Full Length Research Paper

Socio-economic factors influencing farmers' perception on effectiveness of decentralized agricultural extension information and services delivery in Arumeru District, Tanzania

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This study examined socio-economic factors influencing farmers' perception on the effectiveness of agricultural extension information and service delivery during the D by D policy. A cross-sectional research design was used to collect data from 390 respondents using semi-structured questionnaire. Quantitative data were analyzed through Binary logistic regression with eleven explanatory variables fitted in the model. The study revealed that, of the eleven socio-economic variables tested only sex and farm size were found to be statistically significant with a beta coefficient of -.390 and .11 respectively. Based on sex, this confirms that, female farmers in the study area were less likely than male farmers of perceiving agricultural extension information and service delivery as effective during the implementation of D by D policy. The study findings showed further that, farmers with large farm size were more likely, than did those with small farms, of perceiving the effectiveness of agricultural extension information and service delivery during the implementation of D by D policy size. The two councils should recruit more female extension staff and advice farmers to join cooperative societies so as to enhance effectiveness of the policy.

Keywords: Socio-economic**,** agricultural extension, information, services, decentralization, devolution, policy.

INTRODUCTION

The delivery of public agricultural extension information and services is as old as the history of humankind. Its emergence can be traced as far back as thousands of years ago in different parts of the world including China,

Mesopotamia, Egypt and the Americans (Swanson and Rajalahti, 2010). Later in the twentieth century, the United Kingdom decided to transfer agricultural extension responsibilities from Agricultural Colleges and Universities to the Ministry of Agriculture (Swanson and Rajalahti, 2010). In the United Kingdom itself, the term extension was used to describe adult education programmes organized by Oxford and Cambridge

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Universities (Swanson and Rajalahti, 2010). In other European countries, the term 'extension' was expanded and used in their respective Ministries of Agriculture. In developing countries the term public agricultural extension was used and recommended by donor agencies especially the United States Agency for International Development (USAID) helped to create agricultural universities and establish public extension and advisory services systems. Up to late 1970s, most of public extension system in sub-Saharan Africa carried the title of agricultural extension while in other countries worldwide was regarded as the delivery of agricultural extension information and services and was administered by the ministry responsible for agriculture.

The concept of agricultural extension information and service delivery (AEI&SD) refers to the practice which involves linking farmers to markets, facilitating them with information, skills and technologies for livelihood improvement and linking them with other key players in the agricultural value chain (Glendenning et al., 2010). Agricultural extension information and service delivery comprises the entire set of organizations that support and facilitate farmers in their efforts of solving farming problems. Similar definition is provided by Christoplos (2010) who describes AEI&SD as systems that facilitate farmers and other market actors' access to knowledge, information and technologies. In addition, Christoplos posits that, AEI&SD facilitates farmers' interaction with partners in research, education, agribusiness, and other relevant institutions and the latter are assisted to develop their own technical, organizational and management skills and practices.
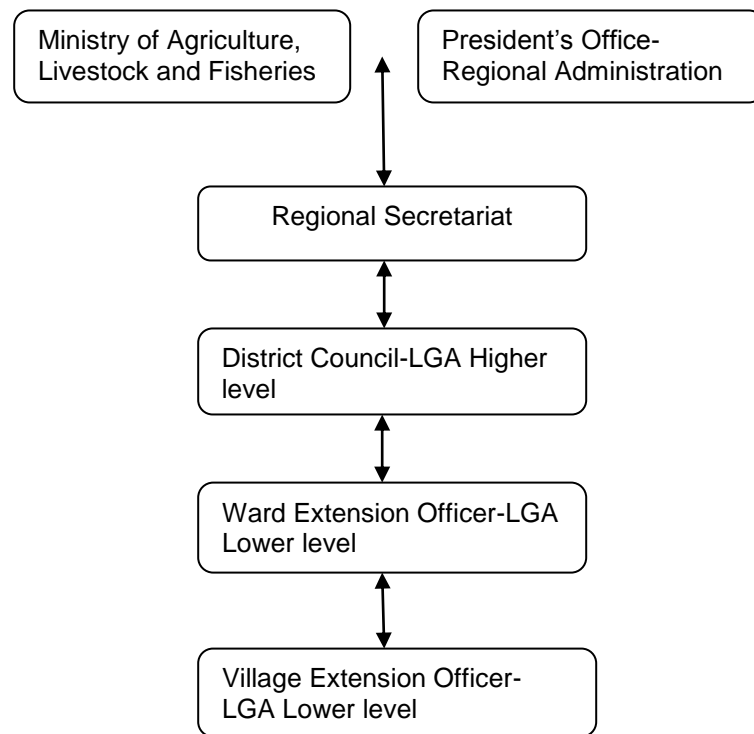
In the 1990s, public AEI&SD continued to face constant challenges of inefficiency, irrelevancy, ineffectiveness, and poor targeting. In this respect, there was a need for reform; as a result, most of the national extension systems responded by adopting three major strategies namely; privatization, decentralization, and program revitalization (WB, 2010). Although cost reduction was the rationale behind many changes, the principal objective of extension reforms worldwide was the desire to improve the quality and quantity of service delivery to its clients. The proponents of decentralized AEI&SD viewed it from democratic perspective, which was anchored on the need for empowering local people in order to control and direct their own public programmes; on the other hand, proponents of decentralized AEI&SD viewed decentralization process from the administrative perspective, which emphasized on the efficiency which is gained as a result of improved administration and effectiveness of public programmes due to local control (MEAS, 2014). The demand for decentralized AEI&SD is strong throughout the World (Green, 2015). However, the benefits of such demand are not obvious. There are continuing debates on efficacy of decentralization as an effective policy instrument for improved AEI&SD. The basis of this contestation emanates from the evidence provided by decentralization literature, which shows the prevalence of both positive and negative correlation between decentralization and service (Mookherjee, 2015).

In Tanzania, the organization of public AEI&SD has been changing with the change in the government policy on agricultural landscape. Soon after independence in 1961 and the subsequent adoption of Arusha Declaration in 1964, which advocated for socialism and self-reliance ideology, the AEI&SD was centrally planned and managed at the Ministerial level. However, the change in the country's agricultural strategic framework, which included the adoption of decentralization by devolution (D by D) policy and the enactment of Local Government Act No. 9 of 1999, led to the change of the structure and management of AEI&SD from the then Ministry of Agriculture and Livestock Development to the Local Government Authorities (Fig 1). The Central Government remained with the role of formulating and monitoring policy implementation and providing technical backstopping to LGAs (Mollel and Tollenaar, 2013).

The main objective of decentralizing AEI&SD in Tanzania was to improve quality and access of the services to farmers through improving and promoting administrative and managerial efficiency and effectiveness. However in reality, there is marked lack of evidence as to whether or not these particular objectives have been achieved (Kyaruzi et al., 2010; Mvuna, 2010). In addition, studies on the provision of AEI&SD in Tanzania show that AEI&SD is ill-equipped, uncoordinated, has high ratio of famers to extension staff, underutilizes information communication technology, and has limited use of participatory approaches (Wambura et al., 2012). Hence, the main questions are; has the D by D policy been able to live up to its expected objectives, hence influenced effective provision of AEI&SD? And; what factors influence AEI&SD effectiveness in Tanzania?

The soufflé theory of decentralization attempts to bring together various dimensions of decentralization and relates them with intermediate outcomes that are likely to have an impact on the overall rural development outcomes (Tanyanyiwa, 2015). According to soufflé theory of decentralization, successful decentralization needs a combination of various social, political, and institutional factors that are country specific (Tanyanyiwa 2015). Based on this theory, this study assessed socio-economic factors that influence farmers' perception on the effectiveness of AEI&SD during the implementation of (D by D) Policy in the study areas. The results from this study would inform

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┌─────────────────────────┐   ┌─────────────────────────┐
│ Ministry of Agriculture,│   │ President's Office-      │
│ Livestock and Fisheries │   │ Regional Administration │
└─────────────────────────┘   └─────────────────────────┘
                      ↕
              ┌─────────────────────┐
              │ Regional Secretariat│
              └─────────────────────┘
                      ↕
              ┌─────────────────────┐
              │ District Council-LGA│
              │ Higher level        │
              └─────────────────────┘
                      ↕
              ┌─────────────────────┐
              │ Ward Extension      │
              │ Officer-LGA Lower   │
              │ level               │
              └─────────────────────┘
                      ↕
              ┌─────────────────────┐
              │ Village Extension   │
              │ Officer-LGA Lower   │
              │ level               │
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Legend
Downward arrow= AEI&SD directives chain of command
Upward arrow= Reporting Chain
Fig.1. Organisation structure of Agriculture Extension Information and Service Delivery in Tanzania.

government and policy practitioners in the study District on best practices of an effective AEI&SD in increasing smallholder production and productivity.

MATERIAL AND METHODS

Description of the study area

The study was conducted in Meru District Council (MDC) and Arusha District Council (ADC) in Arumeru District in Arusha Region. Geographically, MDC lies on the slopes of Mount Meru, which is the second highest Mountain in Tanzania with 14,000 ft. (4516m) above the sea level (MDC Socio-Economic Profile report, 2015). According to MDC 2011/12-2015/16 Strategic Plan Document, MDC has a total land area of 1,268.2 square kilometers of which 64.1% is for agricultural activities, 3% is covered by forest reserves, 16% is for National Parks, 0.4% is occupied by water bodies, and the remaining 3.6% is for settlement. According to MDC 2015/2016 annual report, the main economic activities in the Council include crop cultivation, fishing, livestock keeping, tourism and commerce. Major crops grown in the Council include maize, sorghum, paddy, bulrush millet, legumes, sweet potatoes, cassava, coffee, paddy, and chick peas.

According to the 2012 Population and Housing Census, MDC had a total population of 268,144 people. Of these 131,264 (49%) were males and 136,880 (51%) were females with an estimated average household size of 5 members and annual population growth rate of 2.7% (URT, 2013). The surveyed villages were Poli, Ndatu, Karangai and Kikwe. In May 2016, there were 166 Agricultural Extension Staff whereas 27 were at the District Headquarters, 49 were at the ward level, and 90 were at village levels.

Arusha District Council (ADC) was established on the 1st of July, 2007 by the provision of section 8 & 9 of the Local Government ACT of 1982. ADC has two main agricultural zones: the green belt of the slopes of mount Meru on the South, which is potential for production of bananas, coffee and horticultural crops; and the lowland belt, which is potential for the cultivation of maize, beans,

cassava, peas, rice, pigeon peas and livestock raring mainly on free range. ADC gets the average rainfall of 800mm–1000 annually. The main economic activities include agriculture, livestock keeping, businesses and tourism services. According to 2012 National Census, the Council had a population of 315,173; 149,568 of these were males and 165,605 were females. The Council had a population density of 227.4 with population growth rate of 3.4%. The surveyed villages included Lengijave, Olkejulenderit, Kisyeria and Mlangarini. The two Councils were purposively selected because of their rich experience in the implementation of AEI&SD under D by D policy. Moreover, the researcher had extensive experience of working in the two Councils for more than six years, and this provided an opportunity for the researcher to understand the studied phenomena.

Sampling Procedures

This study used a two stage multi stage sampling technique: the first stage involved the selection of study areas, while the second stage involved the selection of agricultural households.

Stage I: Selection of geographical location

Meru and Arusha District Council were purposely selected from a list of seven Councils that implemented the D by D policy in Arusha. Based on ecological factors and the nature of farming activities two wards and four villages were purposely selected from each Council. In each Council, two wards were purposely selected; one was predominantly dealing with crop farming and the one was dealing with livestock keeping. In Meru District Council, Poli and Kikwe wards were purposively selected. Poli and Ndatu villages, which are in Poli ward are located in the highland zone and were dominantly crop farming, while Kikwe and Karangai villages in Kikwe ward, which are located in lowland   were predominantly livestock keeping communities.

In Arusha District Council, Lengijave, Olkejulenderit villages in Olkokola ward, which are in the highlands zone, were pronominally livestock keeping. These villages were selected to represent livestock keeping communities. On the other hand Kisyeria and Mlangarini villages in Mlangarini wards which are in lowland zone were selected to represent crop farming communities. These selection criteria enabled data gathering from both livestock keepers and crop farmers.

Stage II: Selection farming households' respondents

According to 2007/2008 National Agriculture and Livestock Census, Arumeru District had a total of 97,545 agricultural households. A sample size of 398 of 97,545 households were determined using a formula provided by Yamane (1967) which states that n=N/1+N (e^2) with the level of precision of 0.05 assuming 95% confidence level: Whereas 'N' is the number of population size 97,545 for agricultural households and 'e' is the level of precision at 0.05. Hence, the calculation gave a sample size of 398 agricultural households; these were later divided equally to the two District Councils to get 199 agricultural households, from each. A farming households' list which was kept at the District Agricultural office was used to select adult respondents for the study.

Primary data collection

The study employed a cross-sectional research design to collect quantitative data.   Semi-structured questionnaire was used in data collection. Information collected included farmers socio-economic factors, farmers' perception on access to land, linkage and access to markets, agricultural inputs, financial services, agricultural information and technologies, timeliness, and responsiveness of the services. Some other types of information were quality and relevance of agricultural information and technologies, farmers' yields, income from sales of crops and livestock, farmers' livelihood, equity in the delivery of services and farmers' capacity to initiate the demand for AEI&SD.

Secondary data

Secondary data were collected through reviewing different relevant documents relating to this study. The documents were Tanzania Agricultural Policy of 2013, D by D policy, agricultural extension guidelines, Controller and Auditor General Performance report on the assessment of extension services under decentralized system, and annual agricultural extension development reports from the President's Office–Regional Administration and Local Government.

Data analysis

SPSS version 20 was employed to analyse quantitative data and binary logistic regression was used to determine socio-economic factors influencing the respondents' perception on the effectiveness of AEI & SD during the implementation of D by D policy. Binary regression model was used because the dependent variable was categorical with dummy variable responses. The respondents' perception on the effectiveness of AEI & SD during the implementation of D by D policy were measured using responses 'Yes' or 'No' to the statements.

The scores were summed up to get the total score value for each aspect, and this ranged from 0 to 21. In addition, the score was assigned 1 if the total score was more than half, and 0 if the total score was less than half for a variable. All outcome variable respondents who agreed with the statements were given 1 and those who disagreed were given 0.

The general multiple logistic regression model is given as:

$$\log it[\pi(x)] = \log\left(\frac{\pi(x)}{1-\pi(x)}\right) = \beta_0 + \beta_1 x_1 + \ldots + \beta_p x_p$$

.

Where, $\pi(x)$ is the probability of adherence, $x_i's$ are covariates and $\beta_i's$ are their respective parameters. Whereas x_1=age, x_2=sex, x_3=marital status, x_4=nature of farming experience, x_5=farming duration, x_7= economic activities, x_8=total income, x_9=size of the farm, x_{10}=size of household, x_{11}=name of the council

RESULTS AND DISCUSSIONS

Table 1 shows regression model results of the selected socio-economic factors influencing the respondents' perception on access to AEI & SD during the implementation of D by D policy. Eleven explanatory variables were included in the model namely, age, sex, marital status, academic qualification, farming experience and the nature of farming engagement. Others were economic activities, the total income, the size of the farm, the size of the household and the name of the council. The study results had a Variance Inflation Factor (VIF) which ranged from 1.0 to 1.8, and which according to Akinwande et al, (2015) was a good indicator that the independent variables were not correlated. The multicollinearity practically inflates unnecessarily the standard errors of the coefficients by making some variables statistically insignificant while they were supposed to be significant (Murray et al, 2012). The -2 log improved from 95.66 with the constant only to -2.263, chi-square value was 215 with df-11 and was statistically significant at p≤ 0.034. The Cox and Snell R^2 and Nagelkerke R^2 values were 0.57 and 0.68, respectively implying that the predictors in the model accounted for about 57% to 68% in explaining the respondents' access to AEI & SD during the implementation of D by D policy (Table 1). In addition, the Hosmer-Lemeshow test results had a chi-square value of 12.204 with df=8 and p≤ =0.142, and according to Pallant (2011), the p≤ value should be greater than

0.005, implying that, the fitting effect between the model and data was good, which was the case for this model. Furthermore, Table 1 shows that of the eleven explanatory variables tested only two variables namely, sex and farm size were statistically significant at p≤ 0.05 and 0.01, respectively. Sex of the respondents had a beta coefficient of -.390 and was statistically significant at p≤ 0.05. This implies that female respondents had less likelihood than male respondentsof perceiving the effectiveness of AEI & SD during the implementation of D by D policy. The variable recorded a negative 32% predicted change. The study findings have been attributed by numerous factors including the nature and composition of agricultural extension agents. Observations in the surveyed areas indicated that, the extension system was male dominated with biasness' attitude which lead to reduced female access to AEI&SD. This finding conforms to the finding in a study by Ragasa et al. (2012) in Ethiopia who found that female farmers were less likely to get AEI & SD than their male counterparts.

Yet, age had a positive beta coefficient of .319 and was not statistically significant at p ≤0.44. This implies that as the age of the respondents increased by one year, the likelihood of perceiving the effectiveness of AEI & SD during the implementation of D by D policy was lowered by 38% predicted change (Table 1). This finding is in line with the finding in a study by Abdalah and Awal (2016) in Ghana who found that age had limited effects as a determinant of access to agricultural extension services and to the adoption of technology.

Marital status of the respondents had a positive beta coefficient of .147 indicating that marriage increased the respondents' likelihood of perceiving the effectiveness of AEI & SD during the implementation of D by D policy and vice versa. Marriage variable had a 15.8% predicted change but was not statistically significant at p≤0.22.

Academic qualifications of the respondents had a beta coefficient of .164. This implies that one unit increase in the respondents' academic qualification produced a 100% negative change in the likelihood of the respondents to perceive the effectiveness of AEI & SD during the implementation of D by D policy. The reverse is also true. This variable too was not statistically significant at p≤ 0.67 (Table 1). The findings indicate further that, farming experiences was linked to the respondents' likelihood of perceiving the effectiveness of AEI & SD after the D by D policy. This variable had a positive beta coefficient of .033, which implies that one unit increase in the respondents' farming experience produced 18% positive change in the respondent's likelihood of perceiving the effectiveness of AEI & SD during the implementation of D by D policy. The reverse is also true. This variable was not statistically

Table 1. Socio-economic factors influencing farmers' perception on the effectiveness of AEI & SD during the implementation of the D by D policy.

Variable	B	S.E.	Wald	Sig.	Exp(B)	Predicted % Change	VIF
Constant	-2.263	1.784	1.608	0.21	.104	-73.1	
Age	.319	.417	.588	0.44	1.376	37.6	1.836
Sex(1=Female 0=Male)	-.390	.561	.483	0.05	.677	-32.3	1.120
Marital status	.147	.847	.030	0.22	1.158	15.8	1.260
Academic qualification	.164	.384	.183	0.67	1.178	-100	1.213
Farming experience	.033	.063	.272	0.60	1.033	17.8	1.476
Nature of farming engagement	.016	.775	.000	0.98	1.017	3.3	1.242
Economic activities (1=Formal employment 0=Non Formal)	.12	.605	0.04	0.09	1.127	12.75	1.078
Total annual income	.021	.082	.068	0.07	1.02	177.2	1.174
Farm size	.11	.304	.001	0.01	1.12	2	1.184
Household size	.397	.364	1.188	0.28	1.487	12	1.102
Name of the Council (1=Arusha 0=Meru)	-1.314	.707	3.453	0.06	.269	48.7	1.264

-2 log likelihood = 95.66; Nagelkerke R2 = 0.682; Cox & Snell R2 = 0.571, Model Chi square=215.Df=11, p=0.034 Hosmer and Lemeshow Test; chi square=12.204, df=8, p=0.142: Dependent variable: Perceive access to agricultural extension services (1=Access, 0=Do not access).

insignificant at p≤0.67. The findings are in disagreement with the findings in a study by Chauke et al. (2013) in Republic of South Africa who found that farmers access to credit decreased with a unit increase of e other variables, notably farming experience, repayment period, risk and uncertainty, distance between borrower and lender, and asset accumulation.

Moreover, the nature of farming that the respondents were engaged in had a positive beta coefficient of .016 implying that one unit increase in the respondents' engagement in other farming activities produced a 3% positive change in a respondent's likelihood to perceive the effectiveness of AEI & SD during the implementation of D by D policy and vice versa. However, the variable was not statistically significant at p≤ 0.98. Similar finding is reported in a study by Adamides et al. (2013) in Cyprus who found that the use of personal computers and internet among farmers was not influenced by the nature of farming engagement whether as part time or full time farmers.

Moreover, Table 1 shows that, the respondents' economic activities (formal or non-formal) had a positive beta coefficient of .12 implying that one unit increase in the respondents' economic activity produced a 13% positive change in her/his likelihood to perceive the effectiveness of AEI & SD during the D by D policy. The reverse is also true.   This variable also was not statistically significant at p≤0.90. The finding conforms

to the finding of a study by Suvedi et al. (2017) in rural Nepal who found that off-farm employment limited farmers' participation in the extension activities and in the technology adoption. The respondents' total annual income had a positive beta coefficient of .021 which implies that, one unit increase in a respondent's total annual income produced a 177% positive change in her/his likelihood to perceive the effectiveness of AEI & SD during the implementation of D by D policy and vice versa. This variable too was not statistically significant at p≤0.90. This finding does not conform to the finding of a study by Kiplimo et al. (2015) in Kenya who found that, the total annual household income of smallholder farmers were statistically significant with negative influence on farmers' access to financial credit services. In addition, farm size of the respondents had a positive beta coefficient of .11 implying that one unit increase in a respondent's farm size produced a positive 2% predicted change in her/his likelihood to perceive the effectiveness of AEI & SD during the implementation of D by D policy. The reverse is also the case. Due to high population density, observations in the study villages revealed that, 69% of the respondents owned pieces of land of below 2 acres and relied on their fellow farmers as sources of important agricultural information. Agricultural extension agents were more attracted to work with farmers in estates, because in the estates extension agents were being paid for the associated

services, something which was not happening in small pieces of land.

This variable was statistically significant at p≤0.01 (Table 1). This finding is in disagreement with those by Dazdze et al. (2012) study in Abura-Asebu Kwamankese in Ghana who found that, farm size had significant influence in farmers' access to agricultural credit.

Household size of the respondents had a positive beta coefficient of .397 which means that one unit increase in a respondent's household size produced a 12% positive change in her/his likelihood to perceive the effectiveness of AEI & SD during the implementation of D by D policy and vice versa. Invariably, the respondents with large household sizes perceived the effectiveness of AEI & SD during the implementation of D by D policy better than did households that had small household sizes. However, this variable was not statistically significant at p≤0.28. This finding is in disagreement with that of Abdalah and Awal (2016) study in Ghana who found that household size had a significant influence on farmers' access to agricultural extension services.

Furthermore, Table 1 shows that, the council where the respondents come from had some influence on the respondents' likelihood to perceive the effectiveness of AEI & SD during the implementation of D by D policy. The variable had negative beta coefficient of -1.314 which means that, the respondents from Arusha District were less likely by 48%to perceive the effectiveness of AEI & SD during the implementation of D by D policy than their counterparts from Meru District. This variable was not statistically significant at p≤0.06. This finding conforms to that of Zheng et al.2012) in a study which sought to determine the determinants of producers' participation in agricultural cooperativesin Northern China. Zheng et al.2012 study found that, location had a significant influence on the producer perception and their participation behaviour in cooperatives.

CONCLUSION

The current study revealed that, of the eleven socio-economic variables tested namely; age, sex, marital status, academic qualification, farming experience, the nature of farming engagement, economic activities, the total annual income, farm size, household size, and the name of the council only sex and farm size were found to be statistically significant. These findings suggest that, the perceived effectiveness of the AEI&SD in the study area is influenced by sex and the size of the farm. Female farmers in the study area were less likely to perceive AEI&SD effectiveness during the implementation of D by D policy than male farmers. The influence of sex in the effectiveness of AEI&SD was

also pointed out by Rugasa et al. (2012) study in Ethiopia who found that the AEI&SD was male biased and therefore female farmers were less likely to get AEI & SD than their male counterparts.

It was further noted that, farmers with large farm size had higher likelihood of perceiving effectiveness of AEI&SD during the implementation of D by D policy than those with small farm size. The influence of farm size on the effectiveness of AEI &SD has also been confirmed by other empirical studies in Tanzania, Ghana, and Nigeria. For example, Monela (2014) in Morogoro and Mbeya found that the respondents with large land size were more likely to perceive the effectiveness of the adoption of improved maize and rice seeds than those with small land size. Moreover, Dzadze et al. (2012) in Abura-Asebu Kwamankese District in the Central Region of Ghana found that, the size of land had a significant influence on farmers' perception towards access to agricultural credit. Moreover, the study findings are in agreement with the finding in a study by Monela (2014) in Morogoro and Mbeya who found that the respondents with large land size were more likely to perceive the effectiveness of the adoption of improved maize and rice seeds. The findings from the latter studies imply that, the provision of AEI&SD was biased towards farmers with large farm size compared to farmers with small land size. The results had an implication from soufflé theory of decentralization which posits that, the effectiveness of decentralization is influenced by a combination of social, political, legal and organizational factors. Therefore, in this case, farmers' perception on the effectiveness of agricultural extension information and delivery of services during the implementation of d by d policy is influenced by sex of the farmers and size of the farms.

RECOMMENDATIONS

Given the importance of decentralization reforms on revamping the public AEI&SD, understanding of the factors that influence its effectiveness in the study areas is a matter of necessity. Since sex and farm size were found to have statistically significant influence on the likelihood of farmers to perceive effectiveness of AEI&SD during the implementation of D by D policy, measures which are geared to maximizing the potentialities of the policy in the study areas are recommended underneath. Firstly, the existing male based AEI&SD system must be weakened and discouraged by employing more female agricultural extension staff. Despite that data in the study area show that, 75% of agricultural workforce is comprised by females conversely, majority of agricultural extension staff are males with male biasness attitudes. Therefore,

creating leverage in the provision of AEI&SD based on sex of the service providers will accelerate its effectiveness and hence increase farmers' production and productivity. Secondly, since most of the famers operate in fragmented pieces of land due to high population, the two Councils should advice farmers to combine their efforts and resources in the form of cooperatives for easy access to AEI&SD. The study findings have revealed that, farmers with large farm size are mostly likely to get extension services than those with small farm size.

ACKNOWLEDGEMENT

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