Contribution of Malawi's Decentralized Agricultural Extension Service System to Farmers' Maize Productivity

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Abstract

Agricultural extension plays a critical role in the agricultural sector's development and sustainability of farmers' productivity and well-being. Malawi has consistently been reforming its agricultural extension services to increase accessibility by farmers. However, smallholder farmers' productivity remains low. Therefore, the study on which the paper is based, aimed at examining the contribution of Malawi's decentralized agricultural extension system (DAESS) to households' maize productivity. Specifically, the study aimed at determining how farmers' access to agricultural extension services, factors associated with their maize productivity and lastly, farmers' satisfaction with Malawi's DAESS. The study adopted the cross-sectional research design whereby a structured questionnaire was used to collect quantitative data from 150 smallholder maize farmers in Mangochi district, Malawi. In addition, supplementary data were collected from 10 focus group discussions involving 6 – 8 participants and from nine (9) key informant interviews. IBM-SPPS was used to determine descriptive and inferential statistics. Regression analysis was run to determine how access to extension services is associated with maize productivity. Farmers' satisfaction with DAESS was measured using a 5-point Likert scale. Study findings show that farmers' access to extension services was positively and significantly ($p<0.001$) associated with maize productivity and that 73.3% of smallholder farmers expressed a high level of satisfaction with the services provided. It is concluded that access and number of visits to extension services raise farmers' maize productivity. It is also concluded that most smallholder farmers in Mangochi district were satisfied with the extension services they received. Therefore, it is recommended that the government of Malawi should continue with the implementation and improvement of the DAESS and use of the lead farmer approach to expand access to quality agricultural extension services by smallholder farmers.

Keywords: Smallholder farmers, decentralization, agricultural extension services, maize productivity, satisfaction

Introduction

Malawi's economy is predominantly driven by the agricultural sector with about 90% of the country's population living in rural areas. In addition, nearly 11 million people are involved in subsistence smallholder farming. In addition, just about one-third of the land is appropriate for farming because of the existence of mountains, rough pastures and forests. Generally, smallholder farmers contribute 75% of the food consumed in Malawi by cultivating approximately 5.3 million hectares of arable land. In Malawi, the agricultural sector employs over 85% of the country's workforce, contributes about a third of the country's GDP, and represents about 80% of all exports. Furthermore, smallholder farmers contribute 70% of the country's agricultural GDP with the rest coming from the estate sub-sector. Therefore, suggesting the need for efforts aiming at reducing poverty in Malawi to place substantial emphasis on promoting agricultural growth through increased smallholder farmers' productivity. According to FAO (2015a), the

agricultural sector continues to be Malawi's chief engine for development and economic growth.

Maize (*Zea mays*) continues to be Malawi's chief staple food crop and it is one of the crops that are greatly cultivated by smallholder farmers. It occupies 65% of the total land cultivated by smallholder farmers (FAO, 2018; Phiri *et al.,* 2012). Apart from its strategic significance to the country's food security and economy, maize also plays a crucial role in the livestock sector as it forms a component in feed formulations. The crop is the main source of carbohydrates, fibre and protein, and possesses large content of important minerals such as phosphorous, potassium, calcium and magnesium. Over 1.6 million smallholder farmers rely on maize production for their livelihood. Currently, maize yields in Malawi range between 2,000 kg to 3,000 kg/ha for hybrids, 1,400 kg to 2,400 kg/ha for open-pollinated varieties (OPVs) and 800 kg to 1,300 kg/ha for unimproved maize cultivars (GoM, 2018). However, GoM (2018) argues OPV's and hybrids' yield potential is 5,000 and 10,000 kg/ha respectively.

The Government of Malawi has since the 1950's been improving the country's agricultural extension system to raise agricultural productivity (GoM, 2000; Magomero and Park, 2014; Ragasa *et al.,* 2016). The most recent reform is the country's decentralized agricultural extension system (DAESS). In addition, a number of development partners have committed substantial resources for the reinforcement of the country's extension system (Ragasa *et al.,* 2015).

Malawi's extension policy is operationalized by DAESS which is composed of committees at district, traditional authority (TA) and village level and are responsible for aggregating the demands of farmers as well as finding service providers that can attend to the farmers' demands. Generally, its operational success depends on the financial situation at the district level. District councils are mandated by the Local Government Act of 1998 to collect revenues for the implementation of their activities including those under the DAESS. In addition, to the locally generated revenues, finances transferred by the central government, NGOs and donors are also used (GoM, 2006).

Despite the above, smallholder farming in Malawi continues to experience low production which is caused by the low application of chemical fertilizers, loss of soil fertility as well the practice of the traditional low-technology rain-fed farming (GoM, 2020). Thus, putting into question the role of Malawi's extension services despite the Government's reform of the same and the available resources being used to strengthen the country's extension system. Though some studies have been conducted on Malawi's extension services not much is known about the contribution of DAESS to smallholder farmers' crop productivity, specifically maize: as regards the current study maize/crop productivity refers to amount of crop harvested per unit of land (i.e. Kg/ha). Globally, the studies conducted include Sebaggada and Matovu (2020) who evaluated the impact of access to extension services on farm productivity, Swanson (2008) who in his paper was reviewing global good agricultural extension and advisory service practices and in Malawi, Ragasa *et al.* (2019) who analyzed the demand for and supply of agricultural extension services in three countries of Malawi, Ethiopia and Uganda; Chowa *et al.* (2013) who assessed farmers' experience of pluralistic agricultural extension in Malawi; and a cross-sectional study by Maonga *et al.* (2017) which identified key determinants of smallholder farming household's decision to access agricultural support services in Malawi. In addition, our extensive literature search did not find a study that examined the contribution of Malawi's DAESS to maize productivity. Therefore, the study on which this manuscript is based aimed at determining the contribution of Malawi's DAESS to smallholder farmers' maize productivity. Specifically, the study aimed at; establishing how smallholder maize farmers access agricultural extension services, determining how farmers' access to extension services is associated with their maize productivity and lastly, determining their satisfaction with Malawi's DAESS.

Research Methodology

Description of the study area

The study was conducted in Mangochi district, which is situated in the southern region

of Malawi, at the southern end of Lake Malawi (Malawi) or Lake Nyasa (Tanzania). The district lies between latitudes 14˚29' and 59.99" south of the Equator and longitudes 35˚14' and 60.00" east of the Greenwich Meridian. The district is about 200 kilometers from Blantyre, which is a major commercial and industrial city in the country and it is about 320 Kilometers from Lilongwe, Malawi's capital. With a total land area of 6,273 square, kilometres the district is the largest in the Eastern region and third largest in Malawi and has a population of 1,053,585 people (GoM, 2017b). The predominant types of soils are lithosols and the district experiences a warm tropical climate and temperatures range from 18°C to 32°C. The rainy season normally starts in October ending in May. Main food crops grown in the district include maize (*Zea mays*), sweet potatoes (*Ipomoea batatas*), rice (*Oryza sativa*), groundnuts (*Arachis hypogaea*), beans (*Phaseolus vulgaris*), soya beans (Glycine max), pigeon peas (*Cajanus cajan*) and cassava (*Manihot esculenta*) while main cash crops grown in the district are tobacco (*Nicotiana tabacam*) and cotton (*Gossypium*) (GoM, 2017b).

Research design

The study adopted the cross-sectional research design whereby data were collected once. Generally, the design allows the collection of similar data from respondents (Neuman, 2014) in a relatively faster manner using less cost but, without compromising the quality of data (Setia, 2016).

Sampling techniques and sample size

Mangochi district was selected purposefully for being one of the districts implementing the DAESS. Five (5) Extension Planning Areas (EPAs) and 150 smallholder maize farming households were selected randomly from 303,202 farming households that are in Mangochi District (GoM, 2020), for the study. In addition, respondents were selected based on the farmer registers that were obtained from agriculture offices and local leaders.

Data collection

Primary data were collected from respondents using a pre-structured questionnaire with closed and open-ended questions; the same was pre-tested before the actual data collection. The questions mainly aimed at collecting data on the quality of extension services that smallholder farmers get from different extension service providers. In addition, qualitative data were collected through FGDs and KIIs using an FGD guide and checklist respectively. 10 FGDs were conducted, five (5) with members of village agriculture committees (VACs) and Area Stakeholder Panels (ASPs) who are also smallholder farmers, and another five (5) with frontline extension workers. The FGDs involved six (6) to eight (8) participants and in total, 67 participants were involved in the discussions. A total of nine (9) KIIs were conducted with the Director of Agriculture and Natural Resources (DANR), the chair of the District Agriculture Extension Coordination Committee (DAECC), the chair of the District Stakeholder Panel (DSP) and five Agriculture Extension Development Coordinators (AEDCs). The above-mentioned data collection methods aimed at allowing triangulation, which is a means of producing a comprehensive outcome through the help of two partial results which might not stand on their own (Kelle *et al.,* 2019).

Data analysis

Quantitative data collected through the questionnaires were analyzed through IBM-SPSS whereby both descriptive (frequencies and percentages) and inferential statistics were determined. A multiple regression model was used to determine how farmers' access to agricultural services is associated with their maize productivity. The multiple regression equation used for analysis is as detailed below:

$Y = \beta o + \beta 1X1 + \beta 2X2 + ... + \beta 10X10$

Where;

Y = Productivity (kg/ha)
B = Regression Coefficients
β0 = Intercept
X1 = Access to agricultural extension service (frequency of visits by extension officers)
X2 = Sex (1=male, 0=female)
X3 = Marital status (1 = married, 0=single)
X4 = Age (years)
X5 = Household size (total number of people in

a household)
X6 = Farm size (ha)
X7 = Education level (1=Non formal, 2=Primary, 3=Secondary, 4= Tertiary)
X8 = Use of fertilizer
X9 = Use of new seed
X10= Pest control

For the case of qualitative data that was gathered through the FGDs and KIIs, content analysis was used whereby the responses from key informants and the FGD participants were categorized in meaningful themes.

Findings and Discussions

Respondents' demographic and socio-economic characteristics

Table 1 contains the respondents' major demographic and socio-economic characteristics. Table 1 shows that the majority (60%) of the respondents were females. The observation is in line with the findings of Maliro and Kandiwa (2015) that women account for about 70% of the workforce involved in Malawi's maize production. Furthermore, men and young men in the study area tend to be busy with fishing at the lake Malawi/Nyasa and others migrate to South Africa for greener pastures hence, more female respondents than males.

Table 1 also shows that about a half (49.3%) of respondents were adults aged between 36 and 60 years, followed by the youth aged between 18 to 35 years (38.7%). The mean age of the respondents was 42.3 years. Study findings (Table 1) also show that the majority (82%) of respondents were married and 11% were divorced. The findings further show that about two-thirds (63.3%) of the respondents had attained primary school education, 22.7% had no formal education and only 14% had attained secondary school education. The proportion of respondents with no formal education is more or less similar to the observation by GoM (2017c) where 24.1% of people in Mangochi district are reported to have never attended school. According to Oduro-Ofori *et al.* (2014), improvement of agricultural productivity cannot be meaningful without education.

As regards land holding size, the study found that the average land size in the study area was 0.95 ha; with the majority (72%) having 0.8 to 1.6 ha followed by those having less than 0.4 ha (20%) (Table 1). This average landholding size is slightly lower than Malawi's 1.2 ha average household land holding size (FAO, 2015b). In addition, despite most men and young men out-migrating in search of greener pastures, the study found out that almost all (98%) respondents depend on farming as their main source of income (Table 1) The figure is higher than what was reported by IFAD (2017) that 85 % of the rural people in Malawi depend on agriculture as their source of livelihood. Lastly, Table 1 shows that above one-third (38.7%) of the respondents had more than 19 years of farming experience and less than a quarter (18.7%) had the farming experience of 5 to 9 years.

Farmers' access to agricultural extension services

Study findings (Table 2) show that the majority of farmers met extension staff/agents elsewhere other than their plots with 43.3% and 30% doing so twice or threefold respectively. In addition, Table 2 shows that extension officers in the 2019/2020 agricultural season rarely visited farmers on their plots with only 16% getting such an opportunity and 84% were not visited. Generally, plot visits ranged from 1 to 5. A similar scenario was reported by Mbise *et al.* (2016) for maize framers in Ludewa District, Tanzania where 87.7% of the respondents had not been visited. The study findings suggest limited provision of extension services in Mangochi district.

Furthermore, of the 24 farmers whose plots were visited in the 2019/20 season, only one farmer indicated to have solicited the visit after noticing the presence of some pests. For the rest, extension officers visited the plots on their own because some of the farmers were hosting demonstrations; other plots were visited because of good management and good crop stand while other plots were visited during the Agricultural Production Estimates Survey (APES).

Research findings in Table 2 show that, the major source of extension advice for the smallholder farmers was lead farmers (100%). All farmers interviewed indicated that they received extension advice from lead

Table 1: Respondents demographic and socio-economic characteristics (n = 150)

Respondents' Characteristic		Mean	Frequency	Percentage
Sex	Female		90	60
	Male		60	40
Age	18-35 years	42.3	58	38.7
	36-60 years		74	49.3
	>60 years		18	12
Marital Status	Never married		2	1.3
	Married		123	82
	Divorced		17	11.3
	Separated		2	1.3
	Widowed/widow		6	4
Education Level	No formal education		34	22.7
	Primary		95	63.3
	Secondary		21	14
Household Size	< 3	5.36	11	7.3
	3 – 5		82	54.7
	6 – 8		47	31.3
	9 – 11		10	6.7
Farm Size (in ha)	< 0.4	2.38	30	20
	0.4 – 1.6		108	72
	2 – 2.8		11	7.3
	>2.8		1	0.7
Major Source of Income	Farming		147	98
	Business		1	0.7
	Ganyu		2	1.3
Farming experience (in years)	< 5	17.47	5	3.3
	5 – 9		28	18.7
	10 – 14		39	26
	15 – 19		20	13.3
	>19		58	38.7

farmers, followed by government extension staff whereby almost all (98%) of the farmers indicated to have accessed extension advice from the same. In addition, over a half (55.3%) managed to access extension services from NGOs/CSOs operating in the district while only a few (4%) accessed extension services from private traders. The findings conform to those of Ganpat *et al.* (2014) and Cai and Davis (2017) who have reported public government extension services to be the largest provider of extension services in Malawi followed by NGOs/CSOs. Nonetheless, both of the above-mentioned do engage lead farmers for wider coverage of their interventions. Similar observations have been reported in Tanzania when it comes to access

Table 2: Farmers' access to agricultural extension services in the 2019/20 season

Number of times farmers met extension staff elsewhere n=150			Number of Farmers whose plots were visited n=150				Source of Advice n=150	
No. of Times	**No. of farmers**	**(%)**	**No. of Times**	**No. of farmers**	**(%)**	**Source**	**No. of farmers**	**(%)**
1	25	16.7	0	126	84	Government	147	98
2	65	43.3	1	5	3.3	Private	6	4
3	45	30.0	2	7	4.7	NGOs/CSO	83	55.3
4	12	8.0	3	8	5.3	L/ Farmers	150	100
5	2	1.3	4	2	1.3	Field Days	12	8
6	1	.7	5	2	1.3			

to extension services by female smallholder farmers (Isaya *et al.,* (2018) and in Ethiopia where Gebremariam *et al.* (2021) argue the government extension agencies to be the major source of agricultural extension services.

Smallholder farmers' access to agricultural extension services and their maize productivity

A multiple linear regression model was used to determine factors associated with smallholder farmers' maize productivity. Explanatory variables included access to agricultural extension services and control variables of respondent's sex, education level, marital status, age, household size, farm size, use of the new seed, use of fertilizer and pest control. These control variables were used to obtain unbiased causal effect estimates (Hunermund and Louw, 2020). A collinearity/ multicollinearity diagnostics test was done before running the regression analysis to detect whether there was a correlation among the independent (Xi) variables whereby results (Table 3) show that no variables had a tolerance value of VIF<10. This observation confirms that there was no violation of the multicollinearity assumption in the current study as stipulated by Pallant (2011) and Hair *et al.* (2013). In addition, Durbin-Watson's test was used to test for auto-correlations. The results show that the Durbin-Watson's is 1.87 which falls within the values of 1.5<d<2.5, implying that there is no auto-correlation (Kutner *et al.,* 2005). Hence, there is no auto-correlation in the multiple linear regression data.

Research findings in Table 3 show that, the coefficient of determination (R^2) is 0.35 and this implies that the 10 independent variables of sex, marital status, age of respondent, frequency of visits by extension officers, household size, farm size, education level, use of fertilizer, use of new seeds and pest control services which were included in the regression model explained 35 per cent of the variation in maize productivity, which is the dependent variable. In this study, the number of times farmers' plots were visited by extension agents in the year 2019/2020 was used as a measure of access to agricultural extension services.

Findings in Table 3 show that the number of times farmers' plots were visited by extension agents in the 2019/2020 season was significantly ($p<0.001$) and positively associated with their maize productivity. Thus, suggesting that a unit increase in the frequency of visits by extension agents increased maize productivity by 201.06kgs. The finding is in line with what has been reported in the literature(Owens *et al.,* 2003; Nambiro *et al.,* 2010; Mulinga 2013; Mbise *et al.,* 2016; Musinguzi, 2019), that having access to agricultural extension services results in an increase in crop productivity.

Furthermore, it was discussed in the focus group discussions with farmers that when an extension agent is visiting a farmer on his or her plots, the message that is delivered is relevant to that particular farmer with what he or she is doing. This is demonstrated by the following extract from one of the FGDs with Village Agriculture Committees (VACs) and Area Stakeholder Panels (ASPs);

Table 3: Multiple regression results of factors associated with respondents' productivity

Variables (Factors influencing maize productivity)	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	Beta	Std. Error	Beta			Tolerance	VIF
(Constant)	26.661	388.674		.840	.402		
Sex of respondent	51.129	98.726	.045	.518	.605	.624	1.602
Age of respondent	59.571	68.524	.071	.869	.386	.714	1.401
Marital status	199.351	109.774	.137	1.816	.072*	.821	1.218
Education level	52.790	68.468	.057	.771	.442	.867	1.153
Household size	33.128	20.983	.112	1.579	.117	.927	1.078
Farm size	81.116	29.960	.203	2.708	.008**	.838	1.194
New seed	2.801	127.767	.002	.022	.983	.890	1.123
Pest control	-405.551	286.428	-.102	-1.416	.159	.908	1.101
Fertilizer	-6.910	164.085	-.003	-.042	.966	.872	1.147
Frequency of visits by extension officers	201.055	36.546	.398	5.501	.000***	.898	1.113

$R=0.589$; $R^2=0.346$; Std. Error of the Estimate = 468.022; Durbin-Watson = 1.867; p=0.000
*NB: *, ** and *** refer to significance at the 10 (0.1), 5(0.05) and 1 (0.001) percent levels*

> *It is normally better when extension officers are visiting our plots because they see what we are exactly doing and how we are doing it so they give advice and messages that we surely put to use as the advice and messages exactly relate to our production. As such we easily follow such messages compared to when they call us to different meetings elsewhere sometimes the messages we get there tend to have nothing to do with what is happening in our various farms* (FGD, Mbwadzulu EPA, 27th November 2020).

Based on the study's observation the probability of getting higher maize yield is greater for farmers whose fields are visited by extension agents. Generally, under such circumstances the extension agents do not give general extension services rather, they provide specific services based on what they see in that particular field.

Table 3 also shows that farm size was significantly (p>0.05) and positively associated with maize productivity (kg/ha) whereby farmers with large farms reported higher productivity. The possible explanation for the above could probably be that, farmers with larger farms are more willing to try out new and improved technologies without fear of total crop failure in the process of becoming more productive. The finding conforms to what was reported by Omotilewa *et al.* (2021) that a positive relationship existed between farm size and productivity. However, the finding is contrary to observations by Thapa (2007) and Chand *et al.* (2011) whose studies showed that farm size was inversely related to crop productivity meaning an increase in farm size resulted in a reduction in crop yield (kg/ha). The lack of conformity could probably be due to farm sizes and their respective management. Generally, small-sized farms can be easily managed compared to larger ones especially when labour is a constraint hence the formers higher productivity.

Findings in Table 3 further show that

the other variables of sex, marital status, age, household size, use of new seed varieties, use of fertilizer, pest control and education level were not significantly ($p \geq 0.05$) associated with maize productivity. However, marital status was slightly significant ($p \geq 0.1$). Nonetheless, sex and marital status had a positive beta coefficient of 51.129 and 199.351 respectively suggesting that male-headed households and those of married individuals exhibited relatively higher maize productivity than their counterparts. Literature (Ali *et al.,* 2015; Gebre *et al.,* 2019a) has reported a difference in yield between male and female cultivated plots with the former having higher yields. The positive beta coefficient of 59.571 observed for age suggests as age increases, the maize productivity of that person increases too. (Table 3) This is probably because as the person gets older, farming experience increases too hence, an increase in his/her productivity. The observation conforms to the finding by Tauer (1993) that crop productivity increases with age, nonetheless Tauer also argues that productivity is at its highest in mid-life and declines thereafter.

Study findings in Table 3also show that household size was positively associated with maize productivity thus; suggesting larger households are more productive. The possible explanation is that where production is labour intensive, the larger households have more labour at their disposal hence, their timely engagement in the various husbandry practices required in maize production: these include land preparation, planting, weeding and harvesting which are all critical for higher yields relative to small-sized households especially when these lack capital. According to Oyetunde-Usman and Olagunju (2019), households with more people are technically more capable to perform their farm operations. However, this is in contradiction to findings by Ngongi and Urassa (2014), who found a negative relationship i.e. as the number of household members increased the less productive the household become.

Additionally, the study findings (Table 3) show that the education level of farmers had a positive beta coefficient implying that an increase in the level of education has a possibility of increasing farmers' maize productivity. The finding concurs with Oduro-Ofori *et al.* (2014) and Paltasingh and Goyari (2018) who argue that a farmer's level of education influences the adoption of modern technologies thereby influencing their crop productivity. Furthermore, the results also shows a positive relationship between the use of improved seed varieties and productivity implying that farmers using improved maize seed varieties have high chances of increasing their maize productivity than those not using improved seed varieties (Table 3). The finding is in line with that of Chand *et al.* (2011), who reported that the adoption of improved seeds results in increased productivity.

Lastly, findings in Table 3 show that the use of fertilizer and pest control had negative beta coefficients meaning that their use had a possibility of reducing farmers' maize productivity. This might be a result of excessive use of chemical fertilizers. Generally, excessive use of chemical fertilizers causes severe environmental degradation. Since 2005 Malawi has been implementing the farm input subsidy program (Schiesari *et al.,* 2016) which enables smallholder farmers to buy farm inputs such as chemical fertilizers and improved seeds at a subsidized price. This possibly led to overuse of fertilizers amongst smallholder farmers because it was available at low prices hence, causing significant environmental degradation thus, and the inverse relationship. Similar results have been reported by Rahman and Zhang (2018). On the use of pesticides, due to the problem of fall armyworm the country is having, the government through the ministry of agriculture is providing farmers with free pesticides hence, the possibility farmers applying higher rates of pesticides than recommended such that the marginal productivity of pesticides is negative. According to Zhang *et al.* (2015) applying excessive rates of pesticides than recommended negatively affects crop productivity.

Farmers' satisfaction with DAESS

Study findings (Table 4) show that the majority (73.3%) of smallholder farmers were satisfied with the decentralized extension services (Table 4). Observations from the FGDs concurred with the above. For example, during the FDGs, many participants mentioned that

promotion of organic manure, the livestock pass-on programme, use of the lead farmer and group approach, as well as communication through the local leaders were the major reasons for their satisfaction with the extension services. Moreover, the participants stated that the use of organic manure was the surest way of improving their yield as it is cheaper and readily available compared to the use of inorganic fertilizer as shown in the extract below:

With the livestock pass-on the programme being promoted, we easily get animal droppings to produce manure for our crops (FGD, Katuli EPA, 23rd November 2020).

The findings from the FGD conform to findings by Morshedi *et al.* (2017) that the use of applicable procedures of organic manure results in production optimization. Nonetheless, according to Duwe (2016), the adoption of organic manure by smallholder farmers tends to be low largely because of inadequate livestock.

The use of lead farmers was another reason that raised farmers' satisfaction with provision of extension services. During the FGDs, it was pointed out that lead farmers are readily available as they reside within the farmers' communities. They promote different technologies in their demonstration plots therefore, interested farmers can easily find the lead farmers to enquire and get the required advice as supported by the extract below.

Production has increased, our soils have improved in fertility, and organic content and the soil can hold water just because of the technologies we learnt through the lead farmers (FGD, Masuku EPA, 26th November 2020).

The study's observation conforms with findings by Andersen (2019) who argues that the lead farmer's approach has proved to be greatly significant to the needs of farmers. Moreover, the approach addresses the most pressing challenges of climate change, hunger and poverty. The study's findings are also in line with the findings of Khaila *et al.* (2015) who reported that most lead farmers meet farmers regularly and conduct training sessions at their demonstration fields. Contrary to the finding, Ragassa (2019) argues that there is weak implementation and effectiveness of the approach at national level and that lead farmers have limited coverage due to mobility challenges.

Despite the overall satisfaction of farmers with extension services being high, it was also observed during the FGDS that most service providers come with their ideas and implement them without seeking the knowledge and opinion of the farmers themselves. Therefore, going contrary to the decentralized extension service system's preaching for demand-driven extension services. Similar observations have been made by Chiwasa and Kambewa (2018). The duo argue that despite Malawi having suitable frameworks linked to the demand-based extension services system there is nonetheless, a lack of structures for organizing the demands of farmers and expressing them, consequently, restraining the implementation of the demand-driven extension service system.

Conclusions and Recommendations

Conclusions

The study aimed at determining the contribution of Malawi's DAESS to smallholder farmers' maize productivity. Specifically, it aimed at; establishing how smallholder maize farmers access agricultural extension services, determining how farmers' access to extension services is associated with their maize productivity and lastly, farmers' satisfaction with Malawi's DAESS. Based on the study's findings, it can be concluded that access to agricultural extension services and the number of visits to smallholder maize farmers' plots raises their productivity despite only a few farmers having the opportunity of their plots being visited. It can further be concluded that the use of lead farmers is the most popular approach when it comes to the dissemination of agricultural extension services to smallholder maize farmers in Mangochi district. Lastly, it is concluded that the majority of smallholder farmers in Mangochi are highly satisfied with the DAESS, especially the communication channels used, methodology as well as the extension packages. However, they are not satisfied with the way they are being involved in planning, implementation, monitoring and evaluation of different activities in their area.

Recommendations

Based on the study findings and the conclusions the study recommends that the government of Malawi and all stakeholders of the agriculture sector should continue to improve the decentralized extension service system to ensure that many more farmers may have an access to quality agricultural extension services to increase their productivity. The improvements could be around the following:

i. Employment of more staff both male and female to ensure that there is a gender balance in the provision and access of the services. In addition, the working environment of the staff should be improved to ensure that there is high staff retention.
ii. The lead farmers currently being used to disseminate information and technologies to fellow farmers due to the lack of adequate numbers of extension staff should receive proper training to communicate uniformly and consistently with the available staff. Doing so will ensure the lead farmers are equipped with the necessary information so as not to mislead fellow farmers as they are trusted and frequently used by fellow farmers.
iii. Build the capacity of farmers to be able to identify and organize their agricultural felt needs and to be able to demand services from different service providers.
iv. Build the capacity of farmers in participatory planning, monitoring and evaluation of different activities in their areas for them to gain skills that can strengthen local capacities for tasks such as problem solving, planning, collaborative decision making as well as resource management.

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