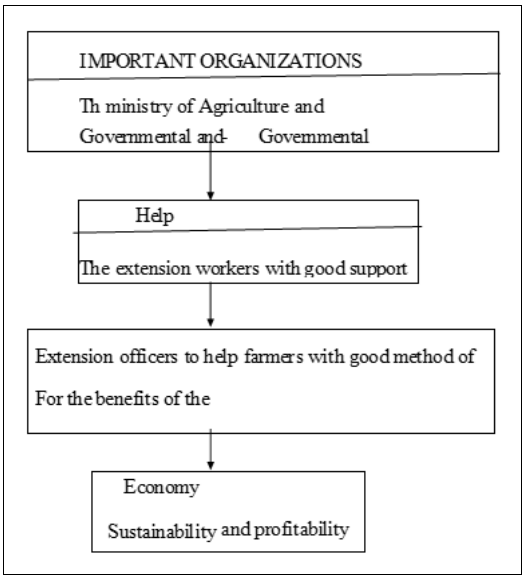

Fig 1: The figure shows the conceptual

The diagrammatic, illustration above shows the simplest way which the researcher hasthe government and the organization have improved the farming system. Represented remedies to making the extension officers and farmers to work together and achieve good farming system

2. Literature Review

2.1 The roles of extension officers in the development of agriculture

Globally, the role of agricultural extension officers has undergone a significant evolution from a simple model of top-down technology transfer to a complex, multi-faceted engagement as facilitators, knowledge brokers, and catalysts for systemic change. Contemporary literature emphasizes their function as critical intermediaries who bridge the gap between scientific research and practical farm-level application, requiring a blend of technical expertise and soft skills such as communication, facilitation, and adaptive management (Faure *et al*., 2020) [13].

The modern extension officer is increasingly seen as a coordinator within pluralistic systems, leveraging participatory approaches like Farmer Field Schools (FFS) and Participatory Rural Appraisal (PRA) to empower farmers as co-creators of knowledge, thereby enhancing the adoption and sustainability of improved practices (Vidyawati, Singh, & Jadoun, 2025) [40]. This shift acknowledges that effective agricultural development hinges not just on disseminating information, but on building local capacity, fostering resilience to climate shocks, and integrating farmers into viable market chains, positioning extension services as a linchpin for holistic rural development.

Within the sub-Saharan African context, the prescribed roles of extension officers are often well-articulated in policy documents but are severely constrained by systemic operational challenges. Theoretically, officers are tasked with a wide range of duties including disseminating climate-

smart agricultural techniques, promoting sustainable land management, facilitating access to inputs and credit, and strengthening farmer organizations (Davis, Babu, & Ragasa, 2020) [11].

However, the effectiveness of these roles is critically undermined by pervasive issues such as drastic underfunding, alarmingly high farmer-to-officer ratios that cripple outreach, and a chronic lack of basic logistical support like transport and communication tools (Christoplos, Sandison, & Chipeta, 2023) [10]. Studies from across the region, such as those in Malawi and Kenya, reveal that extension personnel are often stretched thin, forcing them to prioritize basic advisory services over more impactful, time-intensive roles like participatory facilitation or detailed farm business planning, which limits their overall developmental impact (Beshir *et al*., 2024; Mwanda *et al*., 2021) [8, 31].

In Zambia, the roles of extension officers are formally structured within the Ministry of Agriculture's decentralized system, aiming to deliver technical knowledge on crop and livestock production, natural resource management, and nutrition (Ministry of Agriculture, 2023) [25]. Recent national initiatives, such as the E-Extension Service launched in 2024, seek to modernize these roles through digital tools, reflecting an understanding of the need for innovation (Alliance of Bioversity International and CIAT, 2024) [4]. Yet, local empirical studies indicate a significant gap between this institutional vision and field-level reality.

Research by Somanje *et al*. (2021) [34] in Zambian contexts notes that while officers are key sources of information, their engagement is frequently limited to periodic visits focused on staple crop advice, with less attention to broader roles like market linkage, post-harvest management, or leveraging digital platforms. In mining-transition regions like Luanshya, these gaps are compounded by unique local challenges such as historical land use issues and a specific need for economic diversification that demand tailored, context-sensitive roles from extension services, which are not adequately captured in broad national frameworks (Hasimuna *et al*., 2023) [17].

This disconnect highlights a critical literature gap regarding the precise articulation and effectiveness of extension officers' roles at the hyper-local district level, where national policies intersect with unique socio-economic and agronomic conditions.

The emerging literature on extension roles also underscores the importance of continuous professional development and capacity building for extension officers themselves. Studies indicate that extension personnel who receive regular training and skill upgrading are better equipped to adapt to changing agricultural landscapes, including the integration of new technologies, climate adaptation strategies, and market-oriented approaches (Anderson & Feder, 2021) [5].

However, in many developing country contexts, professional development opportunities for extension staff remain limited, with training programs often being sporadic, underfunded, or disconnected from the actual challenges officers face in the field. This capacity gap becomes particularly critical as extension systems attempt to transition toward more knowledge-intensive services that require sophisticated understanding of value chains, digital platforms, and farmer business development. The literature suggests that investing in the professional growth of extension officers is not merely a matter of individual skill enhancement but a strategic imperative for strengthening the entire agricultural advisory system and ensuring its relevance in rapidly evolving rural contexts.

Another dimension that has gained prominence in recent extension literature is the growing recognition of extension officers as social mobilizers and community organizers who facilitate collective action among farmers. Beyond their traditional role as technical advisors, extension officers are increasingly expected to foster farmer group formation, support the development of producer cooperatives, and facilitate access to collective bargaining opportunities and group marketing arrangements (Pretty *et al*., 2020). This organizational role proves particularly significant in contexts where smallholder farmers face challenges accessing inputs, credit, and markets due to their limited individual bargaining power and economies of scale.

Evidence from various developing country settings demonstrates that when extension officers actively support farmer collective action, it leads to improved input access, better prices for farm produce, enhanced negotiating power with private sector actors, and stronger social capital within farming communities. However, fulfilling this role effectively requires extension officers to possess competencies beyond technical agriculture, including skills in group dynamics, conflict resolution, organizational development, and social networking, competencies that are often absent from traditional agricultural training curricula.

Furthermore, the literature increasingly emphasizes the gendered dimensions of extension work and the critical need for extension officers to adopt gender-responsive approaches in their service delivery. Research consistently shows that women farmers face systematic barriers in accessing extension services, despite their substantial contributions to agricultural production, particularly in sub-Saharan Africa where women comprise a significant proportion of the agricultural workforce (Ragasa, 2020).

Extension officers who are trained in gender analysis and adopt inclusive engagement strategies can play a transformative role in addressing these disparities by ensuring that agricultural information, training opportunities, and resource access reach both male and female farmers equitably. This requires conscious efforts to schedule meetings at times convenient for women, use communication channels accessible to them, address their specific production constraints and priorities, and challenge cultural norms that exclude women from decision-making spaces. Studies indicate that gender-responsive extension not only promotes equity but also enhances overall agricultural productivity and household food security, given that women who receive adequate advisory support tend to reinvest farm income in family nutrition, education, and health more consistently than their male counterparts.

2.2 The effectiveness of extension officers' roles in improving smallholder farmers' productivity and agricultural development

Globally, the evaluation of extension effectiveness has moved beyond simplistic metrics of farmer reach to encompass multidimensional assessments of economic, social, and environmental impact. Rigorous studies employ frameworks that measure outcomes such as the adoption rate of promoted technologies, incremental changes in yield and farm income, improvements in food security, and enhanced resilience to climate variability (Swanson & Rajalahti, 2020) [36]. A key determinant of effectiveness identified in global

literature is the quality of interaction, not merely the frequency; effectiveness is significantly higher where extension utilizes participatory methods, is gender-responsive, and is tailored to local agro-ecological and socio-economic contexts (Faure *et al*., 2020) [13].

Furthermore, the integration of digital tools has emerged as a double-edged sword: while potentially increasing reach and timeliness, its effectiveness is contingent on digital literacy, infrastructure, and the complementarity with face-to-face advisory (Fabregas *et al*., 2023) [12]. This global perspective establishes that effectiveness is not an inherent trait of extension but a result of a supportive ecosystem, quality delivery mechanisms, and relevant, science-based content.

In Sub-Saharan Africa, evaluations consistently reveal a stark gap between the potential impact of extension and its actual performance, largely attributed to systemic and operational constraints. Studies confirm that when adequately supported, extension can lead to significant productivity gains; for instance, research in Ethiopia using Propensity Score Matching showed clear causal links between extension-led training and increased crop yields and household income (Wonde, Tsehay, & Lemma, 2022) [42]. However, the region's pervasive challenges such as catastrophically high farmer-to-officer ratios, crippling under-resourcing, and weak linkages between research and extension severely dilute this impact. The effectiveness of officers is overwhelmingly compromised by logistical failures, such as lack of transport to visit farms, and motivational issues stemming from poor incentives and career stagnation (Davis, Babu, & Ragasa, 2020) [11]. This results in a superficial, blanket delivery of messages rather than deep, impactful engagement, leaving many smallholders, particularly women and marginalized groups, underserved and unable to translate occasional advice into sustained developmental gains.

In the Zambian and specifically Luanshya context, evaluations of extension effectiveness paint a picture of constrained success. Data indicates a positive correlation between extension access and farmer productivity; studies note that farmers receiving advice report yield increases, demonstrating the tangible value of the service (Somanje *et al*., 2021) [34]. Evidence from Luanshya District, as reflected in various research findings, shows that a majority of farmers attribute moderate to significant yield improvements to extension interventions. However, this positive impact operates within a ceiling imposed by severe systemic barriers.

Effectiveness is critically undermined by the very challenges plaguing the national system: the overwhelming farmer-to-officer ratio far exceeds manageable limits, and a dire lack of resources from transport and demonstration materials to operational budgets curtails the frequency and depth of farmer engagement (Ministry of Agriculture, 2023; Alliance of Bioversity International and CIAT, 2024) [25, 4]. Consequently, while extension officers in Luanshya are effective within their extreme constraints, their overall developmental impact remains sub-optimal. The local evaluation underscores that without resolving these foundational resource and capacity constraints, the effectiveness of extension in driving transformative agricultural development will remain fundamentally limited.

3. Methodology

3.1 Introduction

This chapter details the methodological approach, including design, sampling, and analysis procedures used to examine extension officers' roles in Luanshya District (Creswell, 2014).

3.2 Research Design

A mixed-methods survey case study design was employed to integrate quantitative and qualitative data, enabling triangulation and a comprehensive analysis of the extension system (Orodho, 2003; Creswell & Plano Clark, 2017).

3.3 Study Site

Luanshya District was purposefully selected due to its agrarian focus and economic transition from mining, offering a pertinent context for the study (Mulenga, 2017 [29]; Berg, 2004).

3.4 Study Population

The population included Ministry officials, extension workers, and smallholder farmers in Luanshya, capturing the full spectrum of extension service stakeholders (Creswell, 2012).

3.5 Study Sample

A purposive sample of 50 key informants officials, workers, and farmers was selected for in-depth, relevant insights (Saunders *et al*., 2009).

3.6 Sampling Techniques

Purposive sampling targeted experienced individuals directly involved in extension, ensuring knowledgeable participation (Kombo & Tromp, 2009; Patton, 2002).

3.7 Data Collection

Primary data were gathered via interviews and questionnaires, supported by secondary sources, with instruments pilot-tested for reliability (Kombo & Tromp, 2006; Dillman *et al*., 2014).

3.8 Data Analysis

Analysis involved descriptive statistics for quantitative data and thematic coding for qualitative data, followed by integrated interpretation (Braun & Clarke, 2006; Fetters *et al*., 2013).

3.9 Ethical Considerations

The study adhered to ethical standards by obtaining clearance, securing informed consent, and ensuring confidentiality (World Medical Association, 2013).

4. Presentationd of the Research Findings and Discussion

4.1 Background characteristics of the respondents

This chapter presents the analyzed findings from 50 respondents, comprising farmers, extension officers, and agricultural stakeholders in Luanshya District, beginning with a demographic profile that reveals a male-dominated (64%), middle-aged (majority 31-50 years) participation in agriculture, with limited youth involvement (16% aged 18-30), highlighting potential sustainability concerns. The

respondents exhibited a relatively high literacy rate, with 70% having attained secondary or tertiary education, suggesting a capacity to comprehend and adopt technical extension advice. Furthermore, farming experience varied substantially, with 32% having 11-15 years of experience and 28% having 5-10 years, providing a balanced perspective from both nascent and seasoned farmers on the effectiveness of extension services, thereby setting a informed foundation for the subsequent thematic analysis aligned with the study's specific objectives.

4.2 The roles of extension officers in the development of agriculture in Luanshya District

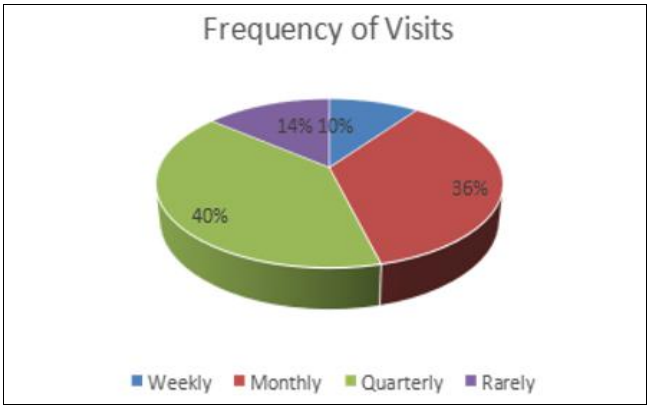

Fig 1: Frequency of Extension Officer Visits

The assessment reveals that 40% of farmers receive extension officer visits on a quarterly basis, while 36% receive monthly visits. Only 10% reported weekly visits, and 14% indicated that extension officers rarely visit their farms. This pattern suggests that while extension services are present, the frequency may not be optimal for addressing farmers' immediate needs and challenges.

Types of Extension Services Provided

Extension Services Provided (Multiple responses allowed)

Fig 4.6: Types of Extension Services Provided

Technical advice on crop production	45 (90%
Pest and disease management	42 (84%)
Soil management and fertilizer use	38 (76%)
Market linkage information	25 (50%)
Access to agricultural inputs	30 (60%)
Climate-smart agriculture training	33 (66%)
Record keeping and farm management	20 (40%)

The data shows that technical advice on crop production was the most common service provided by extension officers, mentioned by 90% of respondents. Pest and disease management (84%) and soil management (76%) were also frequently provided services. However, market linkage information (50%) and record keeping training (40%) were less commonly provided, indicating potential gaps in holistic agricultural development support.

Farmers' Rating of Extension Officers' Knowledge and Skills

Rating of Extension Officers' Knowledge

Fig 4.7: Farmers' Rating of Extension Officers' Knowledge and Skills

Excellent	**24%**
Very Good	**44%**
Good	**26%**
Fair	**6%**
Poor	**0%**

The assessment shows positive feedback regarding extension officers' knowledge and skills, with 44% rating them as very good and 24% as excellent. Only 6% rated the knowledge as fair, and none rated it as poor. This indicates that extension officers in Luanshya possess adequate technical competence, which is crucial for effective agricultural development.

4.2.1 Role of Extension Officers in Technology Transfer

Fig 4.8: Technology Transfer Activities by Extension Officers

Technology Transfer Activities	Freq.	Percent
Demonstration of improved farming techniques	40	80%
Distribution of improved seeds	35	35%
Introduction of modern equipment	18	26%
Training on post-harvest handling	28	56%
Conservation agriculture promotion	30	60%

The findings reveal that 80% of farmers benefited from demonstrations of improved farming techniques, while 70% received improved seeds through extension officers. However, only 36% had access to modern equipment through extension services, highlighting a significant gap in mechanization support. Post-harvest handling training and conservation agriculture promotion reached 56% and 60% of farmers respectively.

4.3 The effectiveness of extension officers' roles in improving smallholder farmers' productivity and agricultural development

Impact of Extension Services on Crop Productivity

Change in Crop Yields after Extension Intervention

Significant increase (>30%)	15 (30%)
Moderate increase (10-30%)	25 (50%)
Slight increase (<10%)	8 (16%)
No change	2 (4%)
Decrease	0 (0%)

The evaluation demonstrates that extension services have had a positive impact on crop productivity, with 50% of farmers reporting moderate increases in yields and 30% experiencing significant increases. Only 4% reported no change, and none experienced decreased yields. This indicates that extension officers play a crucial role in enhancing agricultural productivity in Luanshya.

Effectiveness of Extension Methods Used

Fig 4.10: Effectiveness of Extension Methods

Extension Method	Very Effective	Effective	Less Effective
Farm demonstrations	28 (56%)	18 (36%)	4 (8%)
Group training sessions	20 (40%)	25 (50%	5 (10%)
Individual farm visits	32 (64%)	15 (30%)	3 (6%)
Farmer field schools	18 (36%)	22 (44%)	10 (20%)
Mobile phone advisory services	10 (20%)	15 (30%)	25 (50%)

The evaluation shows that individual farm visits were rated as the most effective extension method by 64% of respondents, followed by farm demonstrations at 56%. Mobile phone advisory services were rated as less effective by 50% of respondents, possibly due to limited network coverage or farmers' limited access to mobile technology.

Extension Officers' Role in Farmer Organization and Empowerment

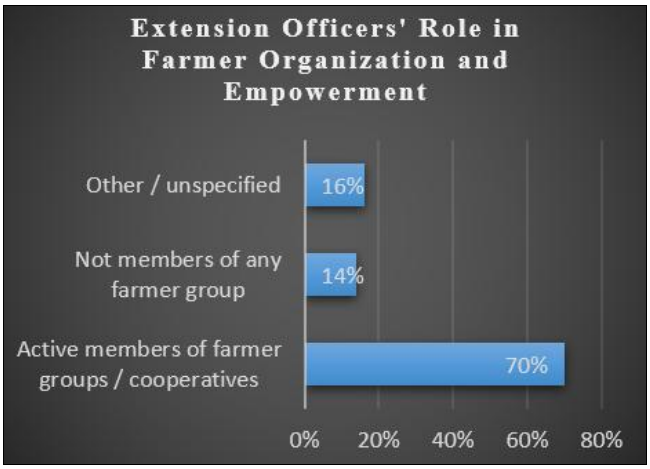

Fig 4.11: Farmer Organization through Extension Support

The data reveals that 70% of farmers are active members of farmer groups or cooperatives facilitated by extension officers, demonstrating the significant role extension services play in farmer organization. Only 14% are not members of any group.

Challenges Faced by Extension Officers

Table 4.12: Challenges Faced by Extension Officers

Inadequate transport facilities	45 (90%)
Large farmer-to-extension officer ratio	42 (84%)
Limited funding and resources	40 (80%)
Inadequate training and capacity building	28 (56%)
Poor road infrastructure	38 (76%)
Lack of demonstration facilities	30 (60%)
Limited ICT tools and equipment	35 (70%)

The evaluation identified several critical challenges facing extension officers in Luanshya. The most significant challenge was inadequate transport facilities, cited by 90% of respondents, followed by large farmer-to-extension officer ratios (84%) and limited funding (80%). These challenges directly impact the frequency and quality of extension services delivery, thereby affecting agricultural development outcomes.

Farmers' Satisfaction with Extension Services

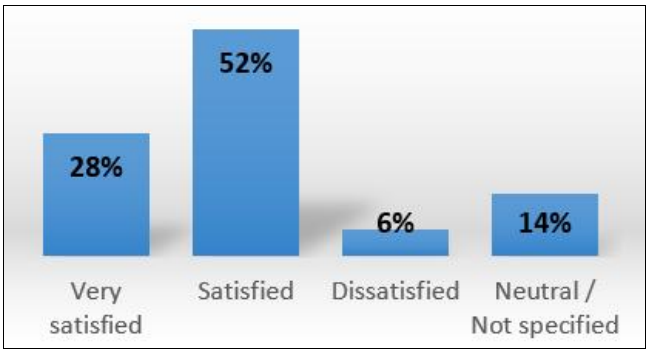

Fig 4.13: Farmers' Satisfaction with Extension Services

The evaluation shows that 52% of farmers are satisfied with extension services, while 28% are very satisfied. Only 6% expressed dissatisfaction, and none were very dissatisfied. This generally positive satisfaction level indicates that despite challenges, extension officers in Luanshya are making meaningful contributions to agricultural development.

4.4 Discussion of Findings

The findings of this study reveal that extension officers in Luanshya District primarily fulfill traditional roles centered on technical advisory and technology transfer, with 90% of farmers receiving crop production advice and 80% benefiting from field demonstrations. This aligns with the global literature that positions extension officers as critical intermediaries for disseminating improved practices (Faure *et al*., 2020) [13], yet it also reflects the regional constraint noted by Davis, Babu, & Ragasa (2020) [11], where systemic pressures force a narrowing of roles. The significant gaps identified, particularly the limited provision of market linkage information (50%) and record-keeping training (40%), corroborate the critique that extension services in sub-Saharan Africa often remain overly production-focused at the expense of broader business and market-oriented advisory, thereby limiting holistic rural development (Christoplos, Sandison, & Chipeta, 2023) [10]. The high regard for officers' technical knowledge (68% rated as excellent or very good) suggests strong human capital, a finding consistent with Somanje *et al*. (2021) [34], but underscores a paradox where competent personnel are hindered by operational failures from achieving transformative impact.

The evaluation of effectiveness presents a clear picture of constrained success. The reported yield increases by 80% of farmers demonstrate the tangible value of extension, supporting evidence from Zambia that links advisory services to productivity gains (Somanje *et al*., 2021) [34]. However, the dominance of individual farm visits as the most effective method (64%) and the poor rating of mobile advisory (50% less effective) highlight the persistent challenge of scalability and the lag in digital integration, factors emphasized in global assessments of extension systems (Fabregas *et al*., 2023) [12]. Crucially, the overwhelming barriers of inadequate transport (90%), high farmer-to-officer ratios (84%), and limited funding (80%) directly explain the sub-optimal frequency of visits and the ceiling on impact. These findings starkly validate the

regional literature on systemic impediments, confirming that without resolving these foundational resource and logistical constraints, the effectiveness of extension will remain fundamentally limited, regardless of the officers' technical competence or farmers' positive perceptions (Davis, Babu, & Ragasa, 2020; Alliance of Bioversity International and CIAT, 2024) [11, 4].

Beyond the quantifiable metrics, the study reveals important qualitative insights about the relationship between extension officers and farmers in Luanshya District. Farmers consistently expressed appreciation for the dedication and commitment of extension officers who, despite facing severe resource constraints, make genuine efforts to reach communities and provide meaningful advice. This suggests that the human element of extension work, including the trust and rapport built between officers and farming communities over time, remains a valuable asset that should be preserved and strengthened in any reform efforts. The personal connections and local knowledge that extension officers develop through repeated interactions with farmers enable them to tailor advice to specific contexts and respond to emerging challenges in ways that more impersonal or technology-driven approaches cannot easily replicate. This social capital, while difficult to measure quantitatively, represents a critical foundation upon which more effective extension systems can be built, provided that the necessary operational support is made available.

The findings also point to missed opportunities in leveraging extension officers as conduits for broader rural development beyond agricultural production alone. While officers are clearly valued for their technical expertise in crop management, their potential to facilitate access to markets, financial services, and business development support remains largely untapped in Luanshya District. This gap is particularly significant given the district's transition from a mining-dependent economy to one increasingly reliant on agriculture, where farmers need not just better production techniques but also entrepreneurial skills, market intelligence, and connections to value chains that can transform farming from subsistence to a viable livelihood. The study suggests that expanding the mandate and capacity of extension officers to address these broader developmental needs could significantly amplify their impact, but this would require substantial investment in their training, resources, and institutional support systems to equip them for these expanded roles.

5. Conclusion

In conclusion, this study demonstrates that agricultural extension officers in Luanshya District play a vital and technically competent role in enhancing agricultural development, primarily through the provision of crop production advice (received by 90% of farmers), technology demonstrations (benefiting 80%), and farmer capacity building, which have led to reported yield increases for 80% of smallholder farmers. However, their effectiveness is severely constrained by systemic challenges including inadequate transport facilities (reported by 90% of respondents), critically high farmer-to-extension officer ratios (84%), limited funding (80%), and a service scope that remains predominantly production-focused with insufficient attention to market linkages (provided to only 50%) and farm business skills like record-keeping (reaching just 40%). These operational barriers restrict the frequency, reach, and holistic impact of extension services, underscoring that while the human capital is capable, transformative agricultural development in Luanshya requires urgent investment in logistical resources, expanded staffing, broader service delivery models, and strengthened digital and professional support systems to unlock the full potential of extension as a driver of sustainable rural growth.

6. Acknowledgement

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