



Received: 02-01-2026
Accepted: 06-02-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Effectiveness of Agricultural Service Provision in Improving Smallholder Farmer Performance in Zambia: Insights from Credit, and Input Supply: A Case of Shangombo District

¹ Mutinta Ncheema, ² Mwenya Silombe

^{1,2} School of Engineering, Information and Communications University, Lusaka, Zambia

DOI: <https://doi.org/10.62225/2583049X.2026.6.1.5837>

Corresponding Author: Mutinta Ncheema

Abstract

This study evaluated the effectiveness of agricultural service provision in enhancing smallholder farmer performance in Shangombo District, Western Province, Zambia, with a specific focus on credit access and input supply. The objectives were to (i) analyse existing mechanisms of agricultural service provision, (ii) assess the impact of access to services on productivity and household income, and (iii) identify key constraints faced by smallholder farmers. Guided by the Unified Theory of Acceptance and Use of Technology (UTAUT), the study adopted a mixed-methods design combining quantitative surveys of 100 smallholder farmers and qualitative interviews with seven extension officers. Quantitative data were analysed using descriptive statistics in SPSS, while qualitative data were analysed thematically. The findings revealed that 88.9% of farmers benefited from agricultural services, and 76.9%

reported yield increases ranging between 10–30%. However, income gains remained modest due to high input costs, low produce prices, and weak market linkages. Only 45.1% of farmers adopted new technologies, while 67% expressed low confidence in managing pests and diseases, highlighting gaps in extension training and advisory support. Although most farmers (82.4%) expressed a neutral satisfaction level, all respondents (100%) recommended improvements such as increased funding, more extension officers, better infrastructure, and stronger private sector participation. The study concludes that agricultural services in Shangombo District contribute positively to productivity but have limited impact on income and resilience. It recommends an integrated, well-funded service delivery model linking inputs, credit, extension, and market access while promoting inclusivity for women and youth.

Keywords: Agricultural Services, Smallholder Farmers, Productivity, Input Supply, Credit Access, Extension, Shangombo District, Zambia

1. Introduction

Agriculture remains a cornerstone of Zambia's economy as it provides employment, food security, and income for more than seventy five percent of the population. The sector contributes significantly to the national Gross Domestic Product and plays a key role in reducing rural poverty, particularly in communities dominated by smallholder farmers (Chavula *et al.* 2022 ^[6]; Muyabe *et al.*, 2025; Robert *et al.* 2022). These farmers produce the majority of food consumed in the country and are therefore crucial to achieving national development goals, ensuring food security, and enhancing household livelihoods. Despite their importance, the productivity of smallholder farmers in Zambia remains low. This is largely attributed to limited access to essential agricultural services such as credit, extension, and input supply, which are fundamental for promoting technology adoption, improving production efficiency, and enabling access to markets and financial support. Credit facilitates the acquisition of improved inputs and technologies, input supply systems ensure timely access to seeds, fertilizers, and crop protection products, while extension services provide technical knowledge and advisory guidance that enhance production practices (Muyabe *et al.*, 2024 ^[21]; Muyabe *et al.*, 2025; Tembo *et al.*, 2025 ^[30]).

To respond to these challenges, the Government of Zambia and its development partners have implemented several initiatives aimed at strengthening agricultural service delivery. These include the Farmer Input Support Programme, the National Agricultural Policy, and the Rural Finance Policy, which seek to improve access to affordable credit, ensure timely delivery of inputs, and strengthen advisory services (Kaoma & Mpundu, 2023) ^[15]. However, service access remains a major challenge in

remote districts such as Shangombo in Western Province where poor infrastructure, limited financial institutions, long distances to input depots, weak extension presence, and low levels of financial literacy continue to constrain service utilisation (Phiri *et al.*, 2025; Tembo, 2025) [26, 29]. These persistent barriers limit smallholder farmers' opportunities to adopt improved practices and reduce their potential to increase productivity and farm income.

Against this background, this study evaluates the effectiveness of agricultural service provision in improving smallholder farmer performance in Shangombo District. It focuses on two key service components, namely credit access and input supply, and examines how they influence productivity, household income, and overall farm performance. The study further explores the mechanisms through which services are provided and the challenges that farmers face in accessing these services. To guide the investigation, the study sought to answer three research questions: what mechanisms govern agricultural service provision in Shangombo District and how effective are they in supporting smallholder farmers; what impact does access to credit and input supply have on farmer productivity and income; and what constraints hinder smallholder farmers from accessing these services.

The significance of the study lies in its contribution to policy, practice, and scholarship. The findings provide empirical evidence on how agricultural service provision shapes smallholder performance in remote rural settings. They highlight the need for improved coordination, timely input delivery, strengthened extension systems, and inclusive approaches that enhance the participation of women and youth. The results are valuable to policymakers, development partners, non governmental organisations, and private sector actors seeking to strengthen agricultural support systems. The study also contributes to academic knowledge by offering context specific insights into agricultural service delivery in a remote district, thereby informing future research and policy development aimed at enhancing agricultural productivity and rural livelihoods.

The study was conducted among smallholder farmers and agricultural officers in Shangombo District and covered the period from 2017 to 2025. A mixed methods approach that included structured questionnaires and semi structured interviews was used to collect data. Although the remoteness of the district posed challenges such as limited secondary data and difficult road conditions, the study achieved its objectives and generated findings that accurately reflect the realities of agricultural service provision in the district.

The theoretical foundation of the study is the Unified Theory of Acceptance and Use of Technology developed by Venkatesh and colleagues in 2003. This model explains the factors influencing individuals' intentions to adopt and use new technologies or services. It comprises four key constructs which are performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to the belief that accessing agricultural services such as credit, inputs, or extension advice will improve productivity. Effort expectancy concerns the perceived ease of accessing and using these services. Social influence captures the role of peers, community leaders, and extension officers in shaping farmers' decisions to utilise services. Facilitating conditions refer to the presence of supportive infrastructure,

institutional arrangements, and resources that enable service adoption. The application of the UTAUT model in this study made it possible to understand not only the availability of agricultural services in Shangombo but also the behavioural and structural factors that influence their uptake and sustained utilisation. Adoption is therefore shaped by perceived usefulness, accessibility, and supportive social and institutional environments.

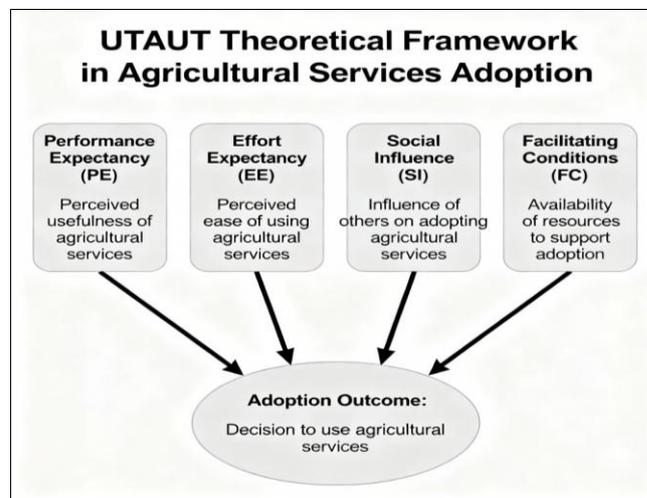


Fig 1: Conceptual Diagram of UTAUT

The conceptual framework will illustrate the relationship among the independent variables, which include credit access and input supply, and the dependent variables which include smallholder productivity, income, and overall farm performance. It will also highlight moderating factors such as infrastructure, financial literacy, and extension support that influence service utilisation and agricultural outcomes.

2. Literature Review

The literature consistently highlights the central role of agricultural service provision in enhancing smallholder farmer productivity, income, and food security. Access to credit, timely input supply, and effective extension services are key determinants of farm performance, enabling farmers to adopt improved technologies, increase yields, and strengthen market participation. Globally, agricultural service delivery has transitioned from state-led systems to pluralistic arrangements involving governments, private firms, NGOs, and farmer organisations. In advanced economies, service provision is market driven and supported by strong financial institutions and policy frameworks that encourage innovation and efficiency (Birner *et al.*, 2000) [2]. In South and Southeast Asia, digital platforms and NGO-led initiatives have expanded access to credit and inputs while lowering transaction costs and improving transparency. Within sub-Saharan Africa, countries continue to implement Input Subsidy Programmes aimed at improving access to seed and fertilizer. Malawi's Farm Input Subsidy Programme and Nigeria's Growth Enhancement Support Scheme have demonstrated the potential of such interventions, though issues such as delayed input delivery, political patronage, and limited scalability remain major barriers (Kaoma & Mpundu, 2023) [15]. Informal financial systems such as village savings and loan associations and microfinance institutions remain important, but high interest rates and restrictive repayment terms often constrain farmer

participation. Donor-supported initiatives, including those led by AGRA and IFAD, have promoted agro dealer networks, warehouse receipt systems, and rural finance institutions, yet weak infrastructure and limited public investment continue to affect their sustainability (Adjognon *et al.*, 2017) ^[1].

In Zambia, the Farmer Input Support Programme remains the primary channel for distributing subsidised inputs. Although the introduction of the electronic voucher improved transparency, challenges such as delayed agro dealer payments and technical system failures continue to limit effectiveness, particularly in remote districts such as Shangombo (Tembo *et al.*, 2020) ^[31]. Credit provision through cooperatives, microfinance institutions, and donor-funded programmes has expanded, but smallholder farmers remain largely excluded due to collateral requirements, limited financial literacy, and the low presence of financial institutions in rural areas (Chavula *et al.*, 2022; Liywalii *et al.*, 2026) ^[6, 17]. Strengthening coordination among government agencies, private firms, and rural cooperatives is therefore essential for improving service delivery.

Empirical studies consistently show that timely access to credit and inputs improves productivity, promotes crop diversification, and enhances household income. Evidence from Asia, Latin America, and Africa confirms that farmers with access to seasonal credit, subsidised inputs, and insurance schemes achieve significantly higher yields and greater resilience to climate and pest shocks. In Zambia, the Farmer Input Support Programme has contributed to increased maize production, but delayed input distribution and inadequate follow-up remain major challenges (Jayne *et al.*, 2018) ^[13]. In remote districts such as Shangombo, farmers who access inputs and small loans demonstrate improved farm performance, although weak infrastructure, poor markets, and limited storage facilities continue to reduce long-term benefits.

Despite the recognised benefits of agricultural service provision, smallholder farmers globally still face significant barriers. These include financial exclusion, gender disparities, inadequate extension support, poor infrastructure, and weak institutional capacity. Digital innovations have improved service delivery in some regions but have also excluded those with low literacy or limited technological access. Studies in Malawi and Zambia indicate that extension effectiveness is often constrained by inadequate funding, long distances, and low agent-to-farmer ratios (Moonga & Qutieshat, 2023) ^[18]. Input systems across Africa also face challenges such as poor targeting, high dependency on imported fertilizer, and fiscal sustainability concerns associated with subsidy programmes. Although private agro dealers complement public systems, their presence in rural and remote areas remains insufficient, limiting farmer access to timely and affordable inputs.

Overall, the literature affirms that agricultural service provision is fundamental to smallholder productivity and livelihood improvement. Access to credit and timely input supply significantly enhances production, but persistent infrastructural, institutional, and socio-economic barriers hinder service utilisation. In Zambia, especially in remote districts like Shangombo, these challenges underscore the need to evaluate the effectiveness of current service delivery mechanisms and identify ways of strengthening agricultural support for smallholder farmers.

3. Materials and Methods

This study adopted a systematic methodological framework to assess the effectiveness of agricultural service provision among smallholder farmers in Shangombo District, Zambia. The methods employed were designed to generate credible, valid, and policy-relevant insights. Because agricultural service delivery encompasses economic, institutional, and behavioural dimensions, a mixed-methods approach was used to integrate quantitative measurements with qualitative perspectives. This combination enabled a comprehensive understanding of how access to inputs, credit, and extension services influences agricultural productivity and household livelihoods.

The study was grounded in a pragmatic research philosophy. Pragmatism holds that research should apply the most appropriate methods to solve real-world problems and allows for the complementary use of quantitative and qualitative techniques (Saunders *et al.*, 2019) ^[28]. This philosophical position was well suited to the multidimensional nature of agricultural service provision, which requires both measurable indicators of access and performance as well as interpretive insights into farmer experiences and institutional processes. The quantitative component assessed the extent of access to inputs, credit, and extension services, while the qualitative component explored perceptions, contextual challenges, and institutional dynamics. Consistent with Ishtiaq, (2019) ^[11], pragmatism prioritises methodological pluralism and the practical value of findings. The linkages between pragmatism, positivism, and interpretivism are summarised in Table 1.

Table 1: Pragmatism Research Philosophy Integrating Positivism and Interpretivism

Research Philosophy	Research Approach	Ontology	Axiology	Research Strategy
Pragmatism	Deductive & Inductive	Objective or Subjective	Value-free or Biased	Qualitative and Quantitative
Positivism	Deductive	Objective	Value-free	Quantitative
Interpretivism	Inductive	Subjective	Biased	Qualitative

Source: Wilson (2010), Essentials of Business Research

A descriptive research design was adopted to systematically characterise existing conditions in agricultural service delivery without manipulating variables. According to Oshagbemi, (2017) ^[25], descriptive designs are suitable for portraying accurate profiles of people, processes, and situations. This design enabled analysis of access to agricultural services and their effects on farm productivity. A case study of Shangombo District complemented the descriptive design by providing contextual depth. Saunders *et al.* (2019) ^[28], notes that case studies are particularly effective for examining complex phenomena within real-life settings, thereby strengthening both internal and external validity.

The study was conducted in Shangombo District in Zambia’s Western Province. The district covers approximately 5,200 km², has a population density of about nine persons per square kilometre and experiences a tropical savanna climate with unimodal rainfall ranging from 800 to 1,000 mm annually. Agricultural livelihoods dominate, primarily involving maize, cassava, sorghum, millet,

groundnuts, and limited livestock production. The district was purposively selected because it exemplifies the access challenges faced by rural smallholders, including limited financial inclusion, poor infrastructure, and chronic input shortages (FAO, 2019) [7].

The target population consisted of all smallholder farmers in Shangombo District and agricultural extension officers responsible for disseminating information, facilitating input distribution, and linking farmers to financial institutions. The Ministry of Agriculture records indicate 1,245 registered smallholder farmers under various schemes, including the Farmer Input Support Programme. Extension officers were included to provide institutional perspectives on service delivery.

The sample size was determined using Yamane's (1967) formula for finite populations. With a population of 1,245 farmers and a margin of error of 0.09, the calculated sample size was 112. Due to logistical constraints, 100 farmers were selected alongside seven extension officers. A multistage sampling strategy was applied. First, wards with high agricultural activity were purposively selected. Within these wards, simple random sampling was used to select farmers from cooperatives to ensure representativeness, gender balance, and inclusivity. Extension officers were selected purposively based on experience and relevance to the study. Three primary data collection instruments were used. Structured questionnaires were administered to 100 smallholder farmers to obtain quantifiable data on access to credit, inputs, and extension services. Both closed and open-ended items were included to capture nuanced responses. Semi-structured interviews with seven extension officers and cooperative leaders generated qualitative insights into institutional capacity, service effectiveness, and operational challenges. Document review supplemented primary data through analysis of policy reports, programme evaluations, and academic literature from the Ministry of Agriculture, FAO, the World Bank, and peer-reviewed journals.

Prior to fieldwork, the researcher secured approval from the District Agricultural Office and obtained permission from traditional leaders. Data collection took place over three weeks. The researcher visited selected wards, administered questionnaires in person, and conducted interviews with key informants. For respondents with limited literacy, questions were translated into local languages to ensure comprehension. Interviews were audio-recorded with consent, and detailed notes were taken to capture contextual information. Completed questionnaires and interview notes were reviewed daily to identify and correct inconsistencies. Secondary data collection involved systematic review of documents relevant to agricultural service delivery in Zambia.

Quantitative data were coded and analysed using descriptive statistical techniques to summarise patterns in access to credit, input distribution, and extension support. Qualitative data from interviews were transcribed, categorised, and analysed thematically to identify recurrent themes related to institutional performance, service accessibility, and farmer experiences. Integration of quantitative and qualitative findings provided a more complete understanding of agricultural service provision in Shangombo District.

Ethical considerations were fully observed throughout the research process. Participants were informed of the study's purpose and provided voluntary consent before participation. Confidentiality and anonymity were ensured

by omitting personal identifiers from all records. The study adhered to the ethical guidelines of the Information and Communications University Research Ethics Committee. Data were securely stored, and participants were informed of their right to withdraw at any stage without negative consequences.

In summary, this methodology chapter has presented the philosophical and methodological foundations of the study. It has outlined the mixed-methods design, sampling procedures, data collection instruments, analytical techniques, and ethical safeguards that guided the research. The combination of descriptive and case study strategies, supported by a pragmatic philosophy, enabled the generation of robust evidence on agricultural service provision in Shangombo District. The next chapter presents the empirical findings and discussion.

4. Results and Discussion

4.1 Overview

This chapter presents and analyzes the findings of the study based on the objectives outlined in Chapter One. The analysis is guided by three objectives: (i) to examine the existing mechanisms employed in the provision of agricultural services, (ii) to analyze the impact of access to services on smallholder farmer productivity and revenues, and (iii) to establish the constraints and challenges faced by farmers in accessing such services. Both descriptive statistics and qualitative insights are integrated to provide a comprehensive understanding of agricultural service provision in Shangombo District.

4.2 Demographic Characteristics of Respondents

4.2.1 Age of Respondents

As illustrated in figure 2.0 shows the distribution of respondents that revealed a clear concentration within the middle-age categories. The largest group consisted of 39 respondents (43.3%) who fell within the 31–40 age range, followed by 22 respondents (24.4%) in the 41–50 bracket, while 21 respondents (23.3%) were between 20 and 30 years old. Only a small proportion, nine respondents (10%), were aged above 50 years.

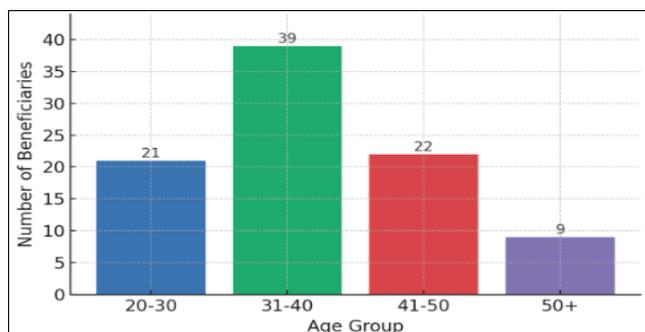


Fig 2: Age Distribution of Respondents

This distribution indicates that the majority of beneficiaries were in their economically active years, a stage typically associated with higher levels of productivity, energy, and capacity to adopt and implement modern farming practices. The dominance of respondents in the 31–50-year category suggests that agricultural activities in the study area are largely driven by individuals who have accumulated some farming experience while still possessing the physical ability to carry out labour-intensive tasks.

In contrast, the relatively low participation of respondents above the age of 50 may reflect the natural decline in physical capacity that comes with aging, making it more difficult to engage actively in farming activities that demand significant effort. Additionally, this could indicate an intergenerational transfer of farming responsibilities, where older farmers increasingly rely on younger household members to take active roles in agricultural production. This trend is consistent with broader demographic patterns in rural Zambia, where farming is primarily sustained by younger and middle-aged groups, while older individuals often assume advisory or supervisory roles rather than being directly involved in daily production (FAO, 2019) [7].

Kassie *et al.* (2015) [16] similarly observed that middle-aged farmers demonstrate higher adoption of improved agricultural practices due to greater willingness to experiment and invest in productivity-enhancing inputs. The findings therefore suggest that agricultural programs targeting this age group are likely to be more effective, while youth-oriented initiatives are equally important to secure the future sustainability of smallholder agriculture.

4.2.2 Education Level of Respondents

The figure below reveals that the majority of respondents, 46 (51.1%), had attained primary education, while 15 (16.7%) had no formal education and another 15 (16.7%) had completed secondary school. A smaller proportion, 8 (8.9%), held a certificate or diploma, and 7 (7.8%) had a university degree. None of the respondents reported having postgraduate qualifications or other forms of education.

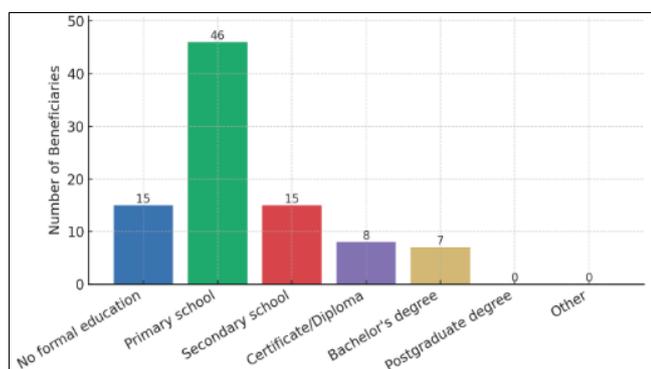


Fig 3: Education Levels of Respondents

The results indicate that the farming population in Shangombo District is dominated by individuals with basic literacy skills acquired mainly through primary schooling. This suggests that most smallholder farmers can understand simple extension messages but may struggle to interpret technical information that requires advanced education. The high number of primary-educated farmers reflects the general education profile of rural areas in Zambia, where access to secondary and tertiary education is limited. The low representation of degree holders and absence of postgraduate farmers indicate a continuing education gap between rural and urban populations.

These findings correspond with those of Kalogiannidis & Syndoukas (2024) [14], who observed that most farmers in developing countries possess only basic education, a factor that constrains their ability to engage in commercial farming and adopt modern technologies. Adjognon *et al.* (2017) [1], also found that education improves farmers' capacity to access credit, maintain production records, and participate in market-oriented programs. In this study, farmers with

certificates and degrees were more likely to be linked to cooperatives and extension services, suggesting that education is positively associated with service utilization and income growth.

Chavula *et al.* (2022) [6], emphasized that education affects farmers' confidence and readiness to embrace innovation. Educated farmers often serve as role models within their communities, influencing their peers toward adopting improved agricultural practices. The results from Shangombo District therefore underscore the importance of tailoring extension training to farmers' literacy levels. Demonstrations, radio programs, and visual training aids would likely enhance understanding among primary-educated and non-literate farmers.

In summary, the educational pattern in Shangombo District suggests that improving adult literacy and expanding vocational training opportunities could boost farmers' ability to adopt innovations and participate more actively in agricultural service delivery. Such efforts would help bridge the knowledge gap and contribute to sustainable agricultural development in the district.

4.2.3 Farming Experience of Respondents

The figure below demonstrates that majority of respondents, 59 (59%), had been engaged in agricultural activities for a period ranging between 11 and 20 years. A smaller proportion, 14 (14%), reported having between 5 and 10 years of farming experience, while 12 (12%) had been involved in farming for less than 5 years. Only a few respondents indicated having more than 20 years of farming experience, showing that very long-term engagement in agriculture was relatively uncommon among the surveyed group.

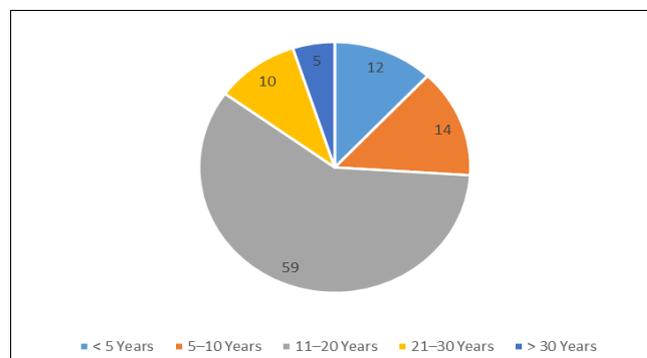


Fig 4: Farming Experience of Respondents

The findings indicate that most respondents possess a moderate level of farming experience, which suggests that they have developed significant familiarity with local agricultural practices, seasonal variations, and crop management techniques. Farmers in the 11–20-year range are likely to have accumulated practical knowledge that helps them manage production risks, respond effectively to environmental changes, and make informed decisions. However, their experience tends to be based on traditional methods that may not always align with the demands of modern, market-oriented agriculture.

Farmers with less than 5 years of experience are likely to be new entrants mostly younger individuals or those who have recently adopted farming as a livelihood strategy. Although they may lack extensive field experience, this group often shows greater adaptability and openness to adopting new technologies, especially when supported with training, input

access, and extension services. Conversely, the few farmers with over 20 years of experience are likely to depend heavily on conventional practices and may be less inclined to experiment with unfamiliar innovations.

The results are consistent with Houndjo Kpoviwanou *et al.* (2024) [10], who noted that while experience enhances stability and productivity, overreliance on traditional approaches can hinder the adoption of improved technologies. Chavula *et al.* (2022) [6] also found that moderately experienced farmers tend to be the most responsive to agricultural innovations, combining accumulated field knowledge with flexibility to adapt to change. Similarly, Kalogiannidis & Syndoukas, (2024) [14] emphasized that farming experience contributes to better decision-making and effective risk management.

Overall, the findings suggest that extension and training programs in Shangombo District should strategically target farmers with 11–20 years of experience as focal participants for demonstrations and peer-to-peer learning. Empowering this group, while offering tailored mentorship to newer farmers, can enhance knowledge transfer, encourage innovation, and strengthen the overall productivity of smallholder agriculture in the district.

4.3 Existing Mechanisms of Agricultural Service Provision

4.3.1 Mechanism of Agricultural service delivery

The diagram, below shows the types of agricultural services that were accessed by respondents. The results indicated that agricultural inputs such as seeds and fertilizers were the most widely accessed services, reported by 51 respondents (56.7%). Credit services were accessed by 24 respondents (26.7%), while only 16 respondents (17.8%) reported receiving extension services. This pattern demonstrated a clear imbalance, as most smallholder farmers relied heavily on input provision, mainly through the Farmer Input Support Programme (FISP), while access to financial and advisory services remained limited.

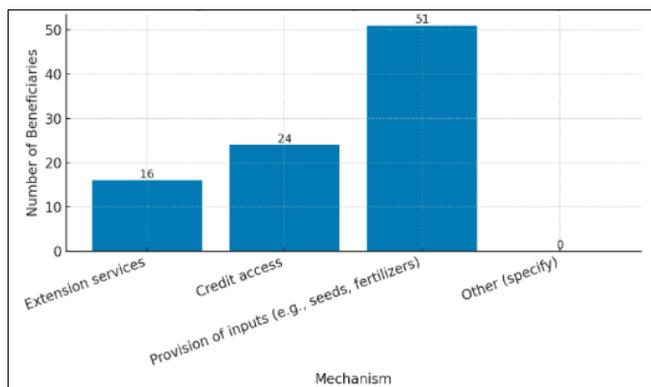


Fig 5: Mechanisms of Agricultural Service Delivery

The findings showed that agricultural service delivery in Shangombo District was dominated by government extension agents, reported by 94.4% of respondents, confirming the central role of the public sector (FAO, 2019) [7]. The private sector followed at 78.9%, and cooperatives at 63.3%, indicating growing but still secondary contributions to service provision. Cooperatives supported collective access to inputs and credit, strengthening farmers’ bargaining power. Participation of NGOs and digital platforms was minimal, largely due to poor connectivity and

low digital literacy, consistent with findings by Hemathilake & Gunathilake, (2021) [8]. Overall, the service system remained heavily public-sector driven, with limited diversification. Strengthening collaboration among government, private actors, cooperatives, NGOs, and ICT providers would enhance inclusiveness and efficiency in service delivery.

4.3.2 Access Methods for Agriculture Services

The diagram below shows the various channels through which farmers accessed agricultural services in Shangombo District. The results indicated that government extension agents were the most commonly used channel, reported by 85 respondents (94.4%). The private sector followed, with 71 respondents (78.9%) acknowledging its role in service provision, while 57 respondents (63.3%) accessed services through farmer organizations. None of the respondents reported using other channels of access.

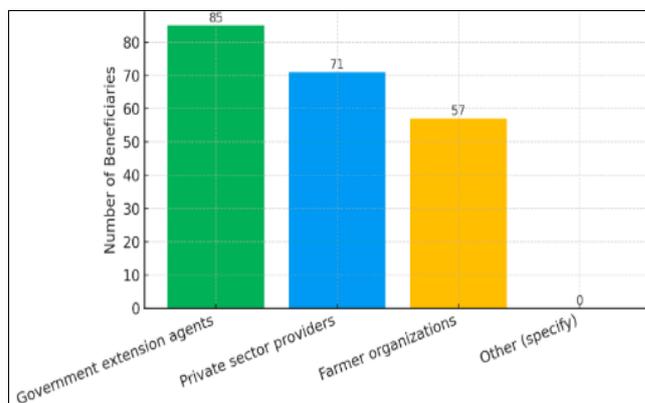


Fig 6: Sources of Agricultural Services

The findings indicate that government extension agents were the dominant source of agricultural services, accounting for 85% of respondents. This confirms the continued central role of the public extension system in supporting smallholder farmers in Zambia. The high reliance reflects the trust farmers place in government officers for technical advice, input distribution, and training, particularly in remote areas such as Shangombo District. Similar trends have been observed across Sub-Saharan Africa, where public extension remains the backbone of rural advisory services despite gradual sector reforms (Birner *et al.*, 2000) [2].

Private sector providers were cited by 71% of respondents, showing that agro-dealers, seed companies, and financial institutions are becoming important complementary sources of support. This suggests a gradual move toward a more pluralistic and market-oriented agricultural service system. Farmer organizations accounted for 57%, highlighting the growing importance of cooperatives and farmer groups in facilitating shared knowledge, collective input procurement, and improved access to credit and markets. However, no respondents (0%) reported receiving services from “other” sources, indicating limited diversification of service channels, especially regarding NGOs and digital advisory platforms. This aligns with findings that ICT-based and non-state advisory services remain underdeveloped in many rural areas due to infrastructure and digital literacy constraints (Kaoma & Mpundu, 2023) [15].

Overall, while agricultural service delivery in the district shows signs of diversification, it remains heavily dependent

on government extension, underscoring the need to strengthen multi-stakeholder partnerships to improve reach, efficiency, and resilience of advisory services.

4.4 Impact of Agricultural Services on Farmer Productivity and Revenues

4.4.1 Benefits of Agricultural Services

The figure below illustrates the proportion of farmers who benefited from agricultural service delivery programs in Shangombo District. The results indicated that the majority of respondents, 85 (88.9%), reported having benefited from agricultural services, while only 15 respondents (11.1%) stated that they had not benefited from any service delivery programs.

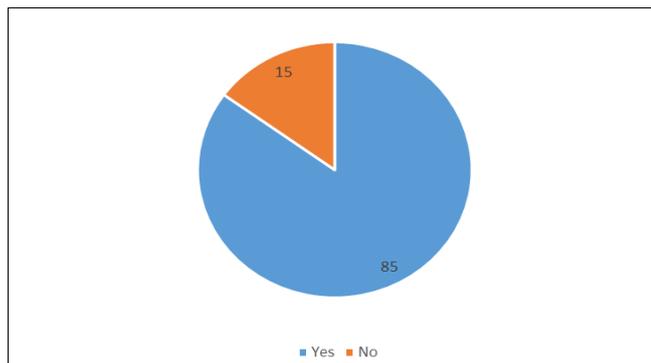


Fig 7: Number of Beneficiaries from Agricultural Service Delivery Programs

The findings showed that agricultural services significantly improved farm productivity and household welfare, with most farmers benefiting from programs such as FISP and government extension services. These interventions enhanced access to inputs, technical knowledge, and production support, leading to higher yields and better crop quality (Chapoto & Jayne, 2009) [3]. Extension officers played a key role by training farmers in good agronomic practices and pest management, while subsidized inputs helped expand production, consistent with findings by (Chavula, 2022).

Private-sector actors and cooperatives also contributed by supplying improved inputs and strengthening market access, improving farmer bargaining power. However, a small proportion of farmers did not benefit, mainly due to limited access, distance, or inadequate program targeting, challenges similar to those identified by Kalogiannidis & Syndoukas, (2024) [14].

Overall, agricultural services had a positive effect on smallholder productivity and income, and improved coordination among government, private sector, and cooperatives would further enhance service reach and effectiveness in Shangombo District.

4.4.2 Awareness of Agricultural Services

As illustrated below in the diagram the level of awareness among farmers regarding agricultural service delivery programs in Shangombo District. The results indicated that almost all respondents, 91 (100%), were aware of the existence of agricultural service delivery programs, while none reported being unaware of such initiatives.

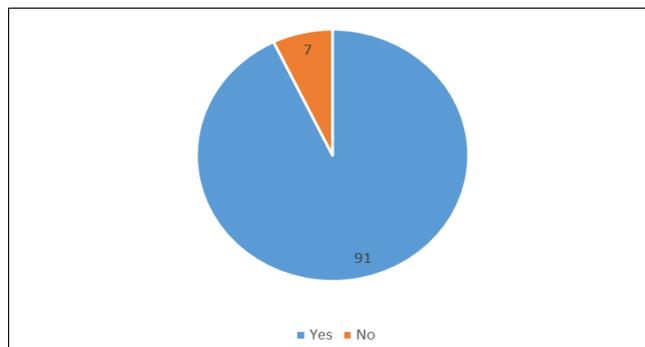


Fig 8: Awareness of Agricultural Service Delivery Programs

The results showed that awareness of agricultural services was widespread among farmers, largely due to effective communication through government officers, community meetings, and cooperative assemblies. This high awareness enabled many farmers to understand available programs such as FISP and how to access them, consistent with Olu Ajayi *et al.* (2009) [24]. Increased awareness also promoted participation in training and encouraged adoption of improved practices, supporting findings by (Chavula *et al.* 2022) [6]. Communication channels such as radio, village meetings, and field days were effective, reflecting the continued importance of face-to-face methods in rural areas. However, awareness of digital tools and private-sector opportunities remained limited, aligning with observations by Kalogiannidis & Syndoukas, (2024) [14]. Overall, information dissemination systems in Shangombo District were functional but needed expansion to cover technological and private-sector innovations. Regarding crop yields, 76.9% of farmers reported increases after accessing agricultural services. Among these, 74.3% experienced yield gains of 10–20%, 44.3% reported gains of 21–30%, and 11.4% achieved increases of 31–50%, while none recorded gains above 50%.

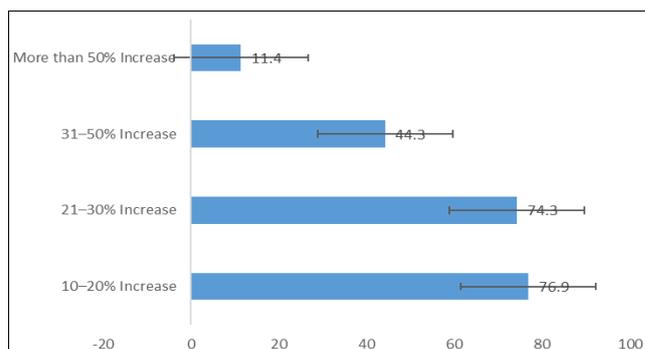


Fig 9: Reported Yield Increases Due to Agricultural Services

The findings demonstrated that agricultural service provision had a positive effect on crop productivity. The observed improvements were largely attributed to the timely access to improved seeds, fertilizers, and extension support through programs such as the Farmer Input Support Programme (FISP). Farmers who benefited from these services reported better crop performance due to enhanced soil fertility management, pest control, and planting techniques. Similar results were observed by Holden &

Fisher (2015) [9], who found that access to agricultural inputs and technical support significantly improved maize yields and household food security in Zambia.

However, the yield gains remained moderate, concentrated within the 10–30% range, suggesting that while agricultural services were effective, several limiting factors constrained their full potential. These included small farm sizes, inconsistent input delivery, limited irrigation facilities, and unpredictable rainfall patterns. Soil fertility degradation and pest infestations also affected productivity levels. Institutional challenges such as delays in input distribution and insufficient follow-up by extension officers further reduced the overall impact of agricultural programs.

The findings also pointed to variability in yield outcomes among farmers, indicating that personal and contextual factors influenced the extent of benefits realized. Farmers with more experience, higher education levels, and greater financial capacity were better positioned to apply inputs correctly and adopt improved practices. Conversely, those with limited experience or resources struggled to fully utilize available services. Kalogiannidis & Syndoukas, (2024) [14] argued that successful agricultural interventions depend not only on access to services but also on farmers' capability to apply knowledge and innovations effectively within their production systems.

In summary, the results revealed that agricultural service delivery programs in Shangombo District contributed meaningfully to crop yield improvement, though the benefits were unevenly distributed. Strengthening program implementation through timely input distribution, continuous extension support, and tailored farmer training could enhance yield outcomes and ensure more equitable productivity gains across all farming groups.

4.4.3 Adoption of Improved Practices

The figure below presents the adoption of improved farming practices among smallholder farmers in Shangombo District. The results showed that agricultural services had a notable impact on the adoption of better farming methods, though the extent of adoption varied by practice. All respondents (100%, n=91) reported adopting conservation agriculture techniques, indicating widespread recognition of their benefits in improving soil fertility, reducing erosion, and sustaining productivity. A substantial number of respondents (81, representing 89.0%) enhanced their record-keeping practices, demonstrating an increasing appreciation for proper documentation of input use, production levels, and sales records as tools for better farm management and access to credit facilities.

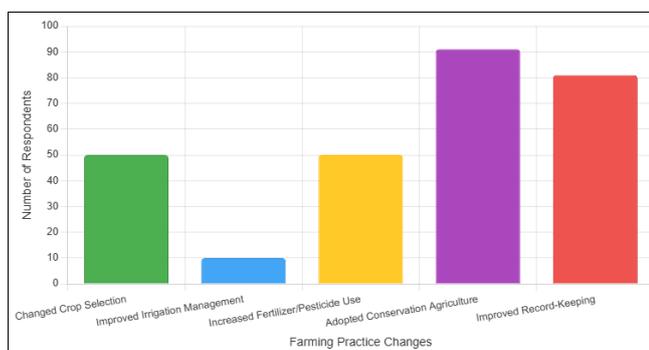


Fig 10: Adoption of Improved Farming Practices

The findings show moderate adoption of improved farming practices, with **54.9%** of farmers adjusting crop choices and a similar proportion increasing their use of modern inputs, indicating a shift toward more market-oriented production. In contrast, irrigation adoption remained very low (**10.9%**), reflecting ongoing constraints related to equipment, finance, and technical capacity. Pest and disease management was identified as a major weakness, with **86.8%** of respondents reporting low confidence in handling outbreaks, highlighting gaps in integrated pest management support. While conservation agriculture practices were widely adopted due to sustained extension efforts and government promotion, limited progress in irrigation and crop protection reduces the overall impact of agricultural services. Strengthening practical training, access to affordable technologies, and targeted advisory support is therefore essential to improve farmer resilience and productivity (Moonga & Qutieshat, 2023) [18].

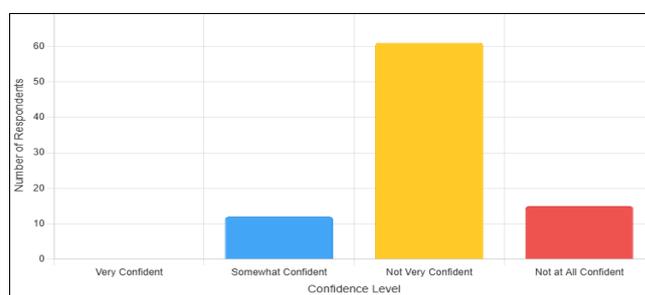


Fig 11: Confidence in Managing Crop Diseases and Pests with Agricultural Services

The findings showed that although many farmers accessed agricultural services, their confidence in managing pests and diseases remained low. Extension services were not adequately addressing practical needs such as pest identification, safe pesticide use, biological control, and early disease detection, leading to continued yield losses. Low confidence was mainly due to limited training, few demonstrations, irregular extension visits, and poor access to affordable agrochemicals. The results highlighted a major gap in pest and disease management within the service delivery system. Strengthening integrated pest management training, increasing extension outreach, and improving access to affordable inputs would significantly enhance farmer capacity. Technology adoption also remained low, with only 40% of farmers adopting new farming practices, while 60% reported no adoption, indicating limited uptake of modern agricultural technologies in the district.

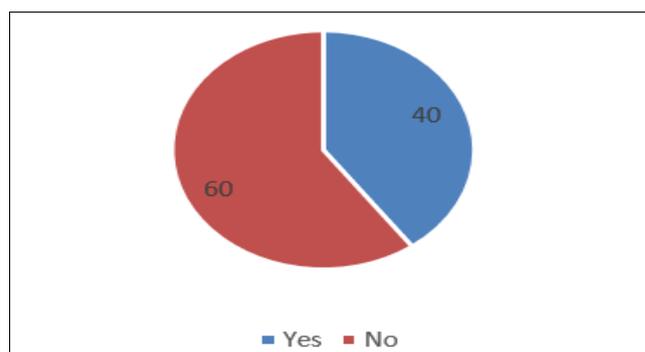


Fig 12: Adoption of New Farming Technologies

The findings showed that adoption of new technologies among smallholder farmers remained low despite the availability of agricultural service programmes. This indicated that service delivery systems had not effectively promoted innovation or technology transfer. Most farmers continued using traditional production methods, with limited uptake of mechanization, precision farming, or digital tools. Low adoption was linked to inadequate training, few demonstration plots, and financial constraints. Farmers who had adopted improved practices credited extension support and cooperative-based learning, while non-adopters cited high costs, limited awareness, and uncertainty about benefits. Holden & Fisher (2015) [9], similarly noted that low investment capacity, weak technical training, and poor access to credit hinder technology adoption in rural Zambia. Although agricultural services successfully provided inputs and basic agronomic guidance, the technological component remained underdeveloped. Strengthening extension capacity to demonstrate innovations such as improved irrigation, digital advisory tools, and pest surveillance systems would enhance adoption. (Kassie *et al.*, 2015) [16], observed that farmers are more likely to adopt new technologies when extension approaches clearly illustrate economic benefits. Overall, the results underscore the need for agricultural services to progress beyond input delivery toward supporting innovation and technology diffusion through stronger partnerships among government, research institutions, and the private sector. Regarding income changes and willingness to recommend services, most farmers reported yield improvements, but household income gains were modest. This suggests that productivity increases did not translate into substantial financial benefits due to limited market access, low produce prices, and rising input costs.

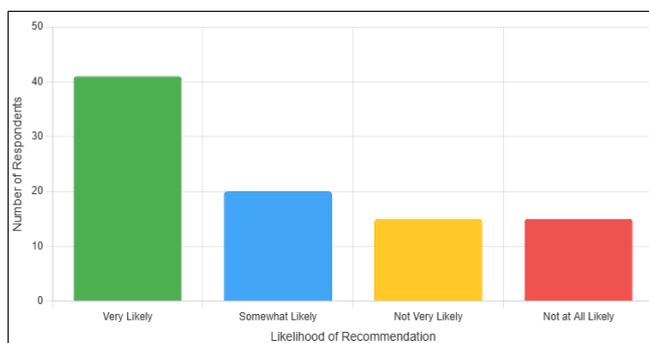


Fig 13: Farmers' Likelihood to Recommend Agricultural Services

When asked whether they would recommend agricultural services to others, 44.6% of respondents stated that they were *very likely* to recommend the programs, 21.7% indicated that they were *somewhat likely*, while 33% expressed hesitation or uncertainty. This reflected mixed perceptions regarding the overall effectiveness of the services. Farmers who benefited from timely input supply and regular extension visits were generally satisfied, while those who experienced delays or limited follow-up expressed frustration with service delivery quality. These perceptions were consistent with findings by Jayne *et al.* (2014) [12], who noted that the success of agricultural programs in Zambia is often undermined by logistical inefficiencies and inconsistent service coverage. Overall, the results indicated that while agricultural services in

Shangombo District positively influenced productivity, their economic impact on household income remained moderate. To enhance effectiveness and farmer satisfaction, there is a need for integrated service delivery that links input provision and training with market access, post-harvest management, and value chain development. Improving these linkages would not only increase incomes but also strengthen farmers' confidence in agricultural service programs, leading to greater participation and positive recommendations within the farming community.

4.5 Challenges Faced in Accessing Agricultural Services

The figure below presents the key challenges encountered by smallholder farmers in accessing agricultural services in Shangombo District. The findings showed that all respondents (100%, n=91) reported facing multiple obstacles, with the most common being high input costs, limited availability of services, lack of awareness, and long distances to service providers. Each of these challenges was mentioned by every respondent, indicating that constraints to agricultural service access were not isolated but widespread across the entire farming community.

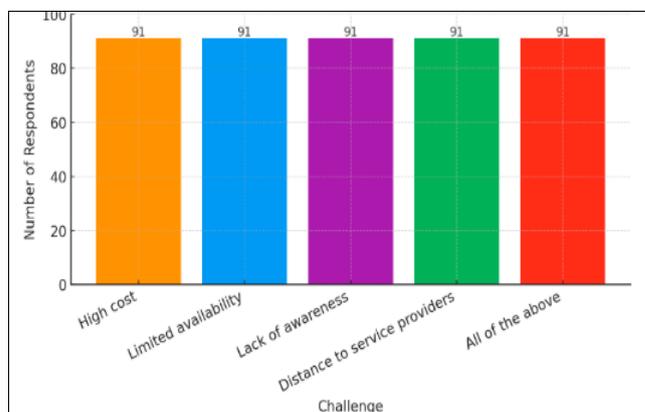


Fig 14: Challenges in Accessing Agricultural Services

High input costs were identified as the most pressing constraint, limiting the ability of farmers to purchase essential inputs such as seeds, fertilizers, and agrochemicals. Limited availability of agricultural services, particularly in remote areas, further compounded these challenges by restricting timely access to extension support and input distribution. Long distances to service centres also discouraged regular interaction with extension officers and delayed adoption of improved practices. Similarly, inadequate awareness of available programs and limited dissemination of information on training schedules or subsidy opportunities hindered participation in agricultural initiatives.

These findings align with observations by Mungoma *et al.* (2023), who noted that geographical isolation and inadequate rural infrastructure continue to limit the reach of agricultural extension systems in Western Province. Comparable challenges were also highlighted by Mulanda & Punt, (2021) [19], who emphasized that even when agricultural services are present, logistical inefficiencies and the high cost of inputs discourage smallholder engagement. Overall, the results indicate that farmers in Shangombo District face significant structural and economic barriers to accessing agricultural services. Overcoming these challenges requires concerted efforts to improve rural

infrastructure, enhance information dissemination, and expand subsidized input programs. Strengthening extension coverage and introducing mobile service delivery models could further reduce spatial barriers, ensuring that smallholders receive timely, affordable, and reliable support. Addressing these systemic constraints would not only facilitate broader service access but also enhance the productivity and resilience of farming households across the district.

4.6 Farmer Satisfaction with Agricultural Services

The feature, below presents the level of farmer satisfaction with the quality of agricultural services in Shangombo District. The study revealed that out of 91 respondents, the majority, 75 farmers (82.4%), expressed a neutral stance regarding the quality of services received. Only 3 respondents (3.3%) reported being somewhat satisfied, while 8 respondents (8.8%) were somewhat dissatisfied. Notably, no respondents (0%) indicated being very satisfied or very dissatisfied.

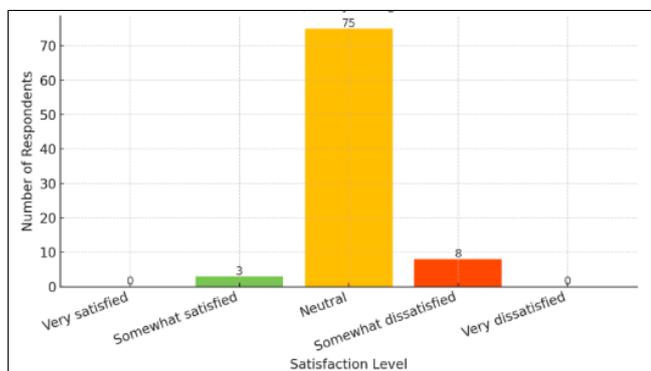


Fig 15: Satisfaction with Quality of Agricultural Services

The results show that agricultural services were generally accessible to most farmers but did not significantly exceed or fall short of their expectations. The predominance of neutrality suggests that many farmers viewed the services as average, neither highly effective nor unsatisfactory. This moderate perception could be attributed to several factors such as delays in input delivery, infrequent extension visits, and limited technical guidance on complex farming aspects like irrigation and pest management.

Those who were somewhat satisfied were likely beneficiaries of timely input supply and more frequent interactions with extension officers, while those somewhat dissatisfied may have faced inconsistent follow-up or delayed assistance. The lack of respondents in the extreme categories (very satisfied or very dissatisfied) suggests that experiences were fairly uniform, with most farmers receiving comparable levels of support.

These findings are consistent with Olorunfemi *et al.* (2020) [23], who observed that in many remote districts, agricultural services tend to emphasize input distribution rather than comprehensive advisory support, limiting farmers' satisfaction levels. Overall, the findings indicate that while the accessibility of agricultural services in Shangombo District has improved, the perceived quality and timeliness remain moderate. Enhancing farmer satisfaction will require improving service responsiveness, ensuring timely input delivery, increasing field monitoring frequency, and incorporating regular feedback mechanisms. Strengthening

these areas could increase farmers' trust in service providers and promote greater adoption of improved farming practices.

4.7 Suggested Improvement Strategies

The illustration, below presents the farmers' proposed strategies for improving agricultural service delivery in Shangombo District. The results revealed that all 91 respondents (100%) identified multiple measures as necessary for enhancing service effectiveness. The most commonly suggested strategies included increased funding (91 respondents, 100%), recruitment of more extension agents (91 respondents, 100%), improved infrastructure (91 respondents, 100%), and greater private sector involvement (91 respondents, 100%). In addition, all respondents also supported a combined approach encompassing all the listed strategies.

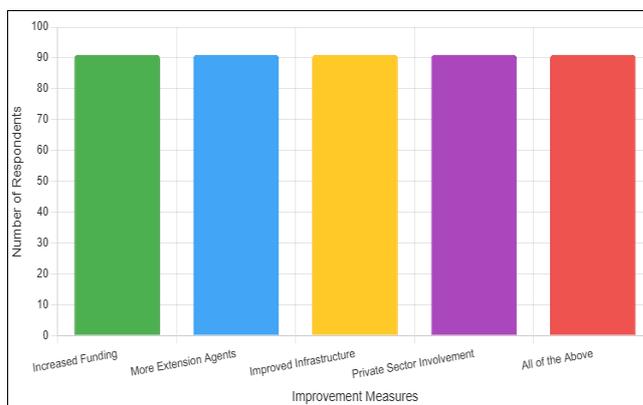


Fig 16: Proposed Improvements for Agricultural Service Delivery in Shangombo District

Farmers showed strong agreement that isolated interventions are inadequate and that a coordinated, multi-sectoral approach is required. Increased government funding was viewed as essential for timely input delivery and improved extension logistics, while recruiting more extension officers was identified as key to strengthening field support. Better rural infrastructure, particularly roads, storage facilities, and communication systems, was considered critical for effective service delivery and market access. Farmers also emphasized the importance of greater private sector participation to improve input supply chains and enhance efficiency. These findings are consistent with Kalogiannidis & Syndoukas, (2024) [14], who highlight the value of partnerships among government, private actors, and community institutions in strengthening agricultural service systems.

The results showed that most farmers were between 31 and 50 years old, had primary education, and possessed 11–20 years of farming experience. Government extension services dominated delivery (94.4%), followed by private actors (78.9%) and cooperatives (63.3%). Input access was highest (56.7%), while credit (26.7%) and extension support (17.8%) remained limited. Although 88.9% of farmers benefited from services and 76.9% recorded yield increases of 10–30%, income gains were minimal due to high input costs, low prices, and weak market linkages. Technology adoption was low (45.1%), and 67% of farmers lacked confidence in pest and disease management. Service challenges included high input costs, long travel distances,

and limited awareness. Satisfaction was mostly neutral (82.4%), reflecting gaps in timeliness and technical support. All farmers recommended increased funding, more extension officers, better infrastructure, and enhanced private sector involvement. Overall, agricultural services improved productivity but were limited in boosting income due to systemic and infrastructural constraints.

5. Conclusion and Recommendations

5.1 Conclusion

The study assessed the effectiveness of agricultural service provision in Shangombo District, focusing on access to credit and input supply. Although agriculture remains the main livelihood source, productivity and incomes are still low due to limited funding, weak infrastructure, and an inadequate number of extension officers despite programmes such as FISP. Most farmers were in the productive age group, had primary education, and possessed substantial farming experience. While 88.9% accessed agricultural services and 76.9% recorded yield increases of 10–30%, income gains remained modest because of high input costs, low market prices, and poor market linkages. Technology adoption was low and farmers reported gaps in pest and disease management support. Satisfaction levels were generally neutral, with services viewed as available but moderate in quality. Key challenges included high input costs, limited-service availability, and poor infrastructure. Respondents unanimously recommended increased funding, more extension staff, improved infrastructure, and greater private sector involvement. Overall, agricultural services positively influenced productivity but had limited impact on income growth, highlighting the need for stronger institutional capacity, better coordination, improved credit access, and enhanced market integration.

5.2 Recommendations

The study recommends increasing government funding to improve timely input delivery and extension logistics, alongside recruiting more extension officers to strengthen advisory support. Improving rural infrastructure such as feeder roads and storage facilities is essential for efficient input distribution and market access. Financial institutions should develop affordable and flexible credit products for smallholder farmers, while cooperatives help guarantee loans. Finally, greater private sector involvement should be promoted through incentives and public–private partnerships to enhance agricultural service delivery.

6. Acknowledgements

The author(s) acknowledge the Information and Communications University and the National Institute of Public Administration (NIPA) for their academic and institutional support throughout the development of this research work.

7. Disclaimer (Artificial Intelligence)

The author(s) affirm that no generative artificial intelligence tools, including large language models (e.g., ChatGPT, Copilot) or text-to-image generators, were used in the preparation, writing, or editing of this manuscript.

8. Competing Interests

The author(s) declare that there are no conflicts of interest regarding the publication of this paper.

9. Authors' Contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

10. References

- Adjognon SG, Liverpool-Tasie LSO, Reardon TA. Agricultural input credit in Sub-Saharan Africa: Telling myth from facts. *Food Policy*. 2017; 67:93-105. Doi: <https://doi.org/10.1016/J.FOODPOL.2016.09.014>
- Birner R, Davis K, Pender J, Nkonya E, Anandajayasekeram P, Ekboir J, *et al.* Defining Pluralistic Agricultural Advisory Services International Food Policy Research Institute sustainable solutions for ending hunger and poverty From “Best Practice” to “Best Fit” A Framework for Designing and Analyzing Pluralistic Agricultural Advisory Services, 2000. www.ifpri.org
- Chapoto A, Jayne TS. Effects of Maize Marketing and Trade Policy on Price Unpredictability in Zambia, 2009. <http://www.aec.msu.edu/fs2/psynindx.htm>
- Chavula P. Climate-Smart Agriculture for Zambia's Smallholder Farmers: Review Paper. *International Journal of Ground Sediment & Water*. n.d.-a; 15, 2022. Doi: <https://doi.org/10.5281/zenodo.5816757>
- Chavula P. Climate-Smart Agriculture for Zambia's Smallholder Farmers: Review Paper. *International Journal of Ground Sediment & Water*. n.d.-b; 15, 2022. Doi: <https://doi.org/10.5281/zenodo.5816757>
- Chavula P, Teresa B, Grace Ntezimana M, Umer Y, Muleba M, Shentema S. An overview of Zambia's Agricultural Extension and Advisory System. In *International Journal of Academic and Applied Research*. 2022; 6. Doi: <https://orcid.org/0000-0002-7153-8233>
- FAO. Monthly Report on Food Price Trends Bulletin #6 GIEWS-Global Information and Early Warning System on Food and Agriculture Key Messages, 2019.
- Hemathilake DMKS, Gunathilake DMCC. Agricultural productivity and food supply to meet increased demands. *Future Foods: Global Trends, Opportunities, and Sustainability Challenges*, 2021, 539-553. Doi: <https://doi.org/10.1016/B978-0-323-91001-9.00016-5>
- Holden ST, Fisher M. Subsidies promote use of drought tolerant maize varieties despite variable yield performance under smallholder environments in Malawi. *Food Security*. 2015; 7(6):1225-1238. Doi: <https://doi.org/10.1007/s12571-015-0511-4>
- Houndjo Kpoviwanou MRJ, Sourou BNK, Ouinsavi CAIN. Challenges in adoption and wide use of agroforestry technologies in Africa and pathways for improvement: A systematic review. *Trees, Forests and People*. 2024; 17:100642. Doi: <https://doi.org/10.1016/J.TFP.2024.100642>
- Ishtiaq M. Book Review Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Thousand Oaks, CA: Sage. *English Language Teaching*. 2019; 12(5):40. Doi: <https://doi.org/10.5539/elt.v12n5p40>
- Jayne TS, Chamberlin J, Headey DD. Land pressures, the evolution of farming systems, and development strategies in Africa: A synthesis. *Food Policy*. 2014; 48:1-17. Doi: <https://doi.org/10.1016/J.FOODPOL.2014.05.014>

13. Jayne TS, Sitko NJ, Mason NM, Skole D. Input subsidy programs and climate smart agriculture: Current realities and future potential. In *Natural Resource Management and Policy* (Vol. 52). Springer, 2018, 251-273. Doi: https://doi.org/10.1007/978-3-319-61194-5_12
14. Kalogiannidis S, Syndoukas D. The Impact of Agricultural Extension Services on Farm Output: A Worldwide Viewpoint. *Research on World Agricultural Economy*. 2024; 5(1):96-114. Doi: <https://doi.org/10.36956/rwae.v5i1.999>
15. Kaoma ON, Mpundu M. The Farmer Input Support Program and Poverty Alleviation in Zambia: The Smallholder Farmer's Perspective Using Intervention and Sustainability Theories. *OALib*. 2023; 10(8):1-20. Doi: <https://doi.org/10.4236/oalib.1110493>
16. Kassie M, Teklewold H, Jaleta M, Marenya P, Erenstein O. Understanding the adoption of a portfolio of sustainable intensification practices in eastern and southern Africa. *Land Use Policy*. 2015; 42:400-411. Doi: <https://doi.org/10.1016/J.LANDUSEPOL.2014.08.016>
17. Liywalii K, Tembo A, Muyabe O, Musenge DC, Mulenga M, Silombe M, *et al.* Evaluating the Efficacy of Neem (*Azadirachta indica*) and Chili (*Capsicum* spp.) Extracts for the Control of Fall Armyworm (*Spodoptera frugiperda*) in Maize (*Zea mays*) Production in Zambia. *Journal of Experimental Agriculture International*. 2026; 48(1):361-374. Doi: <https://doi.org/10.9734/jeai/2026/v48i14009>
18. Moonga BM, Qutieshat A. Analysis of Challenges and Opportunities for Small-Scale Farmers through Input Supply Programs in Zambia. *European Modern Studies Journal*. 2023; 7(2):1-10. Doi: [https://doi.org/10.59573/emsj.7\(2\).2023.01](https://doi.org/10.59573/emsj.7(2).2023.01)
19. Mulanda SM, Punt C. Characteristics of Zambia's agricultural sector and the role for agricultural policy: Insights from CGE modelling. *Structural Change and Economic Dynamics*. 2021; 58:300-312. Doi: <https://doi.org/10.1016/J.STRUECO.2021.06.008>
20. Muyabe O, Musenge DC, Tembo A, Mulenga M, Silombe M, Movwe T, *et al.* Impact of Moringa oleifera L. on Soil Fertility, Resiliency and Crop Productivity for Smallholder Agricultural Systems. *Journal of Experimental Agriculture International*. 2025; 47(12):316-332. Doi: <https://doi.org/10.9734/jeai/2025/v47i123935>
21. Muyabe O, Tembo A, Chisanga Musenge D. An Assessment of Factors Affecting the Adoption of Conservation Agriculture as an Approach to Mitigate the Impact of Climate Change among Smallholder Farmers in Zambia: A Case of Chikankata District. In *Int. J. Adv. Multidisc. Res. Stud.* 2024; 4(4). www.multiresearchjournal.com
22. Muyabe O, Tembo A, Musenge DC, Mulenga M, Silombe M, Chifulo EK, *et al.* The Role of Agroforestry in Sustainable Land Management and Climate Resilience for enhancing Crop Production: A Literature Review. *International Journal of Environment and Climate Change*. 2025; 15(5):131-143. Doi: <https://doi.org/10.9734/ijec/2025/v15i54840>
23. Olorunfemi TO, Olorunfemi OD, Oladele OI. Determinants of the involvement of extension agents in disseminating climate smart agricultural initiatives: Implication for scaling up. *Journal of the Saudi Society of Agricultural Sciences*. 2020; 19(4):285-292. Doi: <https://doi.org/10.1016/J.JSSAS.2019.03.003>
24. Olu Ajayi O, Weldesemayat Sileshi G, Chakeredza S. Local solutions to global problems: The potential of agroforestry for climate change adaptation and mitigation in southern Africa. 2009; 1. <https://www.researchgate.net/publication/275830270>
25. Oshagbemi T. Chapter 4. Research Design and Methodology. *Leadership and Management in Universities*, (2003), 2017, 67-95. Doi: <https://doi.org/10.1515/9783110853681-006>
26. Phiri M, Tembo A, Musenge DC, Muyabe O, Silombe M, Chola E, *et al.* The Impact of Land use Types on Selected Soil Fertility Indicators: A Comparative Study of Natural Forest, Forest Plantation, and Cropland in Ndola District, Zambia. *International Journal of Research Studies in Agricultural Sciences (IJRSAS)*. 2025; 11(1):2454-6224. Doi: <https://doi.org/10.20431/2454-6224.1101003>
27. Robert B, Otton M, Allan T, Chisanga Musenge D, Azekiah NA, Mwenya S, *et al.* An Analysis of Risk Perception and Management Among Smallholder Maize Farmers in Mazabuka District, Southern Province [2015-2017]. *International Journal of Current Science Research and Review*, n.d. Doi: <https://doi.org/10.47191/ijcsrr/V8-i4-05>
28. Saunders MNK, Lewis P, Thornhill A. Research Methods for Business Students. Chapter 4: Understanding research philosophy and approaches to theory development. In *Researchgate.Net*, January 2019. www.pearson.com/uk%0Ahttps://www.researchgate.net/publication/330760964_Research_Methods_for_Business_Students_Chapter_4_Understanding_research_philosophy_and_approaches_to_theory_development
29. Tembo A. Environmental Assessment of Methane (CH₄) Emissions from Different Land Management systems: A case of the Central Chernozem State Biosphere Nature Reserve named after Professor V.V. Alyokhin. *International Journal on Food, Agriculture and Natural Resources*. 2025; 6(1):71-76. Doi: <https://doi.org/10.46676/ij-fanres.v6i1.438>
30. Tembo A, Muyabe O, Musenge DC, Mhango J, Nkomanga GC. Impact of Sustainable Agricultural Practices on Farm Productivity, Yield, and Climate Resilience Among Smallholder Farmers in Zambia. *Journal of Agriculture, Aquaculture, and Animal Science*. 2025; 2(1):30-38. Doi: <https://doi.org/10.69739/jaaas.v2i1.212>
31. Tembo M, Mwanaumo EM, Chisumbe S, Aiyetan AO. Factors affecting effective infrastructure service delivery in Zambia's local authorities: A case of eastern province. In *Supporting Inclusive Growth and Sustainable Development in Africa - Volume II: Transforming Infrastructure Development*. Springer International Publishing, 2020, 65-81. Doi: https://doi.org/10.1007/978-3-030-41983-7_6