Factors influencing smallholder farmersô awareness of agricultural extension devolution in Kenya: a binary logit analysis

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Abstract

The devolved governance structure in Kenya places the provision of agricultural sector services such as extension at the local units. However, farmers' awareness on this aspect and where services are available remains limited and often there is confusion. In order to provide clarity and enhance the understanding of extension service delivery, this study sought to characterize farmers' awareness of agricultural extension devolution and analyze factors that influence their awareness. Data was collected in Meru County using semi-structured questionnaires through face-to-face interviews on a representative multi-stage sample of 288 farmers. A binary logit model was applied to analyze the determinants of farmers' awareness. Slightly less than half of the respondents indicated that they were aware of agricultural extension devolution. The factors that were found to significantly enhance awareness are attendance to farmer field days, land tenure security, income and education.

Key words: Extension-devolution; farmers; awareness; Kenya.

1.0 Introduction and Research Problem

In most agricultural policy debates, a consensus exists that agricultural extension is a key component in enhancing agricultural productivity and profitability. The term 'agricultural extension' is contextualized here to mean the whole arrangement of organizations that facilitate agricultural stakeholders to obtain relevant information, skills, and technologies to improve the livelihoods of farmers and others who depend on farming. In Kenya, agricultural extension dates back to the early 1900s and has undergone various reforms since then. The integrated policy approach of 1960s achieved remarkable success in the dissemination of hybrid maize technology although the policy suffered from ineffective management, poor co-ordination, and lack of community engagement. The training and visit system of agricultural extension that was implemented mainly in the 1980s to early 1990 succeeded in improving staff quality through training and the establishment of better extension linkages but there was no evidence of sustainable impact on agricultural productivity (Gautam, 1999). Following liberalization and structural reforms in 1992, funding and delivery of agricultural extension services in Kenya became a mix of public and private arrangements.

The Kenyan Constitution (Republic of Kenya, 2010) emphasizes the role of devolution for better service delivery. County governments are envisaged to be the primary centers for service delivery, economic expansion and good governance practices at the local level. Agricultural sector,

particularly public extension service has been devolved to County government level in order to take the services closer to people and ensure they participate in improving the service delivery (Republic of Kenya, 2011). This presupposes that farmers at the county levels are aware of their responsibilities and expectations in the devolved extension system. Awareness means providing the public with detailed background information on policy issues regarding development. The aim is to empower the public to be aware of and to understand global and national development concerns and the local and personal relevance of those concerns, and to enact their rights and responsibilities by effecting change for a just and sustainable world (Omolo, 2010). Thus, the right to information or the right-to-know enables citizens to make informed decisions on issues relating to their development.

Access to information has been widely recognized as a basic human right and an essential attribute of democracy. Meaningful public participation in development decisions requires that relevant information is provided in a timely manner, simple procedures and channels of access developed, cost to citizens be reasonable, and that it be available across boundaries (Burton et al., 2006). Public demand for access to information is increasing, which is associated with use of freedom of information legislation and the revolution in information technology (O'Loughlin and Wegimont, 2007). In Kenya, *articles 35(1&3)* of the constitution recognize the right of every citizen to access information held by the state (Omolo, 2011). The use of communication technology such as mobile phones, emails, satellite communications and geographic information systems has generated an extraordinary level of interconnectedness. This has helped to raise citizens' awareness of development issues such as climate change through presentations and dissemination of information. Media outreach, which is the main source of news and public information is a wide-reaching way to inform citizens on development matters. Public awareness and educational programmes have also been widely used to inform citizens. These approaches are considered to be more comprehensive and enable deepening public awareness due to in-depth consultation (African Development Bank, 2007).

Among the objects and fundamentals of devolution in Kenya is enhancing participation of people in making decisions affecting them and the recognition of communities' rights to manage their own affairs (Republic of Kenya, 2011). This dimension of public participation is administrative centric and relates to the involvement of the public in decision making (Yang and Callahan, 2005). Existing literature show a considerable lack of awareness by farmers on various pertinent issues in developing countries. In India, up to 60% of farmers had limited awareness about climate change phenomenon and its impacts (Chakravarty, 2012). In Ghana, Laary et al. (2012) observed that some farmers were unaware of hazardous and inappropriate agrochemical products banned by government authorities and continued to use them without protective measures. In Kenya, the Institute of Economic Affairs noted that there was limited awareness on costs of projects and disbursed amounts by the Constituency development Funds (CDF) program in many parts of the country (IEA, 2006). Similarly, another study showed that the majority of the respondents were not aware of the Local Authority Service Delivery Action Plan (LASDAP) that required local authorities to constructively engage local communities on matters of planning and development (LRFT, 2009).

Other studies on farmer awareness have focused on issues such as climate change (Mandleni and Anim, 2011), crop insurance (Oyinbo et al., 2013) and agrochemical safety (Laary et al., 2012). However, in the case of Kenya's agricultural extension devolution, little is known on local communities' awareness and understanding. Awareness is pertinent in the realization of the benefits of devolution related to community participation and the establishment of appropriate agricultural extension institutions (Kukamba, 2010).

2.0 Methodology

2.1 Sampling Procedure and Data Collection

This study was conducted in Meru County of Kenya, which was purposefully selected due to its wide range of climatic conditions that favor a variety of agricultural enterprises (Monda et al., 2003). The study employed multi-stage cluster sampling approach to select respondents for the survey. This approach was preferred to other methods such as simple random sampling because as sampling procedure moves from secondary to the primary sampling unit, the sampling unit becomes more homogenous and the sampling error is minimized (Allen et al., 2002). A total of 288 respondents were randomly interviewed.

The data was collected using semi-structured questionnaires through a face-to-face interview. Face to face interview has its strength in that immediate follow-up and clarifications are possible unlike in alternatives approaches such as mail and telephone surveys, which are ridden with the challenge of high non-response (Mertens, 2005). The questionnaire captured data on farmer characteristics such as age, education, gender and income; land assets; farm enterprises; farmer knowledge of agricultural extension devolution; use of agricultural extension and; access to institutional services including credit, markets and community group membership.

2.2 Theoretical Framework

Various factors have been shown to influence awareness. For example in, Bayard et al. (2007) and, Mandleni and Anim (2011), education was found to negatively affect awareness on climate change. The reason given was that educated farmers had alternative income earning opportunities and thus do not concern themselves much with agricultural issues. However, this was contrary to Deressa et al. (2009&2009) who observed that education increased the probability of climate change awareness. Access to formal extension has also been found to positively influence awareness (Hassan and Nhemachena, 2008; Apata et al., 2009). Further, Kabubo-Mariana (2005) noted that married farmers and farmers who acquired land through inheritance to have more knowledge on climate change. The possible influence of some of these variables on Kenyan farmers' awareness of extension devolution was explored in this study.

Given that the dependent variable in this study is discrete and dichotomous - aware of extension devolution or not, a binary logit model (Menard, 2002; Harrell, 2001) was considered to be most appropriate. The use of the log odds ratio provides a most simplistic description of the probabilistic relationship of the variables and hence more rich information can be drawn.

2.3 Empirical Model Estimation

The binary logit model for investigating factors that influence probability of farmers' awareness of extension devolution was modeled as follows:

$$Pr\{Aware_i = 1\} = \frac{exp\{\beta_0 + \beta_i x_i\}}{1 + exp\{\beta_0 + \beta_i \beta_i\}} \quad \ldots\ldots\ldots (1)$$

where *Aware* is the state of awareness of i^{th} farmer (1= aware, 0 = otherwise); *x* denotes a vector of farmer and farm characteristic that are hypothesized to influence farmers' awareness of extension devolution; β represents the vector of parameters to be estimated.

Marginal effects were estimated to measure the effects of changes in any explanatory variable on the predicted probability of awareness of agricultural extension devolution, *ceteris paribus*. The marginal effects for continuous variable and dummy-coded variables were computed as following equation 2 and 3, respectively.

$$\beta_m = [\partial(\beta_i x_i + \varepsilon_i)/(\partial \beta_i x_i)]\beta_i \quad \ldots\ldots\ldots\ldots (2)$$

$$\beta_m = Pr[Awaredvln_i = 1] - Pr[Awaredvln_i = 0] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The estimations were done using the NLOGIT version 4.0.

3.0 Results and Discussion

3.1 Farmer Characteristics

The socio-economic, demographic and institutional characteristics of the respondents are presented in Table 1. About 58% of the respondents were female and the mean age was 41 years, which shows that most of farmers are within the active and productive group in the community. Average farm size ranged between 0.25 and 20 acres with a mean of about 1.9 acres. This is consistent with the estimates of the African Development Bank Group that smallholder farming accounts for over 75% of agriculture production in Kenya (Salami et al., 2010).

Table 1: Sample characteristics

Variables	Response (n = 288)
Household size (average number of adults)	3
Gender (% of female farmers)	58.3
Access to extension services in the past year (% of farmers)	72.9
Use of crop extension services in the past year (% of farmers)	68.4
Use of livestock extension services in the past year (% of farmers)	32.3
Attend farmer field days in the past year (% of farmers)	54.9
Farmer field days are held at experimental station (% of farmers)	61.4
Average farm size (acres)	1.9
Percentage of farmers with title deed for their farms	55.9
Commercial farming of tea and bananas (% of farmers)	31.2
Percentage of farmers who sold crop produce	69.4
Livestock keeping (% of farmers)	84.7
Percentage of farmers in dairy farming	66.0
Percentage of farmers who sold milk in the past year	58.3
Average monthly income of the respondent (Kshs)	12,677
Average age of the respondent (in years)	41.2
Percentage of farmers with secondary education and above	55.2
Main occupation is farming (% of respondents)	86.1

Source: Authors' compilation from survey data (2013).

The mean monthly income of the respondents is approximately Ksh 12,677 with about 55% of the respondents having attained secondary level education and above. Perhaps the low level of income among the farmers is due to low level of commercial farming as noted in Omiti (2006). In terms of tenure rights, some 56% have land title deeds that signify security of land ownership and is a possible motivation for long term investment; since the land can be used as collateral to access credit. Two-thirds of the farmers had access to crop extension services, while one-third had access to livestock advisory services.

3.2 Awareness of Agricultural Extension Devolution

Although more than 60% of Kenyans voted for the devolved government system (IEA, 2010), less than half of the respondents were aware agricultural extension matters are expected to be handled at the county level. In order for the devolved governance system to achieve its objective, participation of the locals and accountability of the leaders is needed. Therefore, it is important to sensitize farmers on their role in achieving agricultural development.

The variables hypothesized to influence awareness of agricultural extension devolution and their expected signs are presented in Table 2. Much of the research on awareness demonstrates that variables capturing access to extension service, farm size, tenure rights, income and education are expected to positively influence awareness. Simtowe et al. (2012) reported that farmers with larger land holdings have a higher chance of being exposed to improved varieties than those with smaller land holdings. On the other hand, it is possible that smaller land holdings mostly found in high potential areas are more productive, hence farmers may be more aware of agriculture related issues. Tenure security may have a positive effect on awareness. This is supported by the findings of Asrat et al. (2004) who reported that tenure insecurity had a negative effect on awareness and willingness to pay for soil conservation measures. It has also been found that people with higher income and education are more likely to be aware and express a positive attitude towards organic product (Gracia and Magistris, 2007; Aryal et al., 2009). Further, Simtowe et al. (2012), showed that women had more awareness on improved pigeon pea varieties due to their higher propensity to being exposed to improved agricultural technology than men. Although older farmers may be more experienced, which could have a positive effect on access to information, younger farmers may have a longer planning horizon, hence vibrant in searching for information (Faye and Deininger, 2005).

Table 2: Description of variables used in the binary regression model

Variable	Expected signs
Attendance of farmer field days (1=yes, 0=no)	+
Farm size in acres	+/-
Title deed (1=yes, 0= otherwise)	+
Monthly income (Ksh)	+
Level of education (1=secondary level and above, 0= primary and below	+
Gender (1=male, 0=female)	+/-
Age in years	+/-

Source: Survey data (2013).

To ascertain the absence of multicollinearity between the explanatory variables used in the binary logit regression, variance inflation factors (VIF) were computed for each of the variables. The VIF was calculated as:

$$VIF_i = \frac{1}{1 - R_i^2} \quad \text{.....(4)}$$

where VIF_i is the variance inflation factor for the i^{th}explanatory variable and R_i^2 denotes the $R^2$of the regression with i^{th} independent variable as a dependent variable. The VIF results are shown in Table 3 and according to Maddala (2000), variables that have VIF<5 are considered to have no multicollinearity.

Table 3: Variance inflation factors

Variable	VIF
Farm size	1.30
Possession of title deed	1.21
Education	1.16
Income	1.15
Farmer field days	1.12
Age	1.12
Gender	1.09
Mean VIF	1.15

Source: Survey data (2013).

3.3 Determinants of Farmers' Awareness of Agricultural Extension Devolution

The parameters of binary logit regression were estimated using NLOGIT software and the results are shown in Table 4. The Chi square statistic of 219.38 ($p< 0.1$) showed that the model fitted the data well. The coefficients indicate the effect of each variable on the likelihood of a farmer being aware of agriculture extension devolution. On the other hand, the marginal effects show how a change in each variable influences the farmers' awareness.

Table 4: Binary Logit estimates of factors influencing farmer awareness on extension devolution

Variable	Coefficient(β)	β p-value	Marginal effect (β_m)	β_m p-value
Constant	-1.34***	0.00	-0.33***	0.00
	(0.16)		(0.04)	
Field days	0.46***	0.00	0.11***	0.00
	(0.07)		(0.02)	
Farm size	-0.01	0.84	-0.001	0.84
	(0.03)		(0.01)	
Title deed	0.33***	0.00	0.08***	0.00
	(0.08)		(0.02)	
Income	0.0003***	0.00	0.00008***	0.00
	(0.00005)		(0.00001)	
Education	0.22***	0.00	0.05***	0.00
	(0.08)		(0.12)	
Gender	-0.02	0.77	-0.01	0.77
	(0.07)		(0.12)	
Age	-0.002	0.61	-0.0005	0.61
	(0.004)		(0.0009)	

Source: Survey data (2013)
Note: *** indicate that the variable is statistically significant at 1%. Corresponding standard errors are shown in parentheses.

The result shows that attendance to farmer field days is significant in influencing farmers' awareness of the extension devolution. More than two-thirds of farmers had access to extension services mostly from sources such as public agent, company agents and media. Farmers have also participated in Government spearheaded extension program such as Smallholder Horticulture Marketing Program (SHOMaP) (Republic of Kenya, 2007; Livingstone, 2008). Hence, this result can be explained by exposure to extension agents who might have played a role in informing farmers about agricultural extension devolution. Previous research on awareness (e.g., Hassan and Nhemachena, 2008; Apata et al., 2009) indicated that access to extension services had a strong positive influence on awareness on climate change. Extension service forums appear to be a good tool for enhancing awareness on farming aspects. Ownership of the farm with title deed increases the probability of farmers being aware of extension devolution. As the literature shows that farm title deeds motivates farmers to do more permanent farm enterprises. Majority of the farmers in the survey were engaged in commercial farming of tea and bananas. These are more permanent investments which might have made the farmers want to follow up the updates and new issues concerning agricultural enterprises. This result agrees with the findings by Hassan and Nhemachena, (2008) and Mandleni and Anim (2011) who reported that farmers with tenure security were more aware of climate change and invested in climate change adaptation methods.

Household income was found to have a significant positive effect on farmers' awareness of agricultural extension devolution. The majority of the respondents (86%) are farmers by occupation who grow crops and keep livestock for both domestic and commercial purposes (average quantity of milk sold per month is 127 liters). It is therefore possible that a good percentage of respondent's income came from farm related enterprises hence expect them to be more aware of issues concerning their source of livelihood (agriculture). This is consistent with the observation of Munyua and Stilwell (2009) that people with higher income are likely to be more aware of new developments in different economic sectors. Formal education was found to have positive effect on farmers' awareness of the extension devolution. A higher level of education is expected to increase farmers' ability to process and use information (Ulimwengu and Sanyal, 2011).

The Marginal effect estimates reported in Table 4 above, show that attendance to field days has the highest influence (11%) on farmers' awareness of extension devolution, while possession of title deeds and formal education, respectively contributed to 8% and 5% influence on awareness. In Kenya, extension information is usually passed to farmers through on-station field demonstrations and information and communication technologies such as radio, mobile phones and television (Republic of Kenya, 2012).

4.0 Conclusions and Policy Implications

Considering the low level of awareness, there is need to develop more effective strategies of ensuring farmers understand how the decentralized extension system should work. In addition, increased exposure of farmers to extension field demonstrations is essential in dissemination of agricultural information. Results show awareness level to be directly related to education, meaning that farmers who had attained a higher level of education were more aware of extension devolution. Considering that farmers and particularly small scale farmers generally have low levels of education (about half of the respondents had attained primary education at most), they may not be able to synthesize extension devolution from the broad information on devolution presented in unfamiliar languages. Hence it may appear reasonable for the County governments to promote policies on publishing and airing extension devolution information in languages easily understandable by less literate farmers particularly in vernacular. Public and private investors could consider provision of incentives to radio and television channels that air information in vernaculars to slot in more programs on agricultural extension devolution. Land tenure security was as well found to significantly influence extension devolution awareness. Exclusive rights to access and use of farm lands may encourage more permanent investments in agricultural enterprises. Ultimately, improving awareness and understanding of agricultural extension devolution would enable farmers to exercise their roles and rights in shaping extension service system, which could possibly contribute to development of the agriculture sector.

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