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An Assessment of Factors Hindering Agricultural Productivity of Smallholder Farmers in Selected Districts of Central and Lusaka Provinces

Collins Mudenda[1*], Isaac Simate[2], Mwape Chileshe[3]

[1]PhD Research Scholar, University of Zambia

[2,3]Lecturer and Researcher, Department of Agricultural Sciences, University of Zambia

*Corresponding Author E-mail: collinsmudenda@ymail.com

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ABSTRACT

The study was conducted to ascertain the factors which are hindering the agricultural productivity of smallholder farmers in Central and Lusaka provinces of Zambia. The study followed a mixed method research design and data was collected from a cluster sample of 112 smallholder farmers in Chipapa village in Lusaka Province, and Shalubala and Musomali villages in Central Province. The data was analysed using arithmetic calculations, descriptive statistics and factor analysis. The results indicate that smallholder farmers live in extreme poverty and their productivity is hindered by lack of access to family land for farming, lack of access to non-bank financial institutions, dependency on rainfall for farming, lack of extension services, lack of social support under the social cash transfer and farmer input support programmes, lack of access to community livestock and credit.

Keywords: *Factor, Poverty, Food, Agriculture, Smallholder.*

INTRODUCTION

Agriculture has the potential to create low and high skilled employment in Zambia, improve household income and food security. The Zambia Statistics Agency (2021) reported that agriculture employs about 25% of the labor force, although Mahawar et al., (2021) found that youth were leaving the agriculture sector in India due to poor technology in pursuit of modernised sectors and quick money. However, the growth of this sector has been constrained by low agricultural productivity exacerbated by the dependency on rain fed agricultural practices (Ministry of Agriculture, 2022), although it has been contributing about 3% towards the Gross Domestic Product (GDP) annually.

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For instance, the Zambia Statistics Agency (2022) reported that the 2021/2022 Crop Forecast Survey revealed that agriculture productivity for most crops produced by smallholder farmers remains relatively low to the extent that maize productivity stood at about 2 ton/ha against an average potential of 8 tons/ha., soya beans was at 0.8 tons/ha against an average potential of 2 to 3 tons/ha. Marketable quality for smallholder irrigated crops has also remained low. Some of the challenges to this predicament include low irrigation, limited knowledge of irrigation options and technologies, uncertain land tenure, limited access to energy and low investment (Millennium Compact, 2022)

The low agriculture productivity has been contributing to hunger and poverty among the citizens. For instance, the Living Condition Monitoring Survey of 2015 placed nationwide poverty at 54.4% and an average of 76% in rural areas (Central Statistics Office, 2016). The nationwide poverty is way above the Southern Africa region of 42% (World Bank, 2021).

Research by Varghese et al., (2021) looking at the COVID-19 era found that poverty soared from 54.4% in 2015 to 55.8% in 2019, and rural poverty soared from 76.5% in 2015 to 79.4% in 2019 while urban poverty declined from 23.3 % to 22.8%. The poverty targets in the Millennium Development Goals remained unmet at the end of the programme since over one billion people were still poor (World Bank, 2022), hence the prioritisation of the Sustainable Development Goals with Goal Number 1 aimed at eradicating poverty and Goal Number 2 aimed at achieving zero hunger by 2030 (United Nations, 2015).

Despite the high level of poverty in rural areas, close to 2,3 million people participate in agriculture, 76.3% of whom are male and 23.7% female and the average household size is between 4 and 6 (Zambia Statistics Agency, 2022). However, Phiri and Mwaanga (2020) found out that women participation in agriculture stood at 35% in 2019 after a decline from 36.7% in 2018 and 38.8 in 2017. Therefore, it is necessary to establish the factors that impede the growth and development of the smallholder farmers.

Study Objective

The main objective of this study was to establish the factors which hinder agricultural productivity of the smallholder farmers in the research areas.

Literature Review

Poverty Situation

Low agriculture productivity drives many nations into poverty (United Nations, 2015), with many millions wallowing in poverty in Sub-Saharan Africa (Tchamyou, 2019) which was evidenced by the 2019 poor comparative performance of Africa and Asia (Nwani & Osuji, 2020). Thus, the moderate and extreme poor were profiled to be based in rural areas (Castaneda et al., 2022).

Poverty can be economic (Singer, 2002); mental (Beitz, 2005; Wight, 1966); *Spiritual* (Oladipo, 2009); *emotional* (Aristotle, 2004) and *social* (De Soysa, 2001) but this paper focus on economic poverty.

Agriculture as the enabler of Food Security

Tvaronviciene (2018) stated that food was a basic human right and agriculture is critical to ensuring food security (Idayanti & Rejeki, 2018). With rising food prices since 2015, Crafton (2015) bemoaned that feeding the world will be challenging and the low to middle-income countries will be worst hit (Urgell-Lahuerta et al., 2021).

Food security is a situation where all people have access to food that meet their dietary intake (Lysons, 2014) and nutritious food to maintain a healthy life (Hulse, 2007). Therefore, productive agriculture can lead to households meeting their food needs without struggle with no starvation and malnutrition (Global Report on Food Crises, 2021). Ali et al., (2021) added that agriculture which is based on better technology such as Direct

Seeded Rice which tend to have less costs associated with transplanting and water requirements can improve food production and contribute to food security.

Factors Affecting Smallholder Farmers

Gichangi et al., (2019) conducted a study in Kenya on factors influencing smallholder farmers, after using Probit regression on data collected from 417 respondents, they found that education and income influenced the use of inputs by the farmers.

Emran et al., (2019) conducted a research in Bangladesh on the rice based farming system and found that farming challenges explained 31% of the variations in productivity and the main factors include effects from cyclone, distance to main roads and input markets, intensity of cropping and extension service provision. On the other hand, asset facilitation and crop management were found to be the productivity enhancement mechanisms.

Tuchitechi and Lee (2018) studied the factors affecting agricultural projects in Malawi regarding extension. They found that farmers' illiteracy, poverty, poor participation, and high dependency syndrome were statistically significant and affected their productivity.

Chowhan et al., (2022) conducted a study in in India in which they found that four crops cropping pattern for rice was affected by high wages, unavailability of labor, unpredictable weather and attacks by pests. A similar study by Mahawar et al., (2021) in India found that the agriculture sector was facing challenges of indebtedness, inadequate government support, land degradation, climate change, poor support and limited related infrastructure hence productivity is impeded.

Ali et al., (2021) argued that agriculture is affected by high costs, limited water and soil quality problems especially when poor technology is employed hence they advocated for the use of Direct Seeded Rice as a cheaper option in rice production.

MATERIALS AND METHODS

Study Area

The study was carried out in Kabwe, Chibombo and Kafue Districts in Central and Lusaka provinces of Zambia, respectively. All the sites are located within 130 kilometers radius of Lusaka, the capital city of Zambia, about 30^0 East of Greenwich.

Research Design

The study followed a mixed method in which both qualitative and quantitative data were collected (Kothari, 2014).

Population and Data Collection

Random cluster sampling was used to collect data from 112 smallholder farmers in three locations: Musomali, Shalubala and Chipapa villages in Central and Lusaka provinces. A structured questionnaire was used as data collection tool.

Sampling Framework

Data were collected by identifying the villages using similar characteristics related to farming as the main economic activity. Therefore, the population of smallholder farmers in the research areas was established to be 155 (Zambia Statistics Agency, 2022).

The sample size was drawn based on Yamane (1967) as follows:

$$n = \frac{N}{1 + N(x)^2} \ldots\ldots equation\ 1$$

Where n = required sample

N = population from which to draw the sample

1 = constant

x = error term taken as 5%

$$n = \frac{155}{1 + 155(5\%)^2} = 112$$

Method of Data Analysis

The collected data were analysed using descriptive statistics and Factor Analysis (Boone and Boone, 2012, in Subedi, 2016). Reliability was tested using Cronbach's Alpha where a statistic above 0.7 represents minimum acceptable reliability (Gliem & Gliem, 2003) although Nawi et al., (2020) stated that a statistic between 0.8 and 0.9 represent good reliability.

Factor analysis was also used in order to identify the most loaded factors based on Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's measure of sphericity. Reddy and Kulshrestha (2019) categorised KMO values as 1 to 0.9 very good, 0.8 to 0.9 good, 0.7 to 0.8 medium, 0.6 to 0.7 reasonable, 0.5 to 0.6 acceptable and less than 0.5 unacceptable. The statistics indicate whether the responses given are adequate and whether the partial correlations are not large compared to the summation of the correlations, thus no difference in the correlation pattern, and if so the factor analysis is deemed good and reliable.

Description of key Questionnaire Variables

Gender (Sex) is a binary nominal variable in which males dominate the agriculture sector (Tamene et al., 2014; Oluwatayo & Rachoene, 2017). Age is a quantitative variable and the majority of smallholder farmers are aged above 45 years (Khoza et al., 2019; Owusu et al., 2017). Level of education is a nominal variable and high level promotes knowledge and understanding of agricultural tactics and methods (Afata et al., 2022; Khoza et al., 2019; Ndlovu et al., 2021; and Oluwatayo and Rachoene, 2017).

Experience in occupation is a quantitative variable which promotes technical efficiency (Ndlovu, et al., 2021; Alemu and Haji, 2016).

Household size is a quantitative variable in which a large family supports production (Mfitumukiza et al., 2020; Oluwatayo & Rachoene, 2017; Kinyondo & Magashi, 2017).

Income is a quantitative variable that improves a family's food choices (Tamene et al., 2014).

Determination of Range for Likert Scale Data

The data collection instrument was made up of Likert and non-Likert scale questions. The Likert questions were based on a scale of 1 to 7 with 1 representing 'Strongly Disagree', 2 representing 'Disagree', 3 representing 'Slightly Disagree', 4 representing 'Neutral', 5 representing 'Slightly Agree', 6 representing 'Agree' and 7 representing 'Strongly Agree'

This scaling led to the development of the range which was classified using 0.86 for classifying responses. The 0.86 was obtained by subtracting 1 from the extreme scale of 7 and divided the result by the number of scales as follows:

$$Constant = \frac{\text{Upper scale} - \text{lower scale}}{\text{Number of Scales}}$$

$$0.86 = \frac{7 - 1}{7}$$

Therefore, 0.86 was added to each scale and 0.01 to each lower bound to distinguish classes. The resulting range is presented in the Table 1.

Table1. Ranges of the Likert Scale

Scale	Lower	Upper	Category
1	1.00	1.86	Strongly Disagree
2	1.87	2.73	Disagree
3	2.74	3.60	Slightly Disagree
4	3.61	4.47	Neutral
5	4.48	5.34	Slightly Agree
6	5.35	6.207	Agree
7	6.217	7.077	Strongly Agree

In order to determine the category in which a response fall, the researchers used mean scores which were obtained from descriptive statistics and thus classified between 'Strongly Agree' (7) and 'Strongly Disagree' (1).

RESULTS

The target sample of 112 smallholder farmers responded and so a response rate of 100% was achieved.

Demographic characteristics

Sex

The majority of the respondents were female (54%). This finding does not agree with the 2017/2018 Livestock and Aquaculture Census by the Zambia Statistics Agency (2018), contradicts that of Tamene et al., (2014) and Oluwatayo and Rachoene (2017) who found that many smallholder practitioners were male.

Age Range

The majority (54%) were aged between 16 and 20 years followed by those aged above 40 years who were 19%. Those aged between 36 and 40 years were 9% while the rest of the age groups were less than 5%, each. This indicates that young people are the majority among smallholder farmers. This finding is consistent with that of Afata et al., (2022) who observed that majority smallholder farmers are aged between 21 and 40, but contradicts findings by Khoza et al., (2019) and Owusu et al., (2017) who found mean ages of 48 and 47, respectively. The reason behind these results could be as a result of the youthful population of Zambia and high youth unemployment which between 1991 and 2022 stood at 22% although for 2022 it closed at 11% (International Labor Organisation, 2023).

Level of Education

The majority (61%) reached Grade 12 followed by Grade 9 (19%). This implies that the smallholder farmers are able to read and write. This finding corroborates those of Khoza et al., (2019) and Ndlovu et al., (2021) who found that most of the smallholder farmers attained secondary education.

Work Experience

The majority (26%) of the smallholder farmers had 1-3 year experience followed by those with over 19 years (21%) and those between 4 and 6 (13%). Most studies have placed smallholder farmer experience above 5 years (Ndlovu et al., 2021), beyond which most smallholder farmers begin to attain technical efficiency (Alemu and haji, 2016).

Family Size

The majority (38%) of the smallholder farmers had a family size between 5 and 6 followed by 7 and 8 (30%). Therefore, the average family size is derived as follows:

$$Average\ family\ size = \frac{sum(class\ midpoint\ x\ frequency)}{sum\ of\ frequency}$$

$$Average\ family\ size = \frac{(1x3) + (3.5x14) + (5.5x43) + (7.5x34) + (9.5x7) + (11.5x6)}{110} = 6$$

This result agrees with that of the 2017/2018 Livestock and Aquaculture Census by the Zambia Statistics Agency (2018) which reported that most households in agriculture had a family size between 4 and 6.

Perception of Poverty

Family food cost per day among food entrepreneurs

Poverty was measured against the World Bank (2022) datum line of living under US $2.15 per person per day. Therefore, average expenditure per day is given as:

$$Average\ expenditure/day = \frac{sum(class\ midpoint\ x\ frequency)}{sum\ of\ frequency}$$

$$Average\ expenditure/day = \frac{(60x52) + (70.5x13) + (90.5x6) + (110.5x3)}{92} = 58.4$$

$$Average\ expenditure/person/day = \frac{average\ expenditure\ per\ day}{average\ family\ size} = x$$

$$average\ expenditure/person/day = \frac{58.4}{6} = 9.7$$

Using the Bank of Zambia foreign exchange rates between April 5th 2023 and January 1st 2021 involving 574 days, the average exchange rate was found to be K18.5 per US$1. Using this exchange rate, the average expenditure per person is derived as follows:

$$average\ expenditure/person/day = \frac{Average\ expenditure\ per\ person/day.}{average\ exchange\ rate}$$

$$average\ expenditure/person/day = \frac{9.7}{18.5} = 0.524$$

This result indicates that smallholder farmers live on US $0.524 per person per day on average which is way below the datum line of $2.15 per person per day. This implies that smallholder farmers in the research areas experience extreme poverty and is consistent with findings by Castaneda et al., (2022).

Factors hindering Agricultural Productivity

The collected data were analysed using descriptive statistics for measure of central tendency. It was found that the skewness and kurtosis of all variables were within +1.96 and -1.96, implying that the data did not deviate much from normality.

Reliability Test

The reliability test using Cronbach's alpha obtained 0.710 hence the data had internal consistency.

Analysis of Specific Factors

Access to Land

The majority (35%) of the respondents had access to land but cumulatively, 57.4% had no access to land.

Farming on Family Land

The majority of the respondents (36%) do not farm on family land and the negative responses cumulated to 50% while the positive responses cumulated to 50%.

Access to Livestock

The majority (42%) of the respondents had no access to livestock and were 79% cumulatively, and 37% of those who had access to livestock was family livestock. Livestock is usually used for farming, meat and milk.

Among the smallholder farmers who had access to livestock, 54% had no access to grazing land while 46% had access to grazing land.

Access to water

73% of the smallholder farmers had no access to water while 27% had access. This shows that water is a serious challenge.

Among the farmers who had access to water, the majority (65%) accessed it through a mono-pump and 23% accessed it through a well.

The majority (70%) of the farmers depend on rainfall to do their agricultural activities while 30% use alternative water sources when there is no rain.

Extension support

The majority (34%) of the farmers have no access to extension services which are provided by the District Agriculture Office (DACO) and cumulatively stand at 50% while only 35% have access.

Support towards alternatives options

73% of the farmers hope to be helped with alternative sources of water and 50% hope to be helped with an alternative grazing solution.

46% of the farmers need support with solar water systems while 22% wish to be helped with rainwater trapping, 6% are looking forward to a water reservoir, 4% are looking forward to water canal, 4% are looking forward to a water dam creation.

Financial inclusion

78% of the respondents have no access to a bank and the 70% of the 16% who have access to a bank stated that the banks are far away.

64% of the respondents have no access to a non-bank financial institution while 31% have access.

70% of the respondents are not members of the available village banking groups and only 17% are members.

72% of the respondents use mobile money for their financial transactions and 74% found the network to be good.

65% of the respondents have no access to credit and 70% are not on the government fertilizer support programme. The majority (47%) are not on government social cash transfer support and cumulatively stand at 83% while only 11% are.

Factor Analysis

The dimension reduction tool, Factor Analysis, was used to estimate well loaded factors and a reasonable statistic of 0.647 was obtained with a corresponding statistically significant Chi of 704.006. Therefore, the KMO statistic of 0.647 indicate that Factor Analysis was a correct tool to use (Reddy & Kulshrestha, 2019). The statistic is shown in Table 1.

Table 1: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.647
Bartlett's Test of Sphericity	Approx. Chi-Square	704.006
	df	231
	Sig.	.000

The scree plot which indicates factor loading produced 8 factors as the well loaded factors above the Eigen value of 1 hence revealed that 8 factors were critical as they lay just above the elbow of the plot as shown in Figure 1.

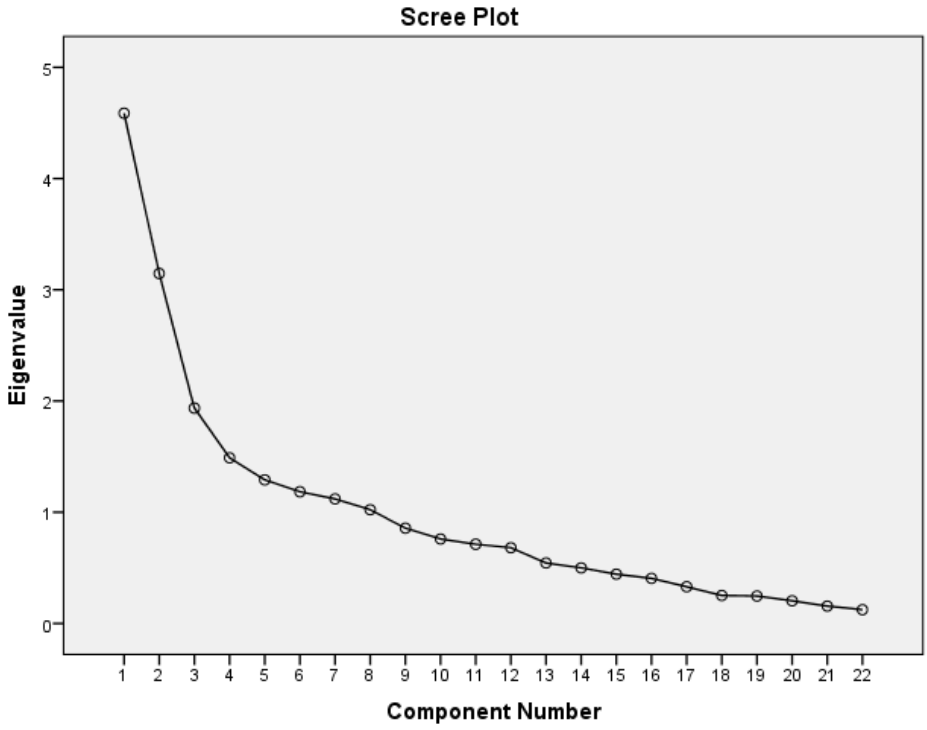

Figure 1: Scree of the resources and financial inclusion variables.

In Component 1, access to family livestock was the most loaded (0.854) (mean = 4.34-neutral), in Component 2, access to non-bank financial institution was the most loaded (0.788) (mean = 3.1-slightly disagree), under Component 3, dependency on rainfall for farming was the most loaded (-0.778) (mean = 5.59-agree), under Component 4, access to land for farming was the most loaded (0.78) (mean = 4.37-neutral), under Component 5, access to District Agricultural Coordinating Officer was the most loaded (0.915) (mean = 3.57-slightly disagree), under Component 6, on social cash transfer was the most loaded (-0.714) (mean = 2.3-disagree), under Component 7, mobile network is good was the most loaded (0.818) (mean = 5.06-slightly agree) and under Component 8, access to community livestock was the most loaded (0.831) (mean=2.45-disagree).

The other factors which obtained factor loading above 0.7 include need for alternative feeding solution for livestock (0.716) (mean = 4.93-slightly agree), access to grazing fields (0.79) (mean = 3.73-neutral), access to credit (0.701) (mean = 3.07-slightly disagree), need for alternative access to water (0.7) (mean = 5.84-agree), and access to farmer input support programme (0.764) (mean = 2.95-slightly disagree).

DISCUSSION

It has been demonstrated that female smallholder farmers are participating more in agriculture than their male counterparts (Kabonga et al.,, 2021) and the majority are young between 16 and 20 (Afata et al.,, 2022). These results could be due to the youthful population of Zambia and high youth unemployment between 1991 and 2022 stood at 22% although for 2022 it closed at 11% (International Labor Organisation, 2023) therefore more youth could be engaging in agriculture for livelihood.

The majority of smallholder farmers reached Grade 12 which agrees with Khoza et al., (2019) and Ndlovu et al., (2021). This level of education is adequate because it implies that the majority of the smallholder farmers are trainable and can easily learn agricultural techniques and technologies.

The level of have occupational experience of 1-3 years is inadequate to master the art of agricultural production and productivity because the dependency on rainfall for agriculture implies that the majority of the smallholder farmers have only experience two rainy seasons so far.

Hence, a good average experience of 5 years minimum (Alemu and haji, 2016) is recommended for the farmers in the current study. Therefore, smallholder farmers do not exhibit sufficient experience to attain technical efficiency.

The average family size of 6 does not deviate much from other studies and is economically manageable but inadequate to provide the much needed labor.

The rest of the factors which affect the agricultural productivity of smallholder farmers include lack of access to family land for farming, lack of access to non-bank financial institutions, dependency on rainfall for farming, lack of extension services provided by the District Agricultural Coordinating Officer, inadequate support under the social cash transfer, inadequate access to community livestock, inadequate access to credit and lack of support under the farmer input support programme, dependency on rainfall for agricultural activities, financial exclusion, poor coverage of extension services.

The low participation in input support programmes and social cash transfer could result from poor targeting in which the deserving beneficiaries get excluded.

CONCLUSION

The study has shown that many factors negatively affect smallholder farmers' productivity. Therefore, it can be concluded that inadequate occupational experience, lack of access to land for farming, small family size which does not avail labor for farming, poor coverage of social cash transfer and extension

services, dependency on rainfall, and financial exclusion are the main factors which affect agricultural productivity of smallholder farmers.

Recommendation

Based on the conclusions, it is recommended that governments in Africa and Zambia in particular increase budgetary allocation to support input programmes and extension services, embark on the creation of irrigation infrastructure in order to reduce dependency of rain fed farming, improve support facilities and services such as financial institutions in order to promote and increase financial inclusion, construct commodity trading centres so as to improve trade of agricultural produce. These interventions will in turn lead to reduction in poverty levels among smallholder farmers in rural areas.

At farmer level, it is recommended that farmers engage in exchange programme so as to learn from each other on best practice.

Statement of Competing Interests

The authors do not have any competing interests.

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There is no such evidence of conflict of interest.

Author Contribution

All authors have participated in critically revising of the entire manuscript and approval of the final manuscript.

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