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Assessing the Effects of Agricultural Systems on Smallholder Farmers: A Case Study of Chavuka Ward, Milanzi Constitutency of Katete District in Eastern Province of Zambia

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Abstract

Agriculture in Katete district is predominantly a smallholder, rain-fed system focus on maize cultivation, groundnuts, soybeans and sunflower. Faced with climate variability and soil degradation, the district is aggressively transitioning towards Climate-Smart Agriculture and crop diversification for example soybeans and sunflower. Katete District in Eastern Province is an agriculture-driven economy where approximately 95% of residents rely on small-scale, rain-fed farming for their livelihoods. The core of this system historically revolves around maize as the primary staple food, supplemented by cash crops such as groundnuts, sunflower, and soybeans.

The traditional agricultural system in Katete district faces significant vulnerabilities. Heavy reliance on rain-fed, maize-based monocropping has led to soil fertility depletion, deforestation, and high susceptibility to drought. Furthermore, limited farm sizes, restricted access to formal extension services, and lack of agro-processing infrastructure constrain productivity. According to Zambian Statistics Agency (Zamstats) explained that about 27.1% of farmers in Katete District are able to access the farm inputs out of 96, 132 farmers registered in the district under farmer registration by 2021/2022 farming season. In addition to low access to finance by farmers, was due to high illiteracy levels and small land cultivation which hampers agricultural development in Katete district. Lack of access by farmers to agricultural extension delivery services coupled with poor farm inputs distribution have led to poor agricultural production and productivity in the study area.

The agricultural systems in Katete District are shifting from traditional, land-expensive maize farming to sustainable, climate-resilient practices. Successful adoption of these modern systems, paired with targeted farmer education and cooperative support, is vital for mitigating environmental degradation, ensuring regional food security, and improving household income. Addressing these problems requires a comprehensive approach that includes improving access to modern inputs and technologies, enhancing financial services for smallholder farmers, and ensuring the efficient equitable implementation of government support program.

Keywords: Agriculture Systems, FISP, Gross Domestic Product, Zambia Central Statistical Office, Climate-Smart Agriculture, Financial Services

Introduction

Background

Agriculture is a critical sector in Zambia, contributing approximately 20% to the national Gross Domestic Product (GDP) and providing employment to about 70% of the population (Zambia Ministry of Agriculture, 2024). Despite its significance, the agricultural sector faces numerous challenges that hinder its full potential and threaten the livelihoods of smallholder farmers, particularly in regions like Katete District in the Eastern Province. The existence and magnitude of these challenges underscore the urgent need for a comprehensive assessment and intervention. In Katete District, the agricultural system is predominantly characterized by smallholder farming, which relies heavily on rain-fed agriculture. This reliance makes the region particularly vulnerable to climatic variability and extreme weather events such as droughts and floods. According to the Zambia Meteorological Department, the country has experienced increasing frequency and intensity of droughts, which have severely

impacted crop yields and livestock productivity (ZMD, 2022). In the 2023/2024 farming season, for instance, the prolonged dry spells resulted in a 60% reduction in maize production nationwide (FAO, 2021), a staple crop that is crucial for food security in Katete.

The magnitude of the problem is further exacerbated by limited access to modern agricultural inputs and technologies. A significant proportion of farmers in Katete District lack access to improved seed varieties, fertilizers, and irrigation systems, which are essential for enhancing productivity. Data from the Central Statistical Office (CSO) indicates that only 25% of farmers in the Eastern Province have access to improved seeds, and less than 10% use fertilizers regularly (CSO, 2020). This low adoption rate of modern inputs contributes to the persistently low agricultural yields and income levels among smallholder farmers. Access to finance is another critical issue that hampers agricultural development in Katete District. Smallholder farmers often struggle to obtain credit due to the lack of collateral and the high-interest rates charged by financial institutions. According to the Zambia National Farmers Union (ZNFU), only 15% of smallholder farmers in the region have access to formal financial services (ZNFU, 2019). This limited access to finance restricts their ability to invest in productivity-enhancing technologies and practices, perpetuating a cycle of low productivity and poverty.

The Farmer Input Support Programme (FISP) has been implemented by the government to address some of these challenges by providing subsidized inputs to smallholder farmers. However, the effectiveness of FISP has been called into question due to issues such as inefficiencies in distribution, corruption, and unequal access among farmers. A study by Mason and Ricker-Gilbert (2013) found that while FISP has led to some increases in maize production, the overall impact on poverty reduction and food security has been limited due to these implementation challenges. The prevailing situation in Katete District is thus characterized by low agricultural productivity, high vulnerability to climate change, and inadequate access to essential resources and services. These issues collectively contribute to food insecurity and hinder economic development in the region. Addressing these problems requires a comprehensive approach that includes improving access to modern inputs and technologies, enhancing financial services for smallholder farmers, and ensuring the efficient and equitable implementation of government support programs.

In light of these challenges, there is a pressing need for a thorough assessment of the agricultural systems in Katete District. This research aims to identify the key barriers to agricultural productivity and sustainability, evaluate the effectiveness of existing support programs, and propose actionable recommendations for improving the agricultural sector. By addressing these issues, the research seeks to contribute to the development of a more resilient and productive agricultural system that can enhance food security and livelihoods in Katete District and beyond.

Significance of the Study

This study on assessing Zambia's agricultural system in Katete district, Eastern Province, holds significant importance in several key areas: practice, policy-making, and knowledge base development. The findings of this study will provide practical insights into the current state of agricultural practices in Katete district. By analysing the socio-economic characteristics of farmers, evaluating crop and animal production systems, and identifying agricultural risks, the study will highlight the challenges and opportunities faced by smallholder farmers. This knowledge can be used to guide agricultural extension services and training programs, helping farmers adopt sustainable farming practices and improve productivity. Insights into the access to finance and effectiveness of support programs like the Farmer Input Support Programme (FISP) will aid in designing targeted interventions to enhance agricultural resilience and livelihoods. The study will contribute valuable evidence for policy-makers and stakeholders involved in agricultural development in Zambia. By evaluating the implementation and effectiveness of the FISP and other agricultural support programs, the study will identify gaps and inefficiencies in policy implementation. Recommendations derived from the study can inform policy revisions and the design of new agricultural policies aimed at promoting sustainable agricultural practices, enhancing food security, and reducing poverty in rural communities. Insights into the challenges faced by farmers, such as climate change impacts and access to finance, will support the formulation of adaptive and inclusive agricultural policies.

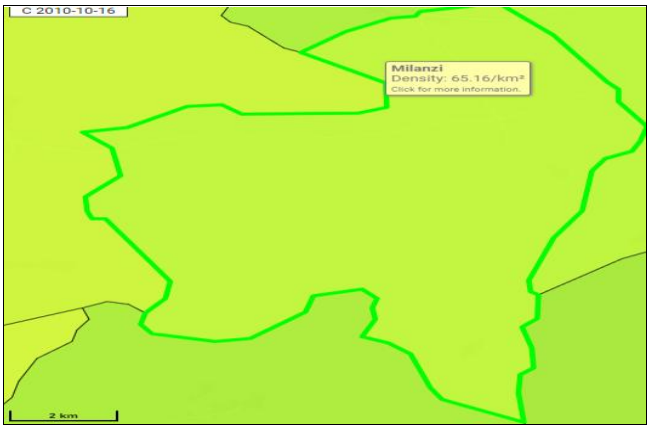
The study will significantly contribute to the knowledge base on agricultural systems in Zambia, particularly in Katete district. By synthesizing current research and generating new empirical data, the study will expand the understanding of the complex interactions between socio-economic factors, environmental conditions, and agricultural productivity. This knowledge will be valuable for future research endeavours, providing a foundation for further studies on sustainable livelihoods, rural development, and agricultural economics in Zambia and similar contexts. The study will also contribute to academic literature, enhancing global knowledge on smallholder farming systems and sustainable development practices.

This study on assessing Zambia's agricultural system in Katete district is of great significance in practice, policy-making, and knowledge base development. By providing practical insights, informing policy decisions, and expanding the knowledge base, the study aims to contribute to sustainable agricultural development, improve livelihoods, and enhance food security in Katete district and beyond. This study will also contribute to the broader academic and development community, offering insights into the challenges and opportunities faced by smallholder farmers in Zambia and providing a foundation for future research and policy interventions in agricultural development.

Methodology

The boundaries of your ward (mapping)

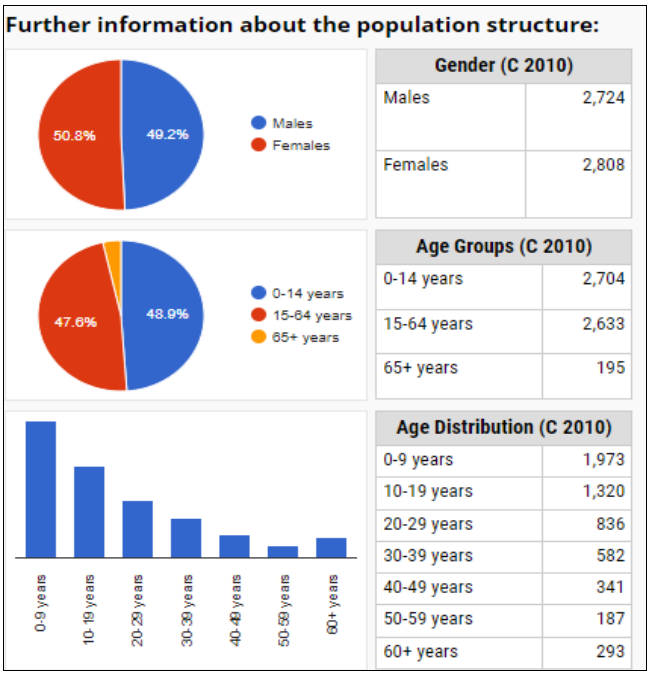
The project will be conducted from Katete district, in Milanzi Constituency Chavuka ward as shown on the mapping attached below.



Source: https://citypopulation.de.

Milanzi Constituency Chavuka ward in Katete district covers an area of approximately 84.90 km² with a population density of 65.16 people per km² according to the 2010 census.

Further information about the Milanzi Constituency population structure: (Note: Zamstats is not yet published 2022 census wards population structures).



Gender (C 2010)	
Males	2,724
Females	2,808

Age Groups (C 2010)	
0-14 years	2,704
15-64 years	2,633
65+ years	195

Age Distribution (C 2010)	
0-9 years	1,973
10-19 years	1,320
20-29 years	836
30-39 years	582
40-49 years	341
50-59 years	187
60+ years	293

Source: Central Statistical Office Zambia (web).

Distribution of the identified institution/households

The distribution of institutions and households in Milanzi Constituency Chavuka ward will be assessed through a comprehensive survey and mapping exercise. Local administrative records and community engagement will be used to identify key institutions such as schools, health centres, and agricultural extension offices. Household distributions will be mapped through a systematic sampling approach, ensuring representation across different geographical areas within the ward. This will provide a basis for understanding the spatial distribution and density of both households and institutions in relation to the agricultural landscape.

Capacity and spread or distribution of the institutions

The capacity and spread of institutions in Chavuka ward will be evaluated through a survey and direct consultation with stakeholders. This will involve assessing the infrastructure, staffing, and service delivery capabilities of institutions such as schools and health centres. Agricultural institutions will be assessed for their capacity to support farmers, including extension services and input supply. This information will be crucial for understanding the support structure available to farmers and the accessibility of agricultural services within the ward.

Population distribution or demographics in your ward

Demographic data for Chavuka ward will be obtained from the latest census and supplemented by field surveys. This will include age distribution, gender composition, educational levels, and household size. Spatial analysis techniques will be used to visualize and interpret demographic patterns, identifying clusters and demographic trends that may influence agricultural practices and outcomes.

Sampling procedure and data collection methods to be used

A stratified random sampling technique will be employed to ensure representativeness across different demographics and geographical areas within Chavuka ward. The sampling frame will be based on the mapped households. Data will be collected through questionnaires that will include both open-ended and closed-ended questions. The questionnaire will be designed to gather information about the participants' views (Farmers), experiences, and perceptions of the Agriculture system in Zambia.

Distribution of questionnaires

Questionnaires will be distributed systematically across sampled households. The questionnaires will cover topics such as socio-economic characteristics, agricultural practices, access to finance, and perceptions of agricultural support programs. The distribution will be monitored to ensure that all sampled households are covered, and efforts will be made to achieve a high response rate.

Ethical issues for consideration in your research

Ethical considerations will be paramount throughout the research process. Informed consent will be obtained from all participants, and their confidentiality and anonymity will be assured. The research will adhere to ethical guidelines for research involving human subjects, ensuring that participants are treated with respect and their rights are protected. The study will also seek permission from local authorities and community leaders before conducting surveys in the ward.

Data processing tools and publication of research results

Upon collecting the questionnaires, the data will be entered into a statistical analysis software program (STATA) for quantitative analysis. The results will be presented in the form of tables, charts, and narratives. Research findings will be published in word documents and transferred into a CD for submission to the course coordinator.

Discussion and Conclusion

The study conducted in Chavuka Ward, Katete District, provides insights into the agricultural practices, challenges, and support systems affecting local farmers. The majority of farmers in the area are engaged in subsistence farming, relying primarily on rain-fed agriculture with limited access to irrigation. This dependency on rain-fed farming exposes them to risks associated with weather variability, particularly excessive rainfall and drought, which were reported as significant challenges affecting crop production.

The demographic profile of the farmers indicates a mean age of 38.5 years, with a majority having completed secondary education. Agriculture serves as the primary source of income for most farmers, and their average farm size ranges from 2 to 7 hectares. Crop production is predominantly rain-fed, and while most farmers practice crop rotation, there are significant challenges such as the destruction of crops due to excessive rainfall during the growing season.

Regarding input support, the study reveals that farmers largely finance their input costs through personal finances, with limited access to loans from banks or other financial institutions. The availability and effectiveness of input support programs were reported as critical factors influencing agricultural productivity. While most farmers receive inputs such as fertilizer and seeds, there are concerns about the timeliness, quantity, and overall effectiveness of these supports in enhancing productivity and reducing poverty.

Efforts to manage agricultural risks, particularly those related to pests, diseases, and weather, are varied. While some farmers depend on natural weather patterns and traditional knowledge, there is a notable gap in formalized risk management strategies. Access to grazing sites and the prevention of animal diseases also emerged as significant challenges for livestock farmers, impacting their productivity and

In conclusion, the study highlights several critical areas for improving agricultural practices and input support programs in Chavuka Ward. Enhancing extension services and improving the dissemination of agricultural knowledge are essential to addressing the gaps in farming practices and mitigating risks associated with weather and pests. Increasing the availability, timeliness, and effectiveness of input support programs, particularly through government interventions, is crucial for improving agricultural productivity and livelihoods.

Furthermore, promoting crop diversification, sustainable farming practices, and effective risk management strategies are recommended to build resilience against climate variability and enhance food security. Policies should focus on addressing the specific needs of farmers in the region, including access to finance, markets, and technology, to support sustainable agricultural development. Overall, addressing these challenges and implementing the recommended strategies will contribute to improving the livelihoods of farmers in Chavuka Ward, fostering agricultural growth, and ensuring food security in the region.

A. Socio-Economic Characteristics of the Farmer

Age of the farmers

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. mean age

Mean estimation                   Number of obs    =         40
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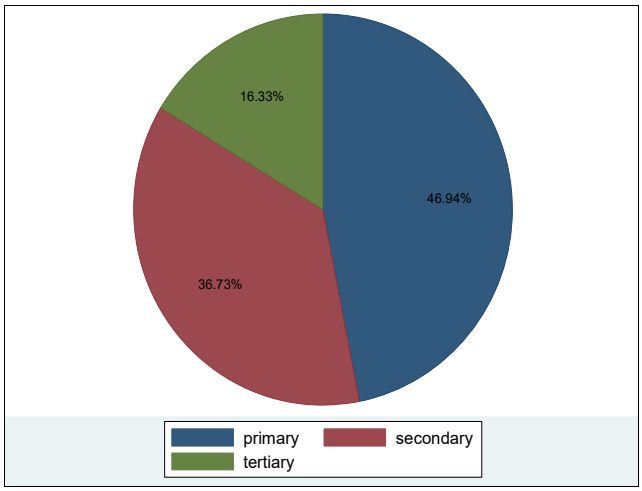
	Mean	Std. Err.	[95% Conf.	Interval]
age	38.5	1.780233	34.89914	42.10086

As shown above, based on the data collected from a sample of 40 out of 50 farmers who participated in the study, the mean age of farmers in Chavuka Ward, Katete District, was estimated to be 38.5 years. The standard error of the mean age estimate was calculated to be 1.780233. The 95% confidence interval for the mean age ranged from 34.89914 to 42.10086 years. This means that we are 95% confident that the true mean age of farmers in the ward falls between these two values. The average age of 38.5 years suggests that the farming population in Chavuka Ward is relatively mature. This demographic profile is important for understanding the experience and knowledge base of farmers engaged in agricultural activities in the area.

Level of Education



As shown on the figure above: The data on the level of education among farmers in Chavuka Ward, Katete District, shows that a significant portion have attained primary education (46.94%), followed by those with secondary education (36.73%). A smaller proportion of farmers have tertiary education (16.33%). This distribution highlights the predominance of basic education levels among farmers, which may influence their agricultural practices, access to information, and ability to adopt modern farming technologies.

B. Crop Production

Farming System

The data on the scale of farming systems among farmers in Chavuka Ward, Katete District, indicates that all respondents (100.00%) practice subsistence farming. This means that farmers primarily grow crops and raise livestock to meet the basic food and household needs of their families, with little surplus for sale or market. Subsistence farming is characterized by small-scale operations, limited use of modern agricultural techniques, and a strong reliance on traditional farming methods. This data underscores the predominance of subsistence agriculture as the main farming system in the ward, highlighting the importance of interventions aimed at enhancing agricultural productivity and food security for rural households.

Do you practice crop rotation?	Freq.	Percent	Cum.
0	1	2.08	2.08
no	2	4.17	6.25
yes	45	93.75	100.00
Total	48	100.00	

C. Animal Production

What type of animal farming do you practice?

What type of animal farming do you practice	Freq.	Percent	Cum.
cattle,chickens	6	12.24	12.24
cattle,dog for security	1	2.04	14.29
cattle,goats	5	10.20	24.49
cattle,goats,chicken,sheep,fish	2	4.08	28.57
cattle,goats,chickens	9	18.37	46.94
cattle,goats,chickens,sheep,dogs	2	4.08	51.02
cattle,goats,fish	2	4.08	55.10
cattle,goats,pigs,chickens	4	8.16	63.27
cattle,goats,sheep	10	20.41	83.67
cattle,pigs	2	4.08	87.76
cattle,pigs,chickens	2	4.08	91.84
cattle,pigs,chickens,dogs,ducks	2	4.08	95.92
cattle,pigs,pigs,chickens,sheep,fish,..	1	2.04	97.96
goats	1	2.04	100.00
Total	49	100.00	

Farmers in Chavuka Ward, Katete District, engage in diverse types of animal farming practices, as indicated by the table above. The most common animal farming type involves cattle and goats, often combined with chickens and sometimes other animals like sheep, pigs, fish, and dogs for security. Specifically, cattle and goats combined with chickens are practiced by 18.37% of farmers, while cattle and goats with sheep are practiced by 20.41%. This diversity in animal farming reflects a strategy of mixed farming, which allows farmers to diversify their income sources and food production. Such practices not only contribute to household food security but also provide opportunities for income generation.

D. Agricultural Risks

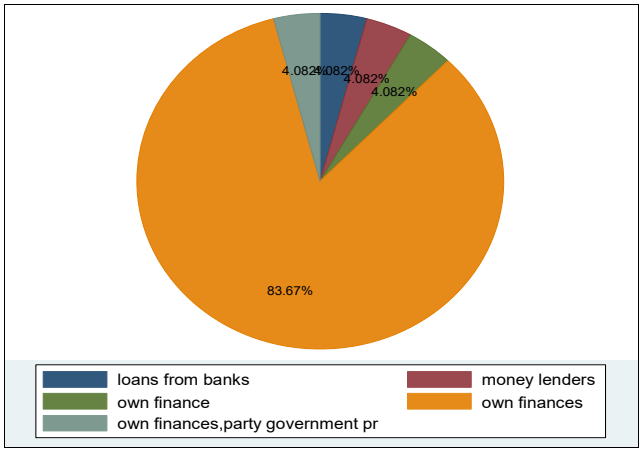
Primary production risks

primary production risks in your area	Freq.	Percent	Cum.
pests	1	2.04	2.04
pests , diseases	1	2.04	4.08
pests,disease,weather,	7	14.29	18.37
pests,diseases	2	4.08	22.45
pests,diseases,lack of access	2	4.08	26.53
pests,diseases,lack of access,share t..	2	4.08	30.61
pests,diseases,weather	31	63.27	93.88
pests,diseases,weather,government giv..	2	4.08	97.96
pests,diseases,weather,lack of access..	1	2.04	100.00
Total	49	100.00	

The data on primary production risks in Chavuka Ward, Katete District, reveals several key challenges faced by farmers in the area. The predominant risk factor reported is a combination of pests, diseases, and weather, accounting for 63.27% of the responses. This highlights that the majority of farmers are contending with multiple concurrent issues that affect their agricultural productivity. A smaller percentage (14.29%) also cited pests, diseases, and weather as their primary risks, underscoring the significant impact of these factors.

E. Access to Finance

How do you normally finance your input costs



The data reveals that the majority of farmers in Chavuka Ward, Katete District, primarily finance their input costs through their own finances, with 83.67% relying on personal funds. A smaller portion of farmers, 4.08%, utilize loans from banks, money lenders, or a combination of own finances and partial government support. This significant dependence on personal funds indicates a potential gap in accessible financial support and services for these farmers, highlighting the need for enhanced financial inclusion and support mechanisms to help farmers manage their input costs more effectively.

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