Factors Influencing Awareness and Use of Electronic – Based Market Information Services for Farming Business in Malawi

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Abstract
The government of Malawi has over the years initiated a number of agricultural market interventions including the recent electronic-based market information services in order to expose smallholder farmers to the exigency of market forces. The performance of agricultural markets is of significant importance in Malawi where agriculture remains the engine of growth. The study uses biprobit regression to examine drivers of awareness and adoption of electronic-based market information service interventions for farming business in Malawi. Using capability approach, it poses the hypothesis that farmers' awareness of ICT-based market information services determines use. Results indicate that household's awareness is positively influenced by owning a mobile phone, leasing some land and being a member of farmer group while being males, distant to agricultural field office and distance to the nearest electricity center are associated with lower likelihood of being aware. The paper also confirms that awareness raises use of ICT-based market interventions. In fact, drivers of ICT usage include income, membership in farmer group and awareness which interacts with distance to the nearest electricity center, distance to agricultural field office and land size. The study concludes that policy-makers will be valuable to work on formation of farmer organizations, access to power grid and land policy to create an enabling environment for awareness of electronic-based market interventions and ICT usage by farmers in Malawi.
Key words: Awareness, use, ICT-based market information services, farmers, Malawi.

1.0 INTRODUCTION

The performance of agricultural markets is of immense importance in most developing countries where agriculture remains the engine of growth. Hence Malawi has in the past implement several strategies aimed at improving the performance of agricultural markets. Well functioning agricultural markets can increase rural incomes and hence contribute to poverty alleviation among smallholder farmers' poverty and consequently spur economic growth in Malawi. However, agricultural markets in Malawi and most developing countries have often failed for small holder farmers who form the majority of agricultural producers (Barrett, 2009). The failure of agricultural markets for smallholder farmers often result from lack of access to market information or from the endemic problem of information asymmetry between the farmers and buyers (Kydd and Doward, 1989; Poulton et al., 2006). Consequently, majority of smallholder farmers sell their produce in poorly-paying local markets or at the farm-gate rather than travel to distant better-paying markets (Fafchamps and Hill, 2005).

Facilitating farmer access to better-paying markets has thus been an issue of major concern to policymakers in Malawi. Thus, the government of Malawi has, over

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the years, embarked on policies targeted at providing farmers and other agricultural actors with market information in addition to pursuing other strategies for improving market efficiency. These first set of interventions aimed at improving market efficiency included removal of price controls, market liberalization and the restructuring of the Malawi's marketing board namely, the Agricultural Development and Marketing Corporation (ADMARC) (Tollen, 2006 and Phiri, 2006). However, market liberalization policies yielded mixed results. Chirwa (2001, 1999) and Goletti and Babu (1994) report that market liberalization in Malawi improved spatial market integration. On the other hand, Phiri (2006), Kherallah, et. al. (2002) and Chilowa (1998) argue that instead of boosting production, liberalization policies resulted in output reduction in many developing and transition economies such as Malawi. The failure of the liberalization efforts to yield unequivocal results shifted attention to enhancing the transparency of agricultural transactions through provision of market information in order to promote greater market access by smallholder farmers.

One of the major contributors to poor market access by smallholder farmers is the lack of reliable and timely agricultural market information on input and output prices as well as on input and output quantity and quality. This lack of information substantially increases transaction costs and reduces market efficiency. In particular, it results in long and fragmented commodity value chains, trade in small volumes and exchange of undifferentiated products with no defined quality. Consequently, farmers often earn low returns for their produce (Mukhebi, 2004).

To resolve the problem of poor access to markets by farmers, Malawi government and other development agencies have in the past implemented a number of ICT-based projects that aimed at providing farmers and other market actors (especially traders) with market information services. Such interventions include the Initiative for Development and Equity in African Agriculture (IDEAA)-Malawi Agricultural Commodity Exchange (MACE), Malawi Ministry of Agriculture and Food Security (MOAFS), Agriculture Commodity Exchange for Africa (ACE) and National Smallholder Farmers' Association of Malawi (NASFAM) (Goletti and Babu, 1994; Phiri, 2006; Manda, 2009; COMESA Secretariat, 2007). The implementation of such interventions was expected to spur improved performance of agricultural commodity markets by lowering transaction costs, improving market co-ordination and also promoting integration of commodity markets in Malawi.

The expectation in Malawi was that the provision of ICT-based market information services would enhance market efficiency, enhance bargaining power of smallholder farmers in the market place, and provide a fair market price discovery mechanism (Phiri, 2006). Nevertheless, the electronic-based market information service projects cannot bring about the expected outcomes unless the intended beneficiaries are aware of the provided services and also actually apply them. That is, availability of ICT services can only translate into improved market efficiency if farmers are aware and are using the services. This study addresses two research questions namely; i) what factors affect the level of awareness of MIS projects?, and ii) What are the drivers of use and intensity of use of ICT-based market information services? This study hypothesizes that, farmers who are aware of ICT projects are likely to use the ICT services offered by the projects. It thus first

examines drivers of awareness of ICT-based MIS project and then assesses the conditioners of ICT-based MIS usage conditional on being aware of ICT-based project. The rest of the paper is organized as follows: Section 2 presents the conceptual framework while Section 3 outlines the modeling and data sources. Section 4 exposes the results along with their discussion and Section 5 gives conclusion and policy implications.

2. CONCEPTUAL FRAMEWORK

The provision of market information services is to increase awareness by farmers of information about prices and other information relevant to farmers and other actors along the value chain. The benefits of market information are reduced opportunistic behavior of market actors associated with marketing. Market information enables market actors to decide where to sell produce, check whether or not the prices they are offered are in line with market prices, decide whether or not to store, grow produce "out-of-season", and grow different products (Shepherd, 2000). With regard to the precursors to the use and impact of the ICT-based market services, ITU (2003) distinguishes ownership, access and use of ICT. Ownership means the farmer possesses an ICT device (for instance the mobile phone handset) whereas access means the farmer can utilize the ICT device because it is available, but may not necessarily be doing so.

Lack of market information results in opportunistic behaviour characterized by tendency by the transaction partners to cheat on the terms of transaction. In the context of farm households and agriculture, opportunistic behavior can take the form of cheating by traders on the prices, quantity and/or quality. Thus a trader (especially a rural assembler) may pay the uninformed farmer a lower price for the produce than what the farmer could get in the market. The farmer in this case makes less money from selling the produce hence get lower profit than would be the case if he/she were informed of the prices. In case where non-standardized measures are used, the trader could also use scales that favor him/her at the expense of a farmer, thus reducing the income accruing from sale. In the last case, the trader can cheat about the quality needed by the market in order to negotiate the purchase price downwards. In all the three case lack of market information reduces the profits earned by the farmer hence making farming less profitable than would be if the farmer sold the produces with full awareness of the price, proper measurement and quality required by the market.

The foregoing suggests that access to market information has the potential to make farming more profitable by reducing the tendencies for more informed transaction partners to take advantage of the less informed partners by cheating on price, quantity and/or quality. Hence farmers who are awareness of existence of ICT-based market information services will adopt such services only if he/she expects to benefit from doing so. In other words, a farmer will use electronic-based market information services only if there are positive benefits from doing so. Such benefit can be in terms of better prices received, savings on quantity sold to traders from being better familiar with the measurement scales or from insistence in the use of standard measurement scale, or due to being familiar with produce quality required by the market.

3. METHODOLOGY

3.1 Study Area and Data Collection

The study was conducted in three districts of Malawi namely, Mwanza in

southern region, Dedza in central region and Mzimba in northern region. The districts were selected to represent the diversity in social and economic backgrounds. Another criterion employed was the active participation of farmers in ICT-based market information services. The study targeted farmers from both ICT and non-ICT based project areas. An ICT project area was defined as one where an ICT-based market intervention whose aim is to facilitate smallholder farmer linkage to markets through the use of ICT tools was had earlier been implemented.

A combination of purposive, stratified and simple random sampling techniques was used. First, the study areas were purposively selected to capture diversity and areas with an ICT-based project this process yielded the 3 districts above. Second, for each area, a list of all farmers was drawn from MACE registered members with the help of MACE staff. This gave rise to the list of MIS users. Similarly, a list of farmers was drawn from an area without an ICT project to obtain the list of non-MIS users. Third, respondents were randomly sampled from the two lists. The final sample was 410 respondents, with 260 MIS users and 150 from non-users. Data was then collected from the randomly sampled farmers through personal interviews using a pre-tested questionnaire. The data collected included farmers' characteristics, household asset endowments, institutional factors and use of ICT services in marketing activities. The survey was done between March and April, 2010.

3.2 Description of Variables and Data

The dependent variable in the outcome equation y_2 is generated by a binary response model with three types of covariates, of which one, the variable y_2 is endogenous and the other ones are the exogenous variables and the interaction of some demeaned exogenous variables with the endogenous variable. The explanatory variables included in the probit reduced form equation of the endogenous variable y_2 are the exogenous variables of the outcome equation y_1 and additional instruments which size is at least equal to the size of the endogenous variables including the interaction terms. Drawing from the capability approach and from the literature on technology adoption in developing countries, the following variables are hypothesized to influence awareness of ICT-based market information service project, thereby the use of ICTs in farming business:

- Phone ownership: ICT usage for farming requires that the ICT components are able to process communication (Robeyns, 2000 ; Zheng and Walsham 2007). Mobile phone being an ICT tool, the user is likely to be aware of ICT-based market information service projects and hence likely to use it for farming.
- Gender: Studies show that gender plays a role in decision-making regarding adoption of technologies (Adesina et al., 2001). Generally in Africa, men have greater access to productive recourses and capital (including mobile phones) than women (Okello et al., 2009). It is therefore hypothesized that male farmers would be aware of ICT-based MIS projects and services and will also use ICT tools more than females.
- Farming as main occupation: As far as ICT-based market information services are designed for farmers, those whose occupation is mainly in non-farm activities will have less interest in ICT-based projects and services. Therefore, when the main occupation is farming, a positive attitude is expected toward

awareness and use of ICT tools for farming.

- Farming experience: De Silva and Ratnadiwakara (2009) noted that more experienced farmers are more likely not to be flexible and prefer their own traditional way of practicing farming. Accordingly, it is hypothesized that more experienced farmers would have a negative position toward ICTs.
- Education: Education is expected to have a positive relationship with the decision to acquire ICT services. It is expected that farmers with more years of education would be able to understand the benefits of such new technologies (Okello et al., 2009). Education is therefore expected to take a positive sign.
- Income: Households that have more income are likely to have surplus to buy ICT tools such as mobile phones, radios, TVs, etc… and hence be able to use them for marketing transactions.
- Farm characteristics: Land in use is one of the major characteristics of farmers. Hence farmers with large land size would behave differently from farmers with small land size. As well, farmers leasing additional land have more land to utilize and produce crops. It is expected that the more land holdings, the more inputs/outputs to buy/sell and then the more aware of ICT projects to take advantage of access to markets.
- Membership to farmer group: Group membership may entail more social influence and give opportunities to the farmers to have accurate knowledge about innovations. Hence, farmers who are group members are likely to be aware of a given intervention and take advantage of it. The coefficient of membership to farmer group is expected to be positive.
- Distance to nearest facilities: Closeness to amenities such as nearest agricultural field office and nearest centre with electricity may influence awareness and use. Thus, the further away these centers are, the less likely to access information then the farmer will be less expected to be aware of ICT projects.
- Location: Location of the farmer is also likely to affect awareness and use in ICT services projects. As all districts and regions do not have the same infrastructure characteristics, it is expected that awareness will be more likely to hold in some regions against others.

3.2 Empirical Model

This paper employs the bivariate regression model to estimate the drivers of use of agricultural MIS. A bivariate probit model is applied in order to correct for the potential endogeneity of awareness of ICT-based market information service project and evaluate its causal effect on the use of these services in farming (Wooldridge, 2007). The endogeneity problem was anticipated because of the nature in which the sampling was done. As above, the farmers who formed the ICT-based MIS users' stratum belonged in an ICT-based project, hence likely to be aware of the ICT-based MIS. This probit response model y_1 is specified as follows:

$$y_1 = I[x_1\beta_1 + y_2\beta_2 + (x_1 - \overline{x_1})y_2\beta_3 + e \geq 0] \quad (1)$$

where $\mathbf{y_1}$ is the observed use of ICT-based market information service project by farmers who either are aware that the project exists or not, $\mathbf{I[A]}$ is the indicator function that equals 1 when A is true and 0 otherwise, $\mathbf{x_1}$ is a vector of other observed relevant variables that affect the conversion of awareness into use, $\mathbf{y_2}$ is an indicator of

awareness of ICT-based market information services (1 if aware; 0 otherwise) and $\bar{x_1}$ is the sample average of x_1 . Interaction terms of demeaned explanatory variables $(x_1 - \bar{x_1})$ with variable y_2 take heterogeneity of the causal effect into account (Wooldridge, 2002). The parameters: β_1, β_2 and β_3 are unknown regression coefficients to be estimated. e is a vector of omitted and unobserved variables that affect the use of ICT-based market information service project such as $E[e|x_1, z_1] = 0$. The vector z_1 is a vector of instruments and E is the expectation operator.

To deal with the endogeneity bias in estimating the probit response model (1), the existence of a control variable is generally assumed. In other words we assume that e and y_2 are independent conditional on some (unobserved) random vector v. This random vector can be written as an identified function of y_2 and some vector of exogenous instruments which comprises z_1 and some of the exogenous components of x_1:

$$e \perp y_2 | v \text{ for some } v = v_0(y_2, z) \qquad (2)$$

Such a control variable will typically be available when the binary endogenous regressors are generated through a reduced form equation specified here as a probit model where δ are the column vector of unknown parameters:

$$y_2 = I[z\delta + v \geq 0], \qquad E(v|z) = 0 \quad (3)$$

Consistent and asymptotically efficient parameter estimates of equation (1) are obtained by maximum likelihood estimation since y_1 and y_2 are binary independent variables (Wooldridge, 2007). Assuming a correlation between the disturbance terms of the use of ICT tools for farming and the awareness equations, with ρ representing the correlation coefficient, and a distribution of these disturbance terms as bivariate normal and independent of the explanatory variables (Wooldridge, 2002), the log-likelihood function is defined as follows (Greene, 2008):

$$\ln L = \sum_{yi1=1, yi2} \ln \Phi_2[X_{i1}\beta_1, y_2\beta_2, (X_{i1} - X_1)y_2\beta_3, z_1\delta, \rho] + \sum_{yi1=1, yi2} \ln \Phi_2[-X_{i1}\beta_1, -y_2\beta_2, -(X_{i1} - X_1)y_2\beta_3, z_1\delta, -\rho] + \sum_{yi2=0} \ln[1 - \Phi(z_1\delta)] \qquad (4)$$

where Φ_2 denotes a bivariate normal cumulative distribution function and Φ is the univariate normal cumulative distribution function. The Maximum Likelihood estimates of parameters β_1, β_2, β_3, δ and ρ are obtained by maximizing in one step the log-likelihood function in equation (4), which rests on the definition of conditional probability. A Wald test or Likelihood ratio test is used to the null hypothesis that ρ equals zero. The rejection of the null hypothesis implies that the awareness of ICT-based market information service project y_2 is endogenous in the outcome equation for y_1. The total marginal effect of awareness of ICT-based market information service project is obtained in two steps (Bartus, 2005). The first step is the separate estimation of marginal effects of the variable awareness of ICT-based market information service project and each interaction term. The total marginal effect is computed in the second step by doing the sum of the marginal effects time their respective derivative with respect to awareness of ICT-based market information service project.

Tables 1 and 2 present summary statistics of the key variables used in the model estimated in this study. The results of two-tailed t-test of differences in means of the independent variables indicate that the two categories of farmers (i.e., those "aware" and those "unaware" of ICT-based MIS) have some distinct characteristics as well as "user" and "non-user" farmer

groups. Farmers who are "aware" of ICT-based MIS owned mobile phones, were more educated, leased land and were members of farmer groups (Table 1). At the same time "users" of ICT-based MIS were members of farmer groups and farmers both "aware" and "users" are near the agricultural field offices and the electricity hook-ups (Table 2).

Table 1: Description and summary statistics of variables included in the awareness model

Description	Unit	Means		t-stat	p-value
		Unaware group ($y_2 = 0$)	Aware group ($y_2 = 1$)		
Mobile phone ownership	1 if owning mobile, 0 otherwise	0.43	0.89	-5.00	0.000
Gender	1 if male, 0 otherwise	0.47	0.41	1.07	0.287
Main occupation	1 if farming, 0 otherwise	0.98	0.95	1.10	0.272
Farming experience	Number of years of experience in farming	18.15	16.81	0.92	0.358
Education	Number of years of schooling	4.85	6.12	-3.22	0.001
Income	Total household income in 2009 (x 100,000 MK)	7.29	2.12	0.96	0.339
Land size	Acres	12.48	14.04	-1.42	0.157
Leased land	1 if leased in land, 0 otherwise	0.08	0.22	-3.92	0.000
Membership to farmer group	1 if member of farm group, 0 otherwise	0.49	0.96	-9.94	0.000
Distance to agricultural field office	Km	7.56	7.65	-0.11	0.911
Distance to nearest electricity hook-up	Km	11.80	10.13	0.68	0.495
Central region	1 if district is in Central Malawi, 0 otherwise	0.48	0.43	1.05	0.293
Number of observations		122	288		

MK = Malawi Kwacha; Km = Kilometers

Table 2: Description and summary statistics of variables included in the awareness model

Description	Unit	Means		t-stat	p-value
		Non-user group ($y_1 = 0$)	User group ($y_1 = 1$)		
Income	Total household income in 2009 (MK)	7.22	2.13	0.95	0.343
Land size	Acres	12.49	14.05	-1.42	0.157
Membership to farmer group	1 if member of farm group, 0 otherwise	0.49	0.96	-10.16	0.000
Distance to agricultural field office	Km	7.34	7.75	-0.45	0.655
Distance to nearest electricity hook-up	Km	11.86	10.10	0.73	0.469
Awareness * mean land size		0	0.48	-0.80	0.427
Awareness * mean distance to agricultural field office		0	7.54	-15.22	0.000
Awareness * mean distance to nearest electricity hook-up		0	10.09	-12.05	0.000
Number of observations		123	287		

4. RESULTS AND DISCUSSION

The results of the estimated bivariate probit model are presented in Table 3. The goodness-of-fit measures of the bivariate probit estimations are also presented along with the estimated coefficients in Table 3. The results in this table interpreted with caution because we assume that the consistency of the bivariate probit model used to estimate the causal effect of awareness on use hinges on the correct specification of the model of awareness of ICT-based market information service project (Heckman et al. 2006; Wooldridge, 2007). The Wald test results presented at the bottom of Table 3 indicate that the null hypothesis that all slope coefficients are zero in each of the seemingly unrelated bivariate probit is rejected at the 1% significance level.

Accordingly, the variables in the model of awareness of ICT project contribute significantly to the variability in awareness and, as a group, explain the use of ICT tools in farming business. In addition, the correlation coefficient (rho) between the equation of awareness of ICT-based market information service project and the equation of use of ICT tools for farming is significantly different from zero at the 10% level. Though weak evidence, it validates our suspicion that the variable y_2 of awareness of ICT-based market information service project is endogenous in the

estimated outcome equation y_1 of ICT usage for farming. This indicates that the seemingly unrelated bivariate probit model is appropriate to estimate consistently the causal effect of awareness on use.

Turning to the estimates, the results show that owning a mobile phone, leasing some land and being a member of farmer group increases the likelihood of being aware of ICT-based market information service project. In contrast, being males, distant to agricultural field office and the nearest electricity center reduces the likelihood of being aware of ICT-based market information service project. As expected, when farmers possess mobile phones, they can better get informed on the MACE project via mobile call-up or SMS channels. Farmers leasing more land are likely to be more market-oriented and hence seek more market information.

As information is disseminated better in farmer groups, members of those groups acquire more knowledge about existing services than non-members.

Table 3: Estimation results for the bivariate probit models on awareness of ICT project and ICT usage for farming

	Coef.	Robust Std. Err.	Z	p-value
Model of Awareness of ICT-based market information service project				
Mobile phone ownership (dummy)	0.217	0.105	2.060	0.039
Gender (dummy)	-0.392	0.196	-2.010	0.045
Farming as main occupation (dummy)	0.281	0.410	0.690	0.493
Farming experience	-0.008	0.006	-1.520	0.129
Education	0.011	0.060	0.190	0.850
Squared education	0.001	0.005	0.250	0.802
Natural log of income	0.033	0.057	0.580	0.565
Land size	0.005	0.009	0.560	0.574
Leased land (dummy)	0.815	0.275	2.960	0.003
Member of farmer group (dummy)	2.251	0.228	9.850	0.000
Distance to agricultural field office	-0.019	0.010	-1.900	0.057
Distance to nearest electricity center	-0.008	0.004	-1.980	0.048
Central region (dummy)	0.299	0.232	1.290	0.197
Constant	-1.928	0.814	-2.370	0.018
Model of Use of ICT tools for farming				
Awareness	2.357	1.375	1.710	0.086
Natural log of income	0.206	0.070	2.960	0.003
Land size	0.015	0.015	0.970	0.332
Member of farmer group (dummy)	2.069	0.426	4.860	0.000

Distance to agricultural field office	0.027	0.025	1.090	0.275
Distance to nearest electricity center	-0.151	0.065	-2.340	0.020
Awareness * demean land size	-0.023	0.014	-1.650	0.099
Awareness * demean distance to agricultural field office	-0.072	0.027	-2.650	0.008
Awareness * demean distance to nearest electricity center	0.154	0.064	2.410	0.016
Constant	-4.735	1.217	-3.890	0.000
Rho	0.851	0.185		
Wald test of rho=0: chi2(1) = 3.52 Prob > chi2 = 0.061				
Wald chi2(22) = 152.07 Prob > chi2 = 0.000				
Log pseudo-likelihood = -185.661				
Mean bivariate predicted probability of success in awareness model and success in use model = 0.612				
Mean conditional (on success in awareness model) predicted probability of success in use model = 0.760				
Number of observations = 410				

Besides, the MACE project has focused mainly on food staple crops and thus, female farmers are the most aware of the project because males are specialized toward main cash crop production, especially tobacco. This explains the unexpected negative sign for gender. In addition, the farther away farmers are from extension offices, the less access to information. This is also the case for farmers living in remote areas without electricity, who therefore do not have power required to make information sources (TV, mobile, CD, internet, etc.) usable.

The results also indicate that awareness of ICT-based market information service project raises the usage of ICT tools for farming. Indeed, drivers of ICT usage include income, membership in farmer group and aware which interacts with distance to the nearest electricity center, distance to agricultural field office and land size. Richer households and members of farmer groups were expected to use ICTs in farming activities. The predicted joint probability of being aware of MACE project and using ICT tools for farming is 0.612. Once being aware of the project, chances of 76% are to use ICT tools for farming. These two probabilities are influenced by the distance to the nearest electricity hook-up, distance to agricultural field office and land size. As showed in Figure 2, the predicted joint probability of being aware of MACE project and using ICT tools for farming decreases with the poorer access to electricity infrastructure. Access to electricity infrastructure has to improve for getting farmers aware of ICT projects and use ICT tools for farming for expected benefits on information cost, access to markets and income.

Results further show that after becoming aware of ICT-based market information service project, the distance to agricultural field office affects the

achievement of using ICT tools. This achievement is likely to hold after being aware of ICT project because there is a chance of at least 70% of using ICT-based MIS for farming irrespective of the access to extension services as shown in Figure 3. However, there is evidence that farmers who are aware of ICT-based MIS and living nearer the agricultural field offices perform less than those aware and living far away to the extension services. As showed in Figure 4, farmers living less than 20 km far away from agricultural field offices are likely to use ICTs for farming if they have more access to land.

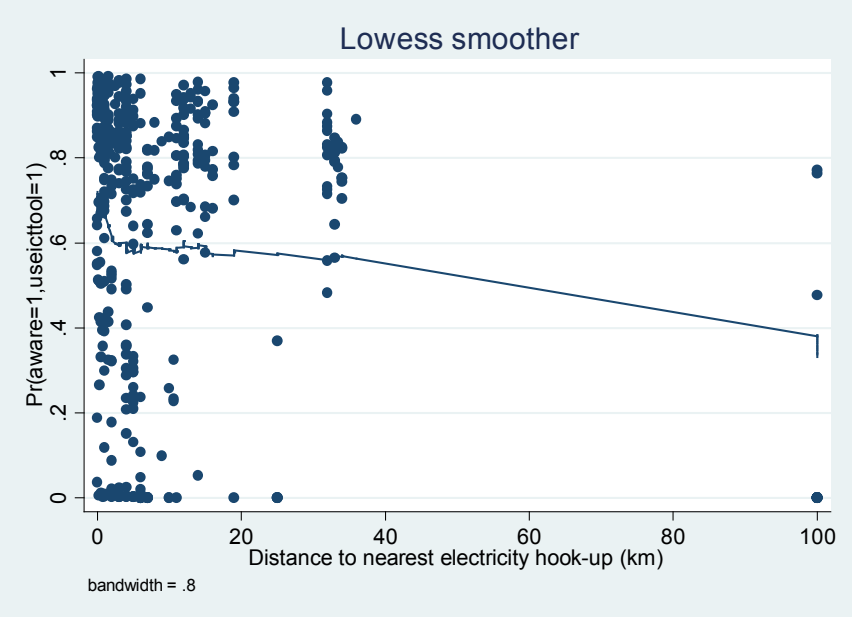

Fig 2: Predicted probability of success in awareness model and success in use model by Distance to nearest electricity hook-up

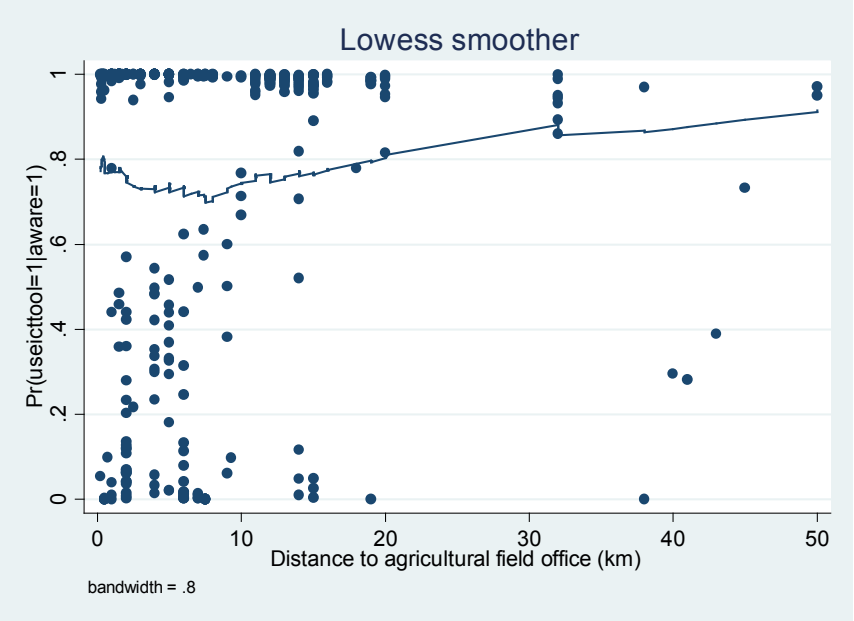

Fig 3: Predicted probability of success in use model conditional on success in awareness model by Distance to agricultural field office

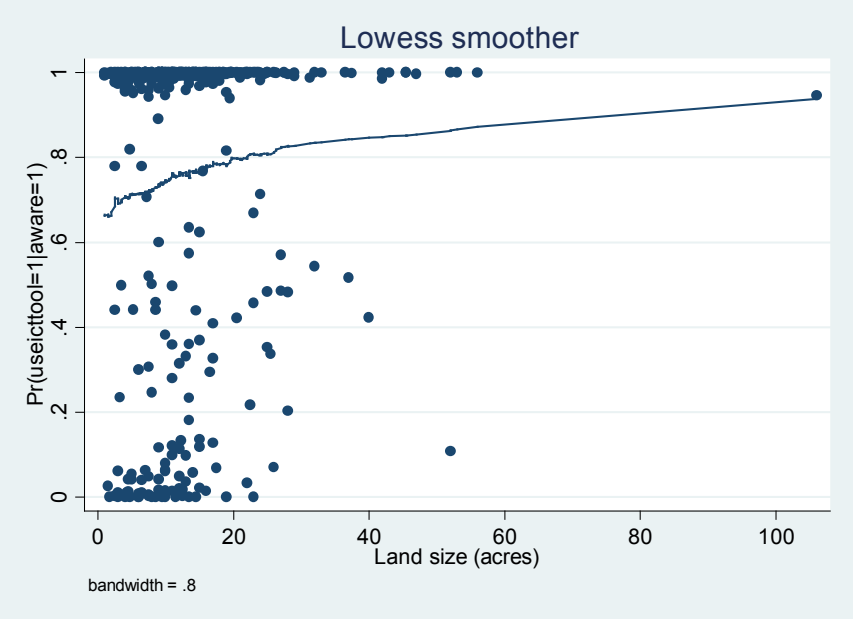

Fig 4: Predicted probability of success in use model conditional on success in awareness model by Land size for farmers distant to agricultural field office by 0-20 km

Results also show that electricity is important in determining the likelihood of using ICT-based MIS services. By stressing that the use of ICT tools for farming requires the access to electricity and contact with extension services, our findings corroborate those of Adekoya (2006) who emphasize that the facilities/services available in the environment determine ICT usage in rural areas. Access to land constitutes another

serious issue since the MACE project works mainly with women. FAO studies relate that women find it more difficult than men to gain access to valuable resources such as land, credit and agricultural inputs, technology, extension, training and services that would enhance their production capacity. The empowerment of women is inter alia key to improving the production and enhancing the living conditions of rural populations (FAO, 1994).

When women have better access to and control over resources, they often perform a greater increase in productivity than men. In addition, when women have better access to and control over income,

production increases, birth rate decreases as fast as their income increases and children's education increases (Fong and Bhushan, 1996). In Sub-Saharan Africa, it is predicted that productivity in agriculture would increase by up to 20 per cent if women received the same access as men to land, seed and fertilizer (Africa Commission, 2008). Addressing gender and land constraints in Malawi will create a more enabling environment for the benefits from using ICT tools for farming.

5. CONCLUSION AND POLICY IMPLICATIONS

Farmers in Malawi face major difficulties in marketing their products due to lack or poor access to market information. Attempts to resolve this problem has seen the introduction of ICT-based market information service projects to enhance agricultural market information access with an aim of reducing transaction costs. However, such projects cannot have significant impact if intended beneficiaries are not aware and/or are not using. This study therefore examines awareness of ICT-based market interventions and use of ICT-based MIS. Its main finding is that the usage of ICT –based MIS is conditional on being aware of ICT-based MIS projects that supply such services.

Membership to farmer organization contributes to awareness of ICT projects and use of ICT tools in farming activities. Being a member of a farmer organization is positively and significantly related to awareness of ICT project. This suggests importance of social influences in determining awareness of ICT project. By virtue of being in a farmer group, farmers' network for sharing agricultural information increases and therefore the likelihood of learning about new technologies and their usefulness also increases. Additionally, access to electricity is an important factor that increases the joint probability of being aware of ICT projects and using ICTs for agricultural purposes. Land size is also revealed as biasing the effect of access to information on ICT usage. Small-scale farmers reaching extension services and being aware of ICT projects can still be not using ICTs because their land size do not give incentives for market participation, and thus for using ICTs. The implication of this study finding is that government and non-governmental agencies that promote the use of ICT-based MIS should not neglect the need to promote awareness of the existence of such services. The findings further imply that agencies involved in the implementation of ICT-based projects should devote time to creating awareness of such projects among target clientele.

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