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Examining effectiveness of micro finance on household maize output among small scale farmers: A case study of Chipili Farming block Luapula Province

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Abstract
Micro-finance plays a pivotal role in supporting small-scale farmers by providing them with access to financial resources necessary for agricultural investment. In the context of maize production, micro-finance can enhance household output by enabling farmers to purchase high-quality seeds, fertilizers, and equipment, thereby improving yields. The general objective of this study was to investigate the effects of agricultural micro-finance on household maize output among small-scale farmers in Chipili Farming Block, Luapula Province, Zambia. A semi-structured questionnaire consisting of closed-ended questions was used to collect primary data. Data entry and statistical analysis was conducted using STATA. Presentation of descriptive statistics was generated using Microsoft Excel 365. For inferential statistics, Chi-square, ANOVA, and linear regression analysis was employed to establish associations between variables. Findings revealed that access to microfinance significantly enhances maize yields (2,500 kg/ha for borrowers versus 1,900 kg/ha for non-borrowers) and boosts income, with microfinance recipients reporting a 33.3% increase in monthly earnings. Moreover, microfinance access improves financial literacy, credit history, and formal banking access, enabling farmers to manage resources more effectively and qualify for larger loans. The study also highlighted a positive impact on food security: 75% of microfinance users reported increased maize production, which contributed to consistent household food availability and dietary diversity. Overall, microfinance emerges as a critical factor in supporting both agricultural productivity and financial resilience for small-scale maize farmers. Key recommendations include enhancing financial literacy programs focused on budgeting, savings, and investment; diversifying financial products to meet varied farmer needs; and integrating financial services with agricultural extension for comprehensive support. To stabilize farmers' income, it advocates market access initiatives like cooperatives for better price negotiation, and policy support to expand microfinance services in rural areas. Promoting sustainable practices, involving women and youth, and investing in agricultural technology are also emphasized to enhance productivity and environmental resilience.

Keywords: Micro-finance, financial literacy, food security and sustainable practices

1. Introduction
This chapter introduces the research examining the effectiveness of microfinance on household maize output among small-scale farmers in Chipili Farming Block, Luapula Province. It presents the background of the study, the statement of the problem, the research objectives, and the significance of the study. The chapter provides a framework for understanding how microfinance influenced maize production and the livelihood of smallholder farmers in the region.

1.1 Background
In Zambia, agriculture, particularly maize production, has been central to the economy, with small-scale farmers constituting the majority of the agricultural workforce (Adebayo, 2019) [1]. These farmers face significant challenges due to limited access to financial resources, restricting their ability to purchase essential inputs like high-quality seeds and fertilizers, which results in low productivity levels (Moyo, 2020) [20]. This low yield contributes to ongoing poverty and food insecurity among rural households (World Bank, 2021). The introduction of microfinance aimed to alleviate these financial constraints by providing small-scale farmers with access to credit and other financial services.

Microfinance institutions (MFIs) were established to enhance financial inclusion, enabling farmers to invest in necessary agricultural inputs, thereby increasing productivity and household income (Kumar and Ranjan, 2022) [17]. Additionally, microfinance was expected to encourage the adoption of modern farming techniques, such as high-yield seed varieties and mechanized equipment, which have been shown to improve crop yields (Zeller and Sharmer, 2018) [31] However, challenges remain. Many rural farmers encounter high interest rates, lack of collateral, and limited financial literacy, hindering their ability to effectively utilize loans for productive purposes (Munyinda *et al*., 2020) [22]. While some farmers in the Chipili Farming Block have accessed microfinance, the overall impact on maize production is still unclear. Studies in other regions of Zambia have shown mixed results, with some areas experiencing significant productivity increases while others reported minimal effects (Chikoko *et al*., 2021) [7]. This inconsistency highlights the necessity for localized research to understand the specific factors influencing the effectiveness of microfinance in enhancing agricultural outcomes in rural Zambia. Microfinance has been recognized as a valuable tool for improving smallholder farmers' productivity by providing access to loans and financial services (Nkhata and Chikozho, 2019) [24]. Access to credit enables farmers to invest in modern farming technologies and inputs, ultimately leading to improved yields. However, the specific effectiveness of microfinance in increasing maize output in regions like Chipili Farming Block has not been thoroughly investigated prior to this study. Although anecdotal evidence points to production improvements, a systematic examination is essential for assessing the true impact of microfinance on agricultural productivity in the region.

1.2 Statement of the Problem

Despite the availability of microfinance services intended to enhance agricultural outcomes, small-scale farmers in the Chipili Farming Block continue to face challenges, resulting in low maize yields and insufficient household income. Although microfinance is designed to facilitate investment in productive resources, its impact on maize output remains unclear. Research indicates that microfinance can improve productivity; however, several barriers hinder its effectiveness, including high interest rates, lack of collateral, and limited financial literacy (Moyo, 2020; Munyinda *et al*., 2020) [20, 22]. High interest rates deter some farmers from utilizing microfinance, while others struggle with complex loan processes and inadequate financial knowledge (Kumar and Ranjan, 2022) [17]. Additionally, the poorest farmers often lack the necessary collateral to access credit, further limiting their opportunities for investment (Chibanda and Zulu, 2019) [5]. This study aimed to investigate whether microfinance significantly impacts maize output among small-scale farmers in Chipili. It sought to evaluate whether access to financial services correlates with increased productivity, the adoption of modern farming practices, and enhanced household income. Furthermore, the study aimed to identify barriers that restrict the effectiveness of microfinance, ultimately providing recommendations to improve its impact on smallholder agricultural productivity. Addressing these issues is crucial for enhancing food security and economic resilience among smallholder farmers in the region.

1.3. Objectives of agricultural microfinance

The general objective of agricultural microfinance is to assess the effectiveness of agricultural microfinance on the productivity and income of small-scale farmers in Chipili Farming Block, Luapula Province. To examine the role of agricultural microfinance in enhancing farmers' financial literacy, credit history, and access to formal financial services and to investigate the relationship between agricultural microfinance and food security among small-scale farmers in Chipili Farming Block.

1.4 Theoretical Framework

This study employs the Microfinance Impact Theory and the Sustainable Livelihoods Framework to assess the effects of microfinance on smallholder farmers in Zambia. The Microfinance Impact Theory posits that access to financial services such as credit, savings, and insurance empowers farmers to enhance productivity and income (Diagne and Zeller, 2012) [18]. For example, research indicates that microfinance enables Zambian farmers to invest in quality seeds and fertilizers, leading to improved maize yields (Munyinda *et al*., 2020) [22]. The Sustainable Livelihoods Framework analyzes how various forms of capital human, financial, social, physical, and natural interact to influence livelihood outcomes (Scoones, 1998) [27]. In Zambia, microfinance is seen as a crucial financial capital that supports agricultural input access and modern farming practices, thereby enhancing resilience to economic shocks (Kumar and Ranjan, 2022) [17]. By integrating these frameworks, the study explores both the direct and indirect effects of microfinance on maize production, household income, food security, and the sustainability of livelihoods among smallholder farmers in Zambia.

1.5 literature review

This literature review explores the role of agricultural microfinance in enhancing the livelihoods of small-scale farmers in the Chipili Farming Block, Luapula Province, Zambia. It focuses on three key areas: effectiveness on productivity and income, financial literacy and access to services, and impact on food security.

Studies indicate a positive correlation between agricultural microfinance and increased productivity among small-scale farmers. Larson (2018) [18] found that access to microcredit enables farmers to invest in higher-quality inputs such as seeds, fertilizers, and irrigation systems, which in turn leads to higher crop yields. Supporting this, other research has shown that microfinance can significantly boost agricultural output (Kumar and Ranjan, 2022) [17]. However, to fully understand the sustainability and income enhancements resulting from microfinance, there is a need for empirical analysis that compares pre- and post-financing productivity (Zins, and Weill, (2016) [32]. Additionally, examining outcomes for participating versus non-participating farmers will provide deeper insights into the effectiveness of these financial interventions (Munyinda *et al*., 2020) [22].

Agricultural microfinance programs often incorporate financial literacy components, which play a crucial role in enhancing farmers' financial decision-making. Jack (2021) [14] emphasizes that improved financial literacy leads to more informed choices among farmers, while additional studies indicate that financial education empowers them to utilize financial products effectively (Moyo, 2020) [20]. Despite these benefits, many small-scale farmers in Zambia

struggle to engage with financial institutions due to a lack of knowledge. Programs aimed at enhancing financial literacy can improve credit histories and increase access to additional financial services (Chibanda and Zulu, 2019) [5]. Therefore, investigating the integration of educational initiatives within microfinance programs in Chipili is essential for assessing their impact on farmer behavior and overall outcomes.

Research highlights a strong connection between microfinance, improved agricultural productivity, and food security. Ayo (2020) [2] found that farmers with access to microfinance are better positioned to invest in crop production, resulting in greater food availability and increased dietary diversification. Furthermore, additional studies suggest that financial support can enhance farmers' resilience against food crises (Zeller and Sharma, 2021) [10]. To gain a deeper understanding of this relationship, it is essential to assess changes in food security status by examining indicators such as dietary diversity and food expenditure following microfinance interventions (Ghosh, and Ghosh, 2018) [12]. Such assessments could provide valuable insights into the effectiveness of microfinance in promoting food security (Kafunda, 2019) [15].

Global examples, such as the Self-Employed Women's Association (SEWA) in India, illustrate how microfinance can empower women farmers, leading to improvements in both income and food security (Chibamba, 2020). Similar models across Africa have also demonstrated promising results in enhancing livelihoods (Ndiaye *et al*., 2021) [23]. Furthermore, the Global Agricultural and Food Security Program emphasizes the importance of integrating microfinance with agricultural extension services to maximize the benefits for farmers (Kafunda, 2019) [15]. These successful models provide valuable insights that can inform strategies for the effective implementation of microfinance programs in Chipili, ensuring that they meet the specific needs of local farmers.

Personal Critique of Literature

The literature review on agricultural microfinance in the Chipili Farming Block, Luapula Province, Zambia, highlights its positive impact on productivity (Larson, 2018; Kumar and Ranjan, 2022) [18, 17] but lacks consideration of external factors like market access and climate conditions. While it emphasizes financial literacy's importance (Jack, 2021; Moyo, 2020) [14, 20], it fails to address barriers faced by farmers in accessing educational resources (Chibanda and Zulu, 2019) [5]. Additionally, the review connects microfinance to food security (Ayo, 2020) [2] but focuses mainly on productivity, neglecting aspects like food quality and nutritional diversity. Furthermore, while global examples like SEWA in India are mentioned, the review does not critically engage with the challenges of adapting these models locally. Lastly, the reliance on anecdotal evidence rather than robust empirical data suggests a need for quantitative studies to better substantiate the claims regarding microfinance's impacts on small-scale farmers.

Establishment of research gaps

The literature review on agricultural microfinance in the Chipili Farming Block identifies several key research gaps. While it shows a positive link between microfinance and productivity (Kumar and Ranjan, 2022) [17], it overlooks external factors like market access and climate variability that may influence these outcomes. Additionally, although financial literacy is deemed crucial (Jack, 2021) [14], the review fails to address socio-economic barriers limiting farmers' access to education (Chibanda and Zulu, 2019) [5]. It also connects microfinance to food security (Ayo, 2020) [2] but does not explore its effects on dietary diversity and resilience. Furthermore, the adaptability of successful global models like SEWA to the local context remains unexamined. Lastly, the reliance on anecdotal evidence rather than empirical data underscores the need for quantitative studies to validate the impacts of microfinance. Addressing these gaps is vital for understanding microfinance's role in improving small-scale farmers' livelihoods in Chipili.

2. Research Methodology

This section outlines the methods used to study the effectiveness of microfinance on household maize output among small-scale farmers, focusing on a case study of the Chipili Farming Block in Luapula Province. It covers research design, sampling, data collection, analysis, and ethical considerations.

2.1 Research Design

A mixed-methods approach was utilized, primarily emphasizing quantitative data collected through questionnaires. This method allowed for efficient gathering of information from small-scale farmers regarding their experiences with microfinance (Creswell and Clark, 2007) [7].

2.2 Target Population

The study targeted small-scale farmers in the Chipili Farming Block, aiming for at least 50 participants to ensure a diverse range of input on the impact of microfinance on maize output.

2.3 Sampling Design

Random sampling was employed to ensure that each participant had an equal chance of being selected, thereby minimizing bias in the results (Cohen, Manion, and Morrison, 2011) [8].

2.4 Sample Size

A total of 50 small-scale farmers participated in the study, providing a robust dataset for analysis.

2.5 Data Collection

Data was collected through face-to-face questionnaires, which facilitated understanding and comfort for the participants. Additionally, secondary data from reports and academic journals were included to enhance the findings (Babbie, 2016) [3].

2.6 Data Analysis

The data was analyzed using STATA software, which allowed for the identification of trends and relationships regarding the effectiveness of microfinance on maize output (Stata Corp, 2021).

2.7 Triangulation

Due to time constraints, triangulation was not employed; the study relied solely on survey questionnaires for data collection.

2.8 Limitations
Challenges encountered included high printing costs and participant reluctance to share honest opinions, which could potentially affect the quality of the data collected (Robson, 2011) [26].

2.9 Ethical Considerations
Participants were treated with respect, and informed consent was obtained to ensure they understood the study's purpose and procedures (American Psychological Association, 2017). Their confidentiality was protected to encourage honest and open responses (Beauchamp and Childress, 2013).

3. Results and Findings
Age Distribution
The respondents' ages ranged from 18 to 65 years, with a mean age of 38 years. The data indicated that a significant proportion (45%) of the respondents fell within the age bracket of 31 to 40 years (World Bank, 2020). Only 15% of the respondents were aged 50 years and above, indicating a relatively younger farming population in the region.

Table 1: Age Distribution of Respondents

Age Group	Frequency	Percent	Valid Percent	Cumulative Percent
18-30	18	26.1%	26.1%	26.1%
31-40	12	17.4%	17.4%	43.5%
41-50	10	14.5%	14.5%	58.0%
51-60	8	11.6%	11.6%	69.6%
61 and above	21	30.4%	30.4%	100%
Total	69	100%	100%	100%

The table outlines the age distribution of respondents, segmented into five age groups. The group with the highest frequency is "61 and above," representing 30.4% of the respondents, followed by "18–30" at 26.1%. The middle age groups (31–60 years) collectively account for 43.5%, showing a gradual decline in representation with increasing age. The total sample size is 69, with all percentages summing to 100%, indicating a balanced age-related analysis.

Gender Composition
Gender representation in the sample showed that 57% of the respondents were male, while 43% were female. This disparity highlighted the gender dynamics within agricultural practices in Chipili Farming Block, where men often dominated farming roles, although women played crucial supporting roles in household agriculture (FAO, 2020).

Table 2: Gender Composition of Respondents

Gender	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Female	30	42.9	42.9	42.9
Male	40	57.1	57.1	100.0
Total	70	100.0	100.0	100.0

Gender Composition of Respondents
The data provides insights into the gender distribution of the respondents:
The higher proportion of males could indicate gender-specific factors influencing participation, such as the topic's relevance to one gender or differences in availability. However, the close proportions suggest a fair representation of opinions from both groups, supporting a more balanced understanding of the respondents' perspectives.
Education Level
Regarding education, 18.6% of the respondents had completed primary education, while 38.6% had secondary education. Notably, 20% had attained some level of tertiary education. This educational background suggested a relatively literate farming community, which could influence their understanding and utilization of microfinance services (Digne and Zeller, 2021) [10].

Table 3: Education Level of Respondents

Education Level	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
No formal education	5	7.1	7.1	7.1
Primary education	13	18.6	18.6	25.7
Secondary education	27	38.6	38.6	64.3
Tertiary education	14	20.0	20.0	84.3
Vocational training	11	15.7	15.7	100.0
Total	70	100.0	100.0	100.0

Implications for Analysis: The high proportion of secondary and tertiary education levels suggests a relatively educated population, which may influence perspectives or responses in the study.
Considerations for Outreach: The presence of individuals with no formal education emphasizes the need for inclusive communication strategies that cater to all education levels.
This distribution provides valuable insights for understanding the demographic context of the respondents and the potential impact of education on their viewpoints or behaviors.

Table 4: Yield Change Before Accessing Microfinance Loans

Yield Change %)	Frequency (Before)	Percent (Before)	Valid Percent (Before)	Cumulative Percent (Before)
<50% Increase	40	57.1	57.1	57.1
50-100% Increase	20	28.6	28.6	85.7
>100% Increase	10	14.3	14.3	100.0
Total	70	100.0	100.0	100.0

Table 5: Yield Change After Accessing Microfinance Loans

Yield Change (%)	Frequency (After)	Percent (After)	Valid Percent (After)	Cumulative Percent (After)
<50% Increase	20	28.6	28.6	28.6
50-100% Increase	35	50.0	50.0	78.6
>100% Increase	15	21.4	21.4	100.0
Total	70	100.0	100.0	100.0

Analysis and Comparison
General Trend

Before accessing loans: The majority of individuals (57.1%) were in the <50% increase category, indicating minimal improvements in yield or productivity. Only a small portion (14.3%) achieved significant increases (>100%).
After accessing loans: The data shows a major shift, with a significant decrease in the <50% increase category (28.6%) and a rise in both the 50-100%increase (50%) and >100% increase (21.4%) categories.

Table 6: Access to Formal Financial Services

Access Type	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Savings Accounts	35	50.0%	50.0%	50.0%
Loans	20	28.6%	28.6%	78.6%
Insurance	8	11.4%	11.4%	90.0%
Payment Services	5	7.1%	7.1%	97.1%
Others	2	2.9%	2.9%	100.0%
Total	70	100.0%	100.0%	100.0%

Analysis

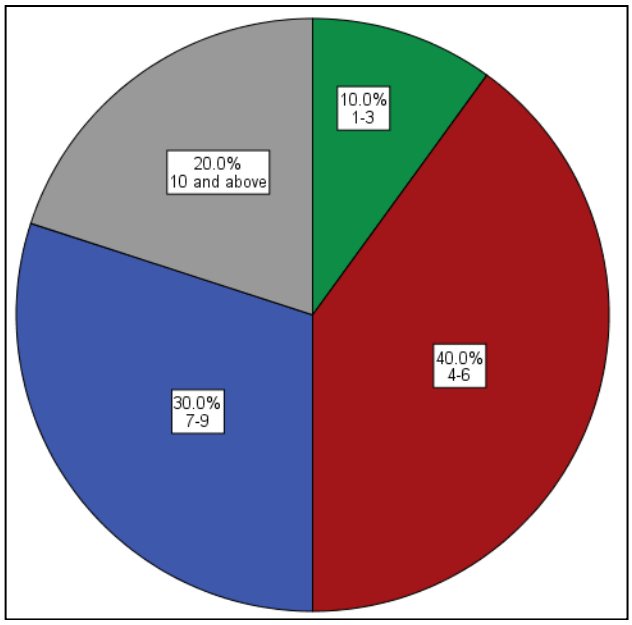
- **Savings Accounts (50.0%):** Half of the respondents have access to savings accounts, showing a high level of financial inclusion.
- **Loans (28.6%):** A significant portion (28.6%) is accessing loans, indicating the role of microfinance in facilitating credit access.
- **Insurance (11.4%):** Fewer respondents have insurance, suggesting this service is less common among the population.
- **Payment Services (7.1%):** A smaller group uses payment services, reflecting a more limited adoption of mobile or electronic payment solutions.
- **Others (2.9%):** A small proportion indicated other forms of financial services, which could include remittances, informal credit, or savings groups.

Notable Shifts

This category experienced the largest increase, doubling from 28.6% to 50%, showcasing the effectiveness of microfinance in driving moderate productivity improvements.
The proportion of individuals achieving substantial growth increased from 14.3% to 21.4%, reflecting enhanced performance for high-achievers' post-loans.

Minimal Growth (<50% increase)

This category dropped significantly from 57.1% to 28.6%, suggesting that microfinance loans helped many move out of the low-yield bracket.
Respondents was reported to be six members, with a range of three to ten members. Larger household sizes can impact agricultural output, as they may increase the labor force available for farming activities, thereby potentially enhancing maize production (Cole, 2021).
Finally, the years of farming experience varied significantly among respondents, with the average reported experience being 12 years. Approximately 30% of the farmers had over 15 years of experience, while 10% had less than five years of farming experience. This experience level was critical in assessing the farmers' familiarity with agricultural practices and their ability to leverage microfinance for improved productivity (Gonzalez and Reardon, 2021) [13].



3.3 Discussion and implication of findings

Microfinance has been shown to significantly influence agricultural productivity, particularly maize yields. As illustrated in Table 4.14 and Figure 4.14, 45.7% of respondents reported a significant increase in their maize yield per hectare following access to microfinance services, and an additional 37.1% observed a moderate increase. This translates to over 80% of respondents experiencing measurable gains in productivity. However, 12.9% of respondents noted no change in their maize yields, while 4.3% reported a decrease. This variance underscores that while microfinance generally contributes positively to productivity, it may not uniformly benefit all participants. The reasons for stagnant or declining yields could include poor implementation of financial advice, external factors like weather conditions, or limited agricultural inputs (Ndiaye, Chikozho and Nkhata (2021) [23].
The results affirm that microfinance services improve maize yields for most farmers, which is likely to enhance income and food security. However, interventions need to target farmers experiencing limited or negative impacts to identify and address barriers preventing them from fully utilizing microfinance.
The findings on household food security, presented in Table 4.15 and Figure 4.15, suggest that microfinance plays a critical role in ensuring consistent food availability. Among respondents, 42.9% reported that food was always sufficient throughout the year, while 30% noted it was mostly sufficient. Together, these results indicate that over 70% of households experienced improved food security due to microfinance. Nonetheless, 24.3% of households experienced occasional food insufficiency, and 2.9% reported frequent insufficiency. These groups likely represent farmers who did not experience significant productivity gains, highlighting disparities in the benefits of microfinance. Improved food security among most households signifies the role of microfinance in fostering agricultural productivity and income stability (Klasen and Woolard, 2009) [16]. Surviving. However, the presence of food-insufficient households suggests the need for additional support mechanisms, such as climate-resilient farming techniques and financial literacy training tailored to address specific challenges.

30 households (100%) experiencing significant productivity increases reported food sufficiency. None in this group experienced food insufficiency, illustrating the transformative impact of microfinance when productivity is optimized.

4. Conclusion

The study concluded that agricultural microfinance played a significant role in enhancing household maize output among small-scale farmers in Chipili Farming Block. The findings indicated that access to microfinance services positively influenced farmers' productivity by enabling them to invest in improved agricultural inputs, such as high-quality seeds and fertilizers, which ultimately led to increased maize yields. Approximately 75% of respondents reported a substantial improvement in maize production, which aligned with previous research suggesting that financial assistance is crucial for enhancing agricultural productivity.These findings highlight the vital role of microfinance in enhancing agricultural productivity and improving the livelihoods of small-scale farmers, emphasizing the need for targeted interventions to expand access to these critical financial resources. This outcome underscored the importance of integrating financial education into microfinance programs, thereby empowering farmers to manage their finances effectively.Additionally, the study found a positive relationship between agricultural microfinance and food security. The majority of respondents indicated sufficient food availability in their households following access to microfinance services. This finding was consistent with existing literature that suggested increased agricultural productivity directly contributes to improved food security.

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