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Factors Influencing Supplementary Extension Service Provision by Agricultural Cooperatives in Kazungula District, Zambia

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Abstract: ***This study examined the factors influencing supplementary extension service provision by agricultural cooperatives in Kazungula District of Zambia. Six out of sixteen cooperatives were purposively selected and 142 respondents were proportionately random sampled from the selected cooperatives. Data was collected through a semi-structured questionnaire. Data was analysed using descriptive statistics and inferential statistics. The study found that public extension was still the major extension service source in the study area followed by agricultural cooperatives and non-governmental organisation. Study revealed that 57.7 percent of the respondents indicated that local agricultural cooperatives supplemented extension services. The study found that more than half of the respondents had negative attitudes toward agricultural cooperative services and at least half of the respondents showed low participation in agricultural cooperative activities. The binary logistic regression analysis shows that credit, share capital, cooperative office distance, maize area planted and maize yield were significantly influencing supplementary extension service provision by agricultural cooperatives in the study area. Therefore, as a recommendation, different support institutions should consider favourable financing options and capacity building of active and viable agricultural cooperatives.***

Keywords: Agricultural Cooperative, Extension Service Provider, Supplementary.

1. Introduction

Agriculture still plays a key role in Zambia's cultural, economic and social development, particularly among the rural population who account for 58.2% of the total population [1]. At least 80% of the total farmer population are subsistence in characteristic and mostly engaged in fragmented agricultural activities [2]. In their fragmented form, one of the main challenges is access and availability of extension services, which affects crop productivity of the staple crop, maize, which has an average yield of 2.5 tonnes per hectare or less [3]. Public extension service is the main model of extension service delivery in Zambia. However, public extension service delivery has suffered setbacks to ensure timely, efficient and effective service provision to small-scale farmers who produce more than 70% of Zambia's maize [2], which is the main staple food, food security and national security commodity. The alternative extension service providers include agricultural cooperatives. Agricultural cooperatives could have a multiplier effect in enhancing extension service provision by numbers, coverage, focus, farmer-to-farmer approach and contact, and by virtual of their common idea of cooperation to meet social, cultural and economic needs of members and reduce the cost of agricultural production and marketing. Therefore, it was necessary to establish the existing extension service providers in the study area with a view to establish the presence of cooperative extension service provision and assess factors that may affect supplementary extension service provision by agricultural cooperatives.

2. Problem Definition

Small-scale farmers rely on subsistence and rainfed agriculture in Zambia. The small-scale farmers face various challenges, which include extension service provision. Public extension service is the most prevalent form of delivering agricultural extension and advisory services in most developing countries like Zambia and small-scale farmers have for many years depended on this form of service delivery in spite of its numerous shortcomings. However, public extension service provision has been on a declining path due to low funding for research and extension services, which has affected extension worker-farmer ratio, farmer extension contact, efficient and effective service delivery to small-scale farmers.

In order to supplement the existing gap or declining public extension service provision, alternative extension service providers have been emerging since the early 1990s [4]. The alternative extension service providers include non-governmental organisations, private companies, farmer organizations and agricultural cooperatives. However, past studies on agricultural cooperatives mostly focused on factors affecting member participation, share capital increment, member satisfaction, cooperative success, cooperative formation, membership increment and impact on agricultural development [5] - [8]. There is limited empirical studies known about supplementary extension service provision by agricultural cooperatives at grass root level. In addition, the increasing number of cooperatives from 500 in 1964 [9] to 45,831 in 2017 [10], also necessitated to study the existence of supplementary extension service provision by agricultural cooperatives and mainly focusing on factors affecting supplementary extension service provision by agricultural cooperatives.

3. Literature Review

The long-standing approach in agricultural extension is group promotion and group organisation. Agricultural cooperatives

have played an important role both in the community and in extension service provision, and now appear to be taking on an even larger role [11]. It is a known fact that farmers transfer knowledge and technologies to each other [12]. [13] explains that agricultural cooperatives could assist farmers to increase their production and household income by ensuring access and availability of extension services. [14] found that increased area planted, may increase crop production and thus increase member participation and cooperative performance. [15] found low education levels among cooperative members hinder proper management of cooperatives and since failure to understand minimum technical issues affects extension service delivery by cooperative management or board of directors to members.

4. Objectives of the Study

The overall objective of this study is to assess factors influencing supplementary extension service provision by agricultural cooperatives in Kazungula District of Zambia. The specific objectives are to:

a) To identify socioeconomic characteristics of respondents;
b) To identify extension service providers and their characteristics;
c) To assess respondents' perception of agricultural cooperative services; and,
d) To determine factors that affect supplementary extension service provision.

5. Theoretical Framework

This study is about agricultural cooperatives being extension service providers and therefore, partly grounded on the agency theory, which is one of the main components of the new institution economics. The agency relationship exist whenever an individual or organization (the agent, in this case the cooperative) acts on behalf of another (the principal, in this case the members or farmers in a cooperative), [16]. The agency theory is thus very relevant to the institutional structure of cooperatives because employed agents (managers) may not act in the best interests of cooperative owner, the members (principal). The purpose of the agency in respect to agricultural cooperatives is how to lower agency costs. In doing so, principal-agent problems are kept under check to ensure that there is no member (principal) dissatisfaction. The agents (management or board of directors) should ensure service delivery is satisfactory to keep membership stable.

This study is also partly grounded on the theory of farmers' behavioural change, which suggests that individuals can change attitudes in groups. So when promoting an innovation, it is not enough to simply provide verbal propaganda but in order to improve the promotion effect, it is important to allow farmers to participate in the implementation of innovation activities, so that they can change their attitude, so as to change their behaviour [17]. In this study, the concept of group (agricultural cooperative) approach as supplementary extension service provider was assessed for factors influencing the group to provide extension services in respect to a group of people connected by a certain social relationship. The farmer groups are special groups with different cultural level, experience level and work content may not be the same.

Lastly, the agricultural innovation diffusion theory is another theory upon which this study is anchored. This theory is a seminal theory in the communications literature that explains innovation adoption within a population of potential adopters [18]. The theory's key elements include innovation, communication channels, time and social system. Innovations may include new technologies, new practices, or new ideas and adopters may be individuals or organisations. The theory at macro level is seen as a process of communication in which people learn innovations and their potential benefits by communication and with the hope of being persuaded to adopt, in this case through agricultural cooperatives serving the purpose of a social system. The theory at micro level is seen as a process founded on five stages: knowledge; persuasion; decision; implementation; and confirmation [17].

6. Methodology

The study was conducted in Mukuni Agricultural Camp (the lowest public agricultural extension catchment area) in Kazungula District of Zambia (Figure 1). A case study of Mukuni Agricultural Camp was used in combination with qualitative and quantitative methods. Mukuni Agricultural Camp has 1,108 farmer households and it is 37,404.51 hectares in size. Data was collected from 23 villages out of 55 villages. Respondents were sampled from 6 out of 16 registered cooperatives, which were purposively selected based on cooperative experience, cooperative income generating activities and any form of services provided to members. Multi-stage random sampling method was used to select 142 respondents of the study; first determined 142 respondents from the six purposively selected cooperatives' member registers using the Yamane's formula's (Equation 1) and secondly the 142 respondents were allocated proportionately to each participating cooperative according to the cooperative membership register.

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

Where, n = sample size; N = population size; e = level of significance (±5%)

Primary data collected using a semi-structured questionnaire. The reliability of the 4-Likert items for the construct on cooperative members' attitude towards cooperative services was determined using the Cronbach alpha method and obtained value of 0.817. While the reliability of the 4-Likert items for the construct on members' participation in cooperative activities determined the alpha value as 0.855. Socio-economic characteristics, extension service providers and perceptions of cooperative members' data analysed using SPSS version 23 and presented respective descriptive statistics. The Pearson chi-square test of independence and Mann-Whitney U test were used to analyse and identify significant independent variables to be regressed in a binary logistic regression analysis.

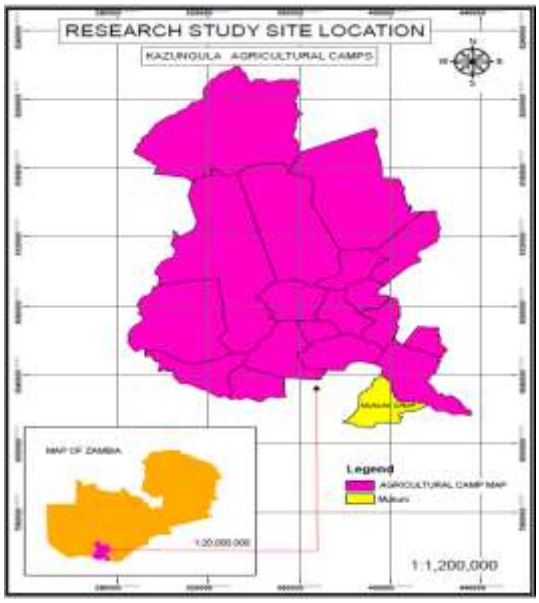

Figure 1: Research Site Map in Mukuni Agricultural Camp of Kazungula District, Zambia

7. Model Specification

Binary Logistic Regression Model

Following the Chi-square test and the Mann-Whitney U test, a binary logistic regression was conducted to determine factors influencing supplementary extension service provision by agricultural cooperatives. Binary logistic regression model provides the odds of preferred outcome using a dichotomous dependent variable [19]. In this study, the binary outcome is either "supplemented extension service" (preferred outcome) or "not supplemented extension service". The logistic model equation (2) used is of the form:

$$\text{Logit}(Y) = \text{In}(\text{odds}) = \text{In}(\frac{p}{1-p}) = \beta_0 + \beta_1 X_1 + ... + \beta_k X_k + \varepsilon_i \qquad (2)$$

Where,

- Y = Preferred outcome
- β_0 = logistic intercept
- β_k = coefficient, ($k = 0, 1 ... n$)
- n = total number of independent variables
- X_k = k_{th} independent variable
- p = probability of interested outcome
- $1 - p$ = probability of interested outcome not occurring
- ε_i = error term

The variables applied in the binary logistic model were:

- Y = Factors affecting odds of cooperative supplementing extension services (1 = supplemented, 0 = not supplemented)
- X_1 = Credit [0 = No (reference category), 1 = Yes]
- X_2 = Cooperative office distance [0 = less than 1km (reference category), 1 = 1 - 3 km, 2 = more than 3 km]
- X_3 = Number of shares
- X_4 = Maize yield [0 = less than 0.5MT/ha (reference category), 1 = 0.5 - 1.0 MT/ha, 2 = more than 1 MT/ha]
- X_5 = Extension contact [0 = low (reference category), 1 = moderate, 2 = high]
- X_6 = Maize area planted [0 = less than 1 ha (reference category), 1 = 1 - 2 ha, 2 = more than 2 ha]
- X_7 = Farm size (hectares)
- X_8 = Market information [0 = No (reference category), 1 = Yes]
- ε_i = Error term

8. Results and Discussion

8.1 Socio-Economic Characteristics of Respondents

Table 1 shows that majority of the respondents were male (54%) and thus agriculture is still dorminated by male farmers. Majority of the respondents were aged between 34 years old and 49 years old (46%). Most of the respondents (87%) were married. The majority of the respondents (55%) had completed primary school level. The majority of the respondents (98.6%) were engaged in farming as their main occupation.

Table 1: Personal Characteristics of the Respondents

Variable	Category	Frequency	%
Gender	Male	65	46
	Female	77	54
Age	18-33 years	38	27
	34-49 years	65	46
	Above 49 years	39	27
Marital status	Married	123	87
	Not married	19	13
Education level	Primary school	78	55
	Secondary school	55	39
	College	9	6
Occupation	Farming	140	98.6
	Petty trading	1	0.7
	Employment	1	0.7

Table 2 shows that the overall mean household size of the respondents was 6 persons (*SD* = 2.70 persons). The mean farm size was 2.2 hectares (*SD* = 1.3 hectares). The overall mean farming experience was 11.3 years (*SD* = 9.0 years). The majority of the respondents (55%) had planted between 1 ha and 2 ha of maize. Majority of the respondents (69%) had harvested less than 1 MT maize grain. Almost half (49.3%) of the respondents had less than 0.5 MT/ha maize yield. Most of the respondents (65%) earned less than K1,000. The overall mean membership experience was 3.9 years (*SD* = 2.5 years, Table 2). The overall mean number of shares owned was 2.2 shares (*SD* = 2.1 shares) and majority of the respondents (85%) owned less than five shares. The overall mean cooperative office distance from the respondents' homestead was 2.5 km (*SD* = 2.9 km) and most of the respondents (57%) lived between 1 km and 3 km from their respective cooperative office.

Table 2: Household Characteristics of the Respondents

Variable	Category	Frequency	%
Household size	1 - 5 persons	72	51
	6 - 10 person	62	44
	Above 10 person	8	6
Farm size	0.5 - 2.5 ha	95	67
	Above 2.5 ha	47	33
	1 - 15 years	106	75
Farming experience	16 - 30 years	31	22
	Above 30 years	5	4

Maize area planted	Below 1 ha	38	27
	1 – 2 ha	78	55
	Above 2 ha	26	18
Maize production	Below 1 MT	98	69
	1 – 2 MT	29	20.4
	Above 2 MT	15	10.6
Maize yield	Below 0.5 MT/ha	70	49.3
	0.5 - 1.0 MT/ha	45	31.7
	Above 1.0 MT/ha	27	19
Maize gross income	*Below K1,000	93	65
	*K1,00 & Above	49	35
Memership experience	1 – 5 years	106	75
	Above 5 years	36	25
Shareholding	With shares	111	78
	Without shares	31	22
Number of shares	0 – 4 shares	121	85
	5 – 10 shares	21	15
Cooperative office distance	Below 1 km	33	23
	1 – 3 km	81	57
	Above 3 km	28	20

*USD to Zambian Kwacha (ZMW) exchange rate as at 31/08/2017 was 1 USD = K9.181 (Source: Bank of Zambia, http://www.boz.zm/average-exchange-rates.htm)

8.2 Identified Extension Service Providers and their Characteristics

Most (75%) of the responses from respondents show that the main extension service provider was government, followed by local cooperatives (23%) and then non-governmental organisation (2%), seen in Table 3. [20] confirmed in their study that government was still the major service extension provider in most developing countries.

Table 3: Identified Extension Service Providers

Extension Service Provider	Frequency	%
Government	106	75
Local Cooperative	33	23
NGO	3	2

The study revealed that 30% of the respondents confirmed high extension contact between government and farmers compared to local cooperatives (18%) and NGO (1%) as shown in Figure 2. Results also showed that 28% of the respondents confirmed medium extension contact between government and farmers, followed by local cooperatives with 4% and NGO with 1%. Figure 1 also shows that 16% of the respondents confirmed low extension contact between government and farmers compared to local cooperatives (2%). [20] confirmed that public extension service delivery had weaknesses in extension contact due to thinly spreading out limited resources caused by wide extension coverage. The [4] reported that low extension worker-to-farmer ratio of one extension worker to 1,200 farmers engaged in crop production is too low thus over stretching the capacity of extension workers to deliver effective extension services.

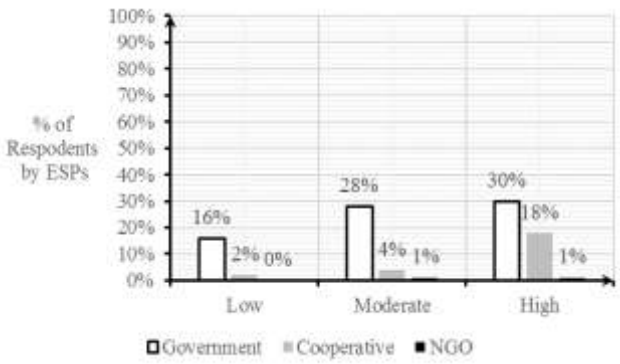

Figure 2: Frequency Distribution of Extension Contact by Identified ESPs

8.3 Extension Service Provision by Agricultural Cooperatives

The study found that 57.7% of the respondents indicated that cooperative supplementary extension service provision existed in the study area (Figure 3). This confirms findings by the [4] that farmer organisations and cooperatives are also active in providing extension services to their members, especially small-scale farmers. A report by [21] indicates that, "the emergence of such organizations in recent years is in response to the breakdown of government service delivery efforts of the past (p. 8)". This study agrees with a study by [22] that "one way to reduce poverty and to increase incomes is through grassroots level agribusiness development (p. 6)". A study by [23] did confirm that farmer-to-farmer extension has a multiplier effect in terms of increased number of farmers reached; increased knowledge and attitude change because farmers tend to learn practices more from seasoned and practical farmers in their communities.

Figure 3: Frequency Distribution of Supplementary Extension Service Provision

The study found that local cooperatives provided the following services to members; cooperative information (100%), facilitating agricultural input acquisition (100%), marketing information (84%), agricultural technology transfer (67%) and credit (28%), Figure 4. [16] in their study of agricultural cooperatives found that the new institutional economics namely the agency theory supports the relationship between the cooperative organisation (agent) and members (principal). According to [16], the agency theory is significant to cooperative structure since it plays an important role of ensuring that the interest of cooperative members, in this case the principal, are met.

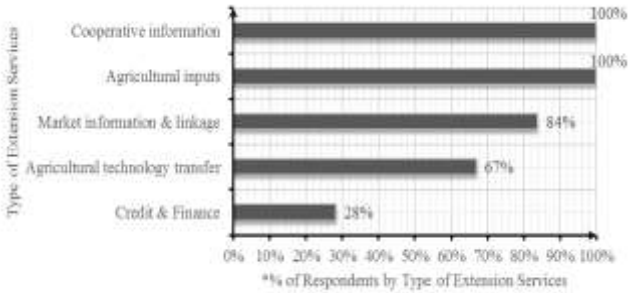

Figure 4: Frequency Distribution of Type of Cooperative Extension Services
*Multiple responses by respondents

Most of the respondents (58%) indicated high extension contact by local agricultural cooperatives supplementing extension service provision in the study area (Figure 5). This agrees with [21] and [4] reports that farmer organisation involvement in extension service provision is partly due to low extension worker-to-farmer ratio and inadequate support to public extension service delivery.

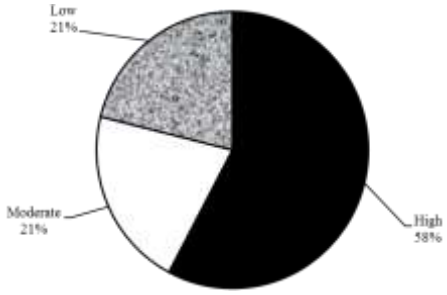

Figure 5: Frequency Distribution of Extension Contact by Cooperative ESP

8.4 Members' Perception of Cooperative Services

8.4.1 Members' Attitude towards Cooperative Services

More than 50% of the respondents had a negative attitude towards cooperative extension services on all the four Likert-items for the construct of attitude (Table 4). Negative perceptions towards cooperative services may be due to trust issues between the members and board of directors or management, which may affect membership and performance of farmer cooperatives to supplement extension services. This may also lead to splitter cooperatives. In a previous study by [24], it was found that 41.7% of the participants disagreed that all members received adequate services from the respective cooperatives. [5] obtained similar results that majority of the respondents (51.58%) disagreed that the cooperatives had supplied its services to all farmers. [5] also found that majority of the farmers (68.94%) disagreed that the cooperatives solved agricultural problems on time and 57.9% of farmers disagreed that the cooperatives provided agricultural innovations. In general, [5] found that farmers had a negative perception of their cooperative services. However, in another recent study by [25], found that majority of the respondents (72.2%) had a positive attitude towards taking part in walnut production cooperatives.

Table 4: Attitude of Members towards Cooperative Extension Services

Members' Attitude	Frequency	%
Cooperative provide innovations, information and production requirements in suitable time		
Strongly disagree	14	10
Disagree	59	42
Neutral	47	33
Agree	20	14
Strong agree	2	1
Cooperative provide innovations, information and production requirements		
Strongly disagree	18	13
Disagree	59	42
Neutral	44	31
Agree	19	13
Strong agree	2	1
Cooperative solves agricultural problems on time		
Strongly disagree	15	11
Disagree	55	39
Neutral	33	23
Agree	30	21
Strong agree	9	6
Cooperative provides its services to all members		
Strongly disagree	96	68
Disagree	39	27
Neutral	5	4
Agree	2	1
Strong agree	0	0

Attitude statements were rated on a Likert-type scale of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

8.4.2 Members' Participation in Cooperative Activities

More than 50% of the respondents indicated low participation in cooperative activities on all four Likert-items (Table 5). A recent study on factors affecting farmers' satisfaction of agricultural cooperatives by [26] generally found that the majority of the respondents (30%) had relatively low participation in the activities of the cooperatives. Low participation was reported in regular attendance in cooperative meetings and collaborating with the board of directors to advance cooperative goals. However, relatively high participation was observed in productive activities and decision-making of cooperative about productive activities. While a study by [24] found that more than half (50%) of the respondents had agreed to have participated in agricultural cooperative activities.

Table 5: Members' Participation in Cooperative Activities

Members' Participation	Frequency	%
Participate in cooperative income generating activities		
Very low	6	4
Low	65	46
Moderate	45	32
High	13	9
High	13	9
Assist in cooperative fundraising activities for investment		
Very low	33	23
Low	64	45
Moderate	25	18
High	17	12
High	3	2
Lobbying local organisations to resolve extension problems		

Very low	132	93
Low	5	4
Moderate	2	1
High	3	2
High	0	0
Participate in market linkages		
Very low	65	46
Low	53	37
Moderate	18	13
High	3	2
High	3	2

Participation statements were rated on a Likert-type scale of 1 = Very Low, 2 = Low, 3 = Moderate, 4 = High, 5 = Very High

8.5 Factor Affecting Supplementary Extension Service Provision

In order to determine the predictor variables used in the Binary Logistic Regression, two different bivariate analysis, namely the Pearson Chi-Square Test of Independence and Mann-Whitney U Test, were conducted to explore statistically significant variables for inclusion in the logistic regression analysis.

8.5.1 Pearson Chi-Square Test of Independence

Table 6 shows the Chi-Square test results on factors influencing supplementary extension service provision presence. Result of the test showed cooperative office distance, extension contact, market information, credit, maize gross income, maize area planted, maize production and maize yield are statistically significantly associated with supplementary extension service provision. Education level and technology transfer were not significantly associated with supplementary extension service provision, instead independent.

Table 6: Pearson Chi-Square Test of Independence

Variable	Chi-Square Value (χ^2)	*df*	*p-value*
Education level	1.807	2	0.405
Cooperative office distance	13.834	2	0.001**
Extension contact	12.718	2	0.002**
Technology transfer	3.445	1	0.063
Market information	10.346	1	0.001**
Credit and finance	23.742	1	0.001**
Maize area planted	8.341	2	0.015*
Maize production	7.375	2	0.025*
Maize yield	8.935	2	0.011*
Maize gross income	7.580	1	0.006**

*, ** shows values significant at 5% & 1% levels of significance, respectively.

8.5.2 Independent Samples Mann-Whitney U Test

The independent samples *t*-test was not used to test the hypothesis because all the continuous dependent variables failed the normality test and the number of shares variable failed the homogeneity of variances test. Consequently, the results could not be reliable if the independent samples *t*-test was applied. The results of the Mann-Whitney U test shows that farm size mean rank scores and number of shares mean rank scores are statistically significantly different by the binary outcome variable (supplementary extension service provision) at 1% level of significance (Table 7).

Table 7: Mann-Whitney U Test

Variable	Mann-Whitney U Value	p-value	Mean Rank Score	
			Supplemented	Not Supplemented
Age	2006.00	0.061	77.04	63.93
Household size	2293.00	0.487	73.54	68.72
Farm size	1812.00	0.007**	79.40	60.70
Farming experience	2091.50	0.127	75.99	65.36
Number of shares	1349.00	0.001**	85.05	52.98
Membership experience	2165.00	0.217	75.10	66.58

** Significant at 1% level of significance

8.5.3 Binary Logistic Regression

In this study, a final inferential statistical analysis using binary logistic regression analysis was used to assess if the selected independent variables significantly influenced supplementary extension service provision by agricultural cooperatives. The assumption of multicollinearity among independent variables was met after removing maize production and maize gross income because they were highly correlated as indicated by the high Spearman Rho correlation coefficient value (Table 8).

Table 8: Multicollinearity of Independent Variables

Variable	Maize production	Maize gross income
Maize production	1	0.909
Maize income		1

A standard binary logistic regression was performed to examine the twelve independent variables (includes dummy variables) on the likelihood that agricultural cooperatives would supplement extension services among their members in the study area. The binary logistic regression model was statistically significant and good-fit model, χ^2 (12, n = 142) = 101.570, $p < 0.001$ (Table 10). The model estimated 68.7% of the variance in the dependent binary variable (supplementary extension service provision) is explained by the predictor variables.

The *Wald criterion* showed that credit and finance, cooperative office distance, number of shares, maize yield and maize area planted variables significantly influenced supplementary extension service provision by agricultural cooperatives (Table 9). While farm size, extension contact and market information were not significant predictors of supplementary extension service provision.

Table 9: Binary Logistic Regression Analysis

Variable	β	SE	Wald	p-value	OR
Constant	-0.902	1.019	0.783	0.376	0.406
Credit(1)	4.569	0.994	21.125	0.001**	96.469
Distance			22.083	0.001	
Distance(1)	-4.381	0.933	22.075	0.001**	0.013
Distance(2)	-2.833	0.890	10.122	0.001**	0.059
Shares	0.738	0.199	13.728	0.001**	2.093
Maize yield			12.268	0.002	
Maize yield(1)	2.567	0.736	12.155	0.001**	13.030
Maize yield(2)	0.949	0.787	1.456	0.228	2.584
Extension contact			0.980	0.613	
Extension contact(1)	-0.138	0.901	0.023	0.879	0.871

Extension contact(2)	0.499	0.833	0.358	0.549	1.646
Maize area planted			8.801	0.012	
Maize area planted(1)	2.246	0.790	8.091	0.004**	9.451
Maize area planted(2)	2.662	1.104	5.816	0.016*	14.327
Farm size	-0.503	0.287	3.080	0.079	0.604
Market information(1)	-0.045	0.576	0.006	0.937	0.956
Pseudo R2	68.7%				
Chi-Square value	101.57				
Df	12				
p-value	0.001**				

*, ** shows values significant at 5% & 1% levels of significance, respectively.
† Reference categories for the categorical predictor variables Distance (0 = < 1 km), Maize yield (0 = < 0.5 MT/Ha), Maize area planted (0 = < 1 Ha) & Extension contact (0 = Low).

The credit significantly predicted supplementary extension service provision by agricultural cooperatives, χ^2 (1, n = 142) = 21.125, p < 0.001. The odds ratio of 96.469 for credit and finance indicates that a cooperative, which provides credit and finance, is only 96.469 times more likely to supplement extension service provision than a cooperative that does not provide or link to credit and finance, whilst controlling for other predictor variables in the model. [7] found similar positive effect of credit facility for members but this was in contrast with findings by [27].

The number of shares significantly predicted supplementary extension service provision by cooperatives, χ^2 (1, n = 142) = 13.728, p < 0.001. The odds ratio of 2.093 for shareholding meant that for each one-unit increase in number of shares, a cooperative is 2.093 times more likely to supplement extension service provision to members, whilst controlling for other predictor variables in the model. A study previously conducted by [28] and [29] on factors affecting cooperative member participation in agricultural input and output marketing confirms the current findings that increased shareholding of cooperative members improved members' participation and sense of ownership, thus seek extension services from the cooperative.

Cooperative office distance of 1 to 3 km is statistically significantly different from the cooperative office distance of less than 1 km, χ^2 (1, n = 142) = 22.075, p < 0.001. A cooperative office distance of 1 to 3 km has an odds ratio of 0.013. A comparison with the reference category (cooperative office distance of less than 1 km) showed that a cooperative located at a distance between 1 and 3 km away from members' homestead is 0.013 times less likely to supplement extension services provision to members, holding constant other predictor variables. Similar studies found an inverse relationship between cooperative office distance and membership and level of participation by members [14], [28]. This study established that increased distance from the cooperative office or cooperative regular meeting place would affect members' attendance of extension meetings and affect cooperatives' extension outreach activities, especially with poor state of roads in the study area.

Cooperative office distance of more than 3 km is statistically significantly different from cooperative office distance of less than 1 km, χ^2 (1, n = 142) = 10.122, p = 0.001. Cooperative office distance of more than 3 km has an odds ratio of 0.059. A comparison with the reference category (cooperative office distance of less than 1 km) showed that a cooperative located at a distance greater than 3 km away from members' homestead is 0.059 times less likely to supplement extension services provision to members, holding constant other predictor variables. The findings were similar to previous studies [14], [28].

Maize yield of 0.5 to 1.0MT/Ha is statistically significantly different from maize yield of less than 0.5MT/Ha, χ^2 (1, n = 142) = 12.155, p < 0.001. Maize yield of 0.5 to 1 MT/Ha has an odds ratio of 13.03. A comparison with the reference category (maize yield of less than 0.5MT/Ha) showed that a cooperative with members who obtained maize yields from 0.5 to 1.0MT/Ha is 13.03 times more likely to supplement extension services provision than a cooperative with members who obtained less than 0.5MT/Ha maize yield, holding other predictor variables constant. This confirms a previous study on factors affecting agricultural production among cooperative members [30].

Maize area planted of 1 to 2 Ha is statistically significantly different from maize area planted of less than 1 Ha, χ^2 (1, n = 142) = 8.091, p = 0.004. Area planted of 1 to 2 Ha has an odds ratio of 9.451. A comparison with the reference category (area planted less than 1 Ha) showed that a cooperative with members who planted maize between 1 Ha and 2 Ha is 9.451 times more likely to supplement extension services provision than a cooperative with members who planted less than 1 Ha maize, holding other predictor variables constant. Similar findings by [31] were found that there was a positive relationship between area planted and cooperative membership.

Area planted of more than 2 Ha is statistically significantly different from maize area planted of less than 1 Ha, χ^2 (1, n = 142) = 5.816, p = 0.016. Area planted of more than 2Ha has an odds ratio of 14.327. A comparison with the reference category (area planted less than 1 Ha) showed that a cooperative with members who planted maize more than 2 Ha is 14.327 times more likely to supplement extension services provision than a cooperative with members who planted less than 1 Ha maize, holding other predictor variables constant. The findings were similar to studies by [31].

9. Conclusion

The result of this study shows that credit and finance, shareholding, cooperative office distance, maize yield and maize area planted significantly influenced supplementary extension service provision by agricultural cooperatives.

Credit and financing of agricultural cooperatives should be in respect to supporting active and viable agricultural cooperatives with low interest loans and grants for viable income generating activities and improving agricultural

production and productivity. Cooperative members should be regularly sensitised on the importance of paying shares and benefits of owning shares to reduce members' negative attitudes and low participation.

The government should provide rural infrastructure to supplementary extension service provision by agricultural cooperatives. In a way, this will address long distances covered by either the cooperative committees or members through better road network and availability of mobile communication may be used to disseminate extension messages to members by mobile phones.

The findings from this study may play a pivotal role in providing empirical evidence to policy makers, extension workers, cooperative experts and legislators on how to improve agricultural cooperatives as supplementary extension service providers in an open market system found in Zambia. Further studies in farmer perceptions of cooperative services should be conducted.

References

[1] CSO, "2015 Living Conditions Monitoring Survey," Central Statistical Office, Lusaka, Zambia, 2016.
[2] MACO, "2010/2011 Crop Forecast Survey Report," MACO/ CSO, Lusaka, Zambia, 2011.
[3] MoA, "2015/2016 Crop Forecast Survey Report," MoA & CSO, Lusaka, Zambia, 2016.
[4] MoA, "National Agricultural Extension and Advisory Services Strategy," MoA , Lusaka, Zambia, 2017.
[5] I. Yamusa, J. O. Adefila, "Farmers' cooperatives and agricultural development in Kwali Area Council Federal Capital Territory Abuja Nigeria," International Journal of Humanities and Social Science, IV (7), pp. 161-169, 2014.
[6] H. Azadi, G. Hosseininia, K. Zarafshani, A. Heydari, F. Witlox, "Factors influencing the success of animal husbandry cooperatives: A case study in Southwest Iran," Journal of Agriculture and Rural Development in the Tropics and Subtropics, CXI (2), pp. 89-99, 2010.
[7] N. C. Ojiagu, C. Onugu, "Effects of membership of cooperative organizations and determinants on farmer-members' income in rural Anambra State, Nigeria," International Journal of Scientific and Technology Research, IV (8), pp. 28-35, 2015.
[8] B. Arayesh, "Identifying the factors affecting the participation of agricultural cooperatives' members," American Journal of Agricultural and Biological Sciences, VI (4), pp. 560-566, 2011.
[9] P. Ojermark, C. Chabala, "The Development of Independent Cooperatives in Zambia," FAO, Rome, Italy, 1994.
[10] MCTI, "Concept note on the cooperatives categorization study based on performance status in Zambia," Department of Cooperatives, Ministry of Commerce, Trade and Industry, Lusaka, Zambia, 2017.
[11] W. Majee, A. Hoyt, "Cooperatives and Community Development: A Perspective on the Use of Cooperatives in Development," Journal of Community Practice, XIX (1), pp. 48-61, 2011.
[12] E. T. Muki, "Effectiveness of farmer-to-farmer extension in increasing agricultural technology dissemination and uptake amongst small-scale farmers," Master's Thesis, China Agricultural University, Beijing, The People's Republic of China, 2016.
[13] C. B. Sifa, "Role of cooperatives in agricultural development and food security in Africa," Department of Economic and Social Affairs, UN, New York, USA, 2014.
[14] M. H. Ahmed, H. M. Mesfin, "The impact of agricultural cooperatives membership on the well-being of smallholder farmers: empirical evidence from eastern Ethiopia," Agricultural and Food Economics, V (6), pp. 1-20, 2017.
[15] F. A. Abdullah, B. A. Samah, "Factors impinging farmers use of technology," Asian Social Science, IX (3), pp. 120-124, 2013.
[16] G. F. Ortmann, R. P. King, "Agricultural Cooperatives I: History, Theory and Problems," Agrekon, XLVI (1), pp. 40-68, 2007.
[17] Castelloe, P., Watson, T., & White, C. (2002). Participatory change: An innovative approach to community practice. Journal of Community Practice, 10(4), 7-32.
[18] A. Bhattacherjee, Social Science Research: Principles, Methods and Practices, The University of South Florida, Tampa, Florida, USA, 2012
[19] A. Field, Discovering statistics using IBM SPSS statistics, SAGE Publications Ltd, London, UK, 2017.
[20] D. F. Rutatora, A. Z. Mattee, "Major agricultural extension providers in Tanzania," African Study Monographs, XXII (4), pp. 155-173, 2001.
[21] E. C. Sitapai, "A Critical Analysis of Agricultural Extension Service in Papua New Guinea: Past, Present and Future," In Proceedings of the CIMC National Agriculture Conference, pp. 1-28, 2012.
[22] J. Sumelius, "Strengthening farmer-led economic activities and agribusiness through producer organisations in Zambia," The University of Helsinki, Department of Economics and Management, Discussion Papers No.54, 2011.
[23] O. M. Akinnagbe, A. R. Ajayi, "Challenges of Farmer-Led Extension Approaches in Nigeria," World Journal of Agricultural Sciences, VI (4), pp. 353-359, 2010.
[24] B. Msimango, O. I. Oladele, "Factors influencing farmers' participation in agricultural cooperatives in Ngaka Modiri Molema District," Journal of Human Ecology, XLIV (2), pp. 113-119, 2013.
[25] M. Abdolmaleky, "Preventive Factors to found walnut production cooperatives in Tuyserkan Township, Iran," International Journal of Agricultural Management and Development, V (1), pp. 9-17, 2015.
[26] M. Taleghani, M. Mehdizade, "Factors affecting farmers' satisfaction: Case of agricultural production cooperatives in Guilan Province, Iran," International Journal of Agricultural Management and Development, VI (4), pp. 489-495, 2015.
[27] A. Elias, M. Nohmi, K. Yasunobu, A. Ishida, "Farmers' Satisfaction with Agricultural Extension Service and its Influencing Factors: A Case Study in North West Ethiopia, "Journal of Agricultural Science and Technology, XVII, 39-53, 2015.

[28] M. Muthyalu, "The factors that influence the participation of cooperative members in the agricultural input and output marketing - A case study of Adwa District, Ethiopia," Journal of Business Management & Social Sciences Research, II (4), pp. 121-130, 2013
[29] A. W. Atsbaha, "Analysis of the Role of Cooperatives in Agricultural Input and Output Marketing in Southern Zone of Tigray, Ethiopia," Master's Thesis, Mekelle University, Ethiopia, 2008.
[30] T. U. Anigbogu, O. E. Agbasi, I. M. Okoli, "Socioeconomic Factors Influencing Agricultural Production among Cooperative Farmers in Anambra State, Nigeria," International Journal of Academic Research in Economics and Management Sciences, IV (3), pp. 43-58, 2015
[31] A. Higuchi, "Impact of a Marketing Cooperative on Cocoa Producers and Intermediaries: The Case of the Acopagro Cooperative in Peru," Journal of Rural Cooperation, XLII (1), pp. 80-97, 2014.

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