

Awareness and use of m-banking services in agriculture: The case of smallholder farmers in Kenya

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**Awareness and use of m-banking services in agriculture: The case of smallholder farmers
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Abstract

Smallholder farmer access to agricultural finance has been a major constraint to agricultural commercialization in developing countries. The ICT revolution in Africa has however brought an opportunity to ease this constraint. The mobile phone-based banking services that started in Kenya urban centers have spread to rural areas and even other countries. Using these services farmers could receive funds invest in agriculture finance transactions. This study examines the awareness and use of m-banking services among rural farmers in Kenya. It also assesses the factors conditioning the use of such services. The study finds high awareness of m-banking services among the smallholder farmers. It also finds that education, distance to a commercial bank, membership to farmer organizations, distance to the m-banking agents, and endowment with physical and financial assets affect the use of m-banking services. It discusses the implications of these findings for policy and practice.

Key words: Mobile phones, m-banking services, awareness and use, smallholder farmers, Kenya

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1.0 Introduction

Access to financial services has the potential to improve commercialization of smallholder agriculture and contribute to poverty alleviation among rural communities (Kibaara, 2005; Gine et al, 2009). More than 70 percent of Africa's population live in rural areas and experience high incidence of poverty. Majority of these rural dwellers depend on agriculture as source of livelihood. The World Bank (2009) for instance identifies rural finance as crucial factor in achieving pro-poor growth and poverty reduction goals. However, formal financial markets tend to fail for majority of smallholder farmers in developing countries (Besley, 1998).). Consequently, most smallholder farmers depend on 'traditional' informal financial systems which are poorly developed (Financial Sector Deepening (FSD), 2006). Development of rural financial systems is hampered by the high transaction cost of delivering the services to small, widely dispersed farmers (Poulton et al, 2006. Other factors that lead to the failure of formal financial markets for smallholder farmers include high covariate risks, missing markets for managing weather and market risks and the lack of suitable collateral (Onumah, 2002). Transaction costs tend to be particularly high among smallholder farmers due to poor communication and transportation facilities, lack of production and market information, as well as thin and segmented markets (Poulton et al., 2006; Poulton et al, 1998; Shiferaw, 2009).

Lack of working capital and low liquidity (due to inability to access financial services) is one of the key impediments to commercialization of smallholder agriculture (Kibaara, 2005). It especially limits smallholder farmer's ability to purchase productivity-enhancing inputs (e.g., seeds, fertilizers and pesticide) (Nyoro, 2002). Consequently smallholder farmers tend to produce small volumes that exclude them from participating in better-paying output markets that require large volumes (Barrett, 2008). Indeed, smallholder farmers' inability to invest in productivity enhancing inputs (due to lack of agricultural finance) is the reason such farmers remain autarkic and are trapped in low equilibrium poverty trap (Barrett, 2008).

The desire to spur progress in smallholder agriculture has historically led to search for new models of agricultural financing that address the constraints faced by farmers. Among these models are interventions that provide agricultural finance to farmers in groups and attempt to use the Grameen lending model (Okello et al, 2010). Other models link farmers to formal agricultural finance markets through flexible lending systems that allow recovery of loan from sales (i.e., interlinked credit scheme) (Gine, 2009). These models have had limited success due the factors highlighted above. However, most smallholder farmers still lack access to formal financial systems (especially banks).

The recently introduction money transfer services using mobile phones (m-banking) has caused excitement among development agents due the potential it has in resolving some of the financial constraints smallholder farmers face namely, access to finances when needed. The excitement about m-banking emanates from the increase in penetration and use of mobile phones in the rural. Studies suggest that 80-90 percent of Kenyan population now covered by mobile networks (Mason, 2007; Okello et al. 2009). There are approximately 15 million mobile subscribers in Kenya compared to just 5 million individuals with bank accounts Omwansa (2009). At the same time, there were over 12,000 M-PESA agents in 2009 in Kenya, substantially more points of service than the combined number of bank branches (887) and ATM (1,435). Cumulative value of mobile phone-based money transfers had reached \$1.5 billion in early 2009, the monthly value of person-to-person transfers was \$190.3 million; equivalent to about 10 percent of Kenya's GDP (FSD, 2009). Thus the introduction of m-banking has spurred unprecedented transfers of money among individuals and households in Kenya. To what extent are smallholder farmers aware of this service? Are they using the mobile phone-based money transfer services? If they are, then for what purpose? This paper examines the above questions. It specifically:

- i. Assesses the awareness of m-banking services among smallholder farmers.
- ii. Examines the use of m-banking services by smallholder farmers.

This paper is focuses on smallholder farmers in three different districts namely Kirinyaga (Central province), Bungoma (Western province) and Migori district (Nyanza province). The districts were selected for survey because they present diversity of social and economic backgrounds. Kirinyaga district has export oriented agriculture with several export crops being

produced. Smallholder farmers in Bungoma district grow mainly maize with some sugarcane. In Migori, on the other hand, the main crops are maize and some tobacco. Thus the choice of the districts presents differing levels of commercialization as well as cultural backgrounds. M-banking is an interesting issue to study because it can potentially lower the cost of remitting money from urban to rural households in a timely and cost effective way. The large network of m-banking agents in the rural areas can especially make it easy for agricultural households to reduce the time and cash expense in accessing the funds they need to invest in agriculture.

The rest of this paper is organized as follows: Section 2 characterizes the study farmers; Section 3 presents the study methods; Section 4 presents the results of the study; and Section 5 concludes.

2.0 Characterization of study farmers

Table 1 presents the characteristics of the households interviewed in this study.

Table 1: Household Characteristics

Variable	Mean	Std. Dev.	Minimum	Maximum
Age	43.67	13.84	18	92
Education	8.44	3.66	0	18
Distance to bank	10.12	7.37	1	55
Distance to M-banking agent	2.2	9.6	0.2	40
Farming Experience	20.3	8.99	1	70
HH Size	5.74	2.17	1	14

Of the 379 respondents, the mean age was 43.7 years while the mean household size is 5.7 members. Mean education of respondents was 8.4 years indicating that the farmers have relatively low levels of education. The low level of education has implications on the use of new generation ICT tools (e.g., mobile phones) for money transfer. Previous studies identify literacy as important in the use of mobile phones for information access due to difficulty of navigating through the phone menus, often written in English (Okello et al, 2009). Of the sampled farmers, 191 (50.4 percent) were men while 188 (49.3 percent) were female. The average years of experience in farming was 20 suggesting that the respondents have a lot of experience in

agricultural production. Results also show that the mean distance to the nearest m-banking agent was reported to be 2.2 kilometres, while the mean distance to the nearest bank was given as 10.12 kilometres. Hence farmers have better access to m-banking services than services of commercial banks.

3.0 Study Methods

3.1. Conceptual method for analyzing awareness and use of m-banking

This study uses the Transaction Cost Economics (TCE) paradigm, which is part of the New Institutional Economics – NIE - (Hubbard, 1997; Clague, 1997; Poulton *et al*, 1998). The concept of transaction costs was first introduced about seven decades ago by Coase (1937) and has been widely used in studying agricultural economics and related issues in developing countries (Jaffee, 2003; Fafchamps, 2004; Fafchamps and Hill, 2005; Okello and Swinton, 2007). Coase defines transaction cost as costs associated with information, negotiation, monitoring, coordination, and enforcement of contracts. North (1990) reiterates on the same and defines transaction costs as costs of measuring the valuable attributes of the commodity exchanged and the costs of providing and ensuring the desired attributes.

Transaction costs both in the input and output markets of developing countries can be summed up into four categories; search costs, negotiation costs, monitoring costs and mal-adaptation/adjustment costs (Poulton *et al.*, 2006; Fafchamps, 2004; Fafchamps and Gabre-Madhin, 2006 and Okello *et al.*, 2010).

High transaction costs impede smallholder farmer linkage to financial services. For such farmers, the cost of borrowing tends to be high because of lack of information regarding their credit worthiness, difficulty of monitoring the usage of loans, and the systematic risks that affect farmers. Smallholder farmers often lack the collateral needed by commercial banks to secure loans. Hence most credit organizations regard them as credit unworthy. In addition, the geographical dispersion of smallholder farmers and poor organization among them makes monitoring costly to lenders (Poulton *et al*, 2006). Indeed, the emergence of rural micro-finance organizations and SACOs has been based on the premise that smallholder farmers need unique

services that is close to them. However, the poor economic conditions in rural communities make running such organizations and unprofitable. Consequently, most financial organizations tend to be located in commercial centers where there is enough clientele to make their operations profitable. However, such centers tend to be inaccessible to the remotely located smallholder farmers.

Mobile phone-money transfer services can theoretically resolve the constraints smallholder farmers face in accessing finances by reducing the transaction costs farmers face in using banking services. First, they can make money transfer into farming communities easy and instant. Consequently, farmers do not have to incur high time and travel costs to travel to banking facilities. Second, it can include the hitherto excluded farmers into the banking services by reducing the costs of accessing funds and/or depositing savings. The latter is especially important because unlike the commercial banks and savings organizations, the m-banking services attract no ledger fees and minimum balances. At the same time, it attracts a very modest withdrawal fee that is affordable to farmers.

3.2 Empirical methods

This study uses qualitative and quantitative methods to address the objectives above. It uses descriptive analysis to assess the awareness and use of m-banking services. It then uses a logit model to examine the factors that condition the use of m-banking services. In a logistic regression model, the probability, p , that a household is uses m-banking is given by:

$$P = e^z / 1 + e^z \tag{1}$$

Central to the use of logistic regression is the logit transformation of p given by Z

$$Z = \ln(p/1-p) \tag{2}$$

Where;

$$Z = X\beta + \varepsilon \tag{3}$$

β is the a vector of regression parameters, X is a vector of explanatory variables and ε is the stochastic term assumed to have a logistic distribution. The vector X comprise of farmers' demographic characteristics, physical, human, and social capital endowments, and farm and regional characteristics. Z is a latent variable that takes the value of 1 if the farmer used m-banking services and 0 otherwise.

3.3 Sampling procedure and data

This study used data collected from smallholder farmers located in Kirinyaga, Bungoma and Migori districts. It targeted farmers who had worked with (or still working) with ICT-based organizations whose aim is to facilitate smallholder farmer linkage to markets through the use of new generation ICT tools especially the mobile phone. The respondents in this study were therefore stratified by participation in such ICT-based agricultural projects.

The sampling procedure was done in three stages. First, in each district, an area with an ICT-based project was identified. Second, for each such area, a list of all farmers registered to participate in the ICT-based projects was drawn with the help of project leaders and farmer leaders. A second list of farmers that did not participate in the ICT-based projects was also obtained with the help of local administration (village elders and area agricultural extension officers).

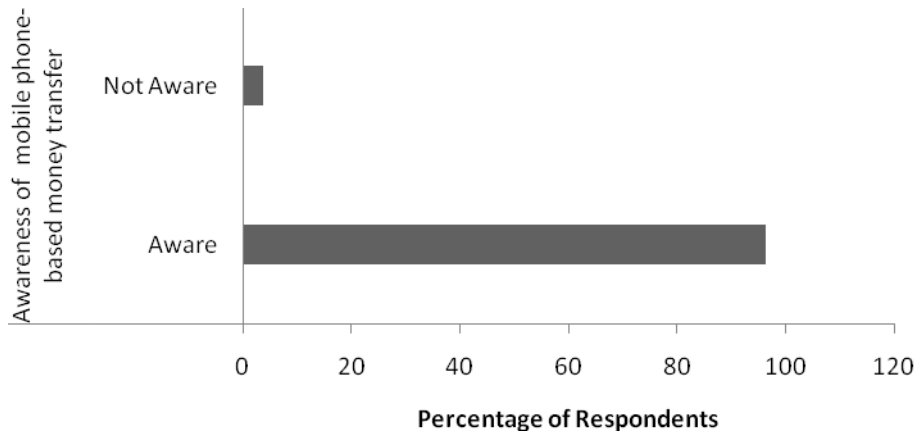
Third, the respondents were sampled from the two lists using probability proportionate to size sampling method. That is, more farmers were sampled from the list with more names. This procedure resulted in 153 farmers who have participated in ICT-based interventions and 224 non-participants. A total of 379 farmers were therefore interviewed in this study. The data was collected through personal interviews using pre-tested questionnaire. The data collected included household characteristics, demographic and economic characteristics, household asset endowments, use of mobile phone-based money transfer, among others. The household survey was conducted during April of 2010.

4. Results

4.1 Awareness of mobile phone-based money transfer services

In order to assess the level awareness of mobile phone-based money transfer services, 379 respondents were asked to indicate whether they had ever heard of the mobile phone based money transfer services. As shown in Figure 1 majority of the farmers (96.3%) were aware of the existence of m-banking services.

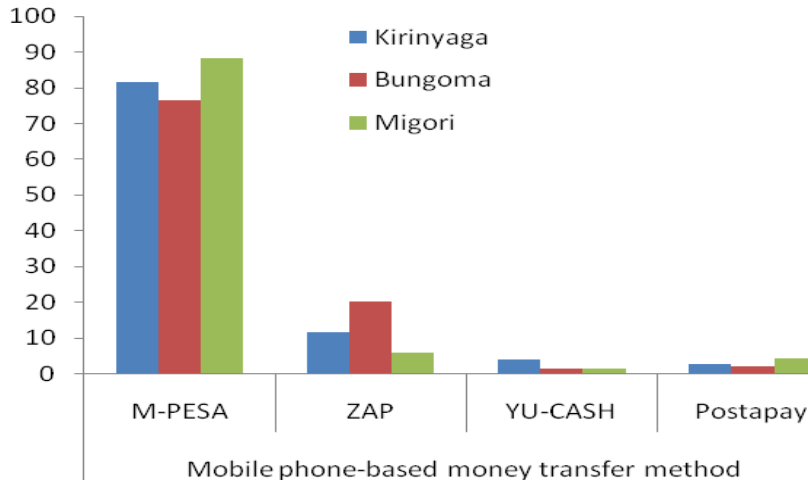
Figure 1: Overall awareness (%) of mobile phone-based money transfer



The overall level of awareness however slightly differed for the different regions (districts) farmers were located. Migori district had the highest level (99%) of awareness followed Bungoma district and then Kirinyaga district.

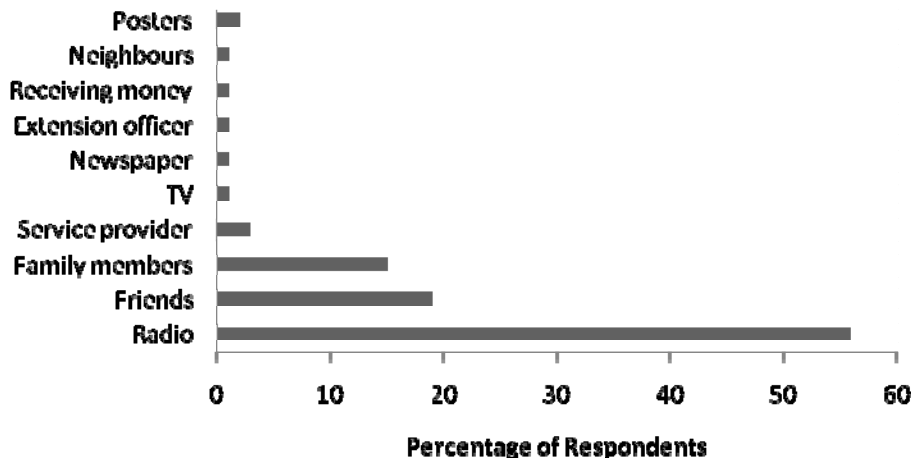
There are also differences in awareness of the different mobile-based money transfer services in the different study regions (Figure 2). Safaricom’s M-PESA was the most widely known m-banking method in all the three districts, probably because it has been in operation longer than the rest (i.e., ZAP and YU-cash). The Kenya postal money transfer service, Postapay, which uses mobile phone to relay information from one post office to another about a transfer was largely unknown by the respondents. YU-cash, the most recent entrant in the mobile phone-based money transfer services was also relatively unknown. These findings suggest that M-PESA continues to enjoy the first mover advantage in the m-banking service industry. However, it could also be due to the aggressive promotion by Safaricom of this service countrywide.

Figure 2: Awareness (%) of mobile phone-based money transfer by district, 2010



We also investigated the various sources from which farmers learned about m-banking. Majority of the respondents (more than 50%) in all the study districts learned about the mobile phone-based money transfer services from the radio (Figure 3). The other important sources used by farmers were friends and family. As expected most farmers did not learn about m-banking from newspapers, TV and billboards/posters due to low literacy levels and also because the study areas were remote.

Figure 3: Source from which farmers first learned about m-banking

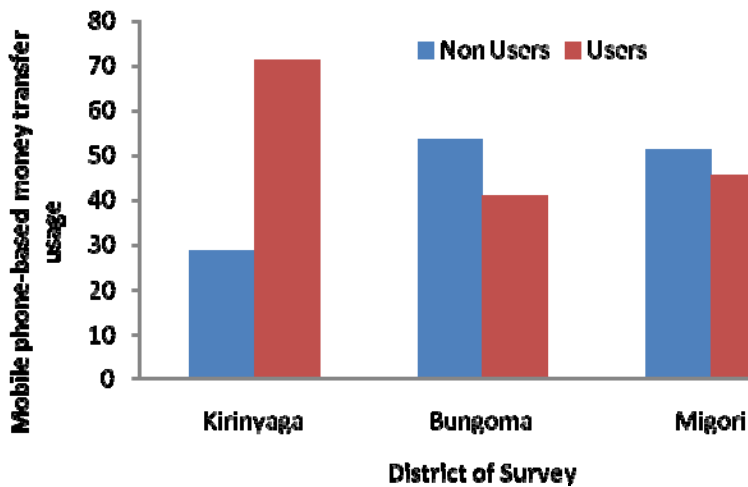


4.2 Use of mobile phone-based money transfer services

In order to assess the use of m-banking services by the farmers, the respondents were asked to indicate whether they had ever used m-banking services. Even though there is high level awareness of m-banking, the usage level is much lower. Overall, of the farmers that were aware of the m-banking services only 52% have used the services before.

However, as expected, the usage differed for different regions (Figure 4). More farmers in Kirinyaga district have used m-banking services before than in the other two districts. Indeed, Kirinyaga is the only district where there are more users of m-banking services than non-users. Two factors explain this finding. First, the level of agricultural commercialization is much higher in Kirinyaga than in the others. Majority of the respondents interviewed participate in better-paying fresh export vegetable production. Second, the level of education is much higher in Kirinyaga than the other districts, indicating that farmers in Kirinyaga are better able to use mobile phones for money transfer. Third, results showed that the ownership of mobile phones was higher in Kirinyaga than in Migori and Bungoma districts. As expected, the use of mobile phone-based money transfer services was lowest in Migori district, likely due to low level of agricultural commercialization in the district.

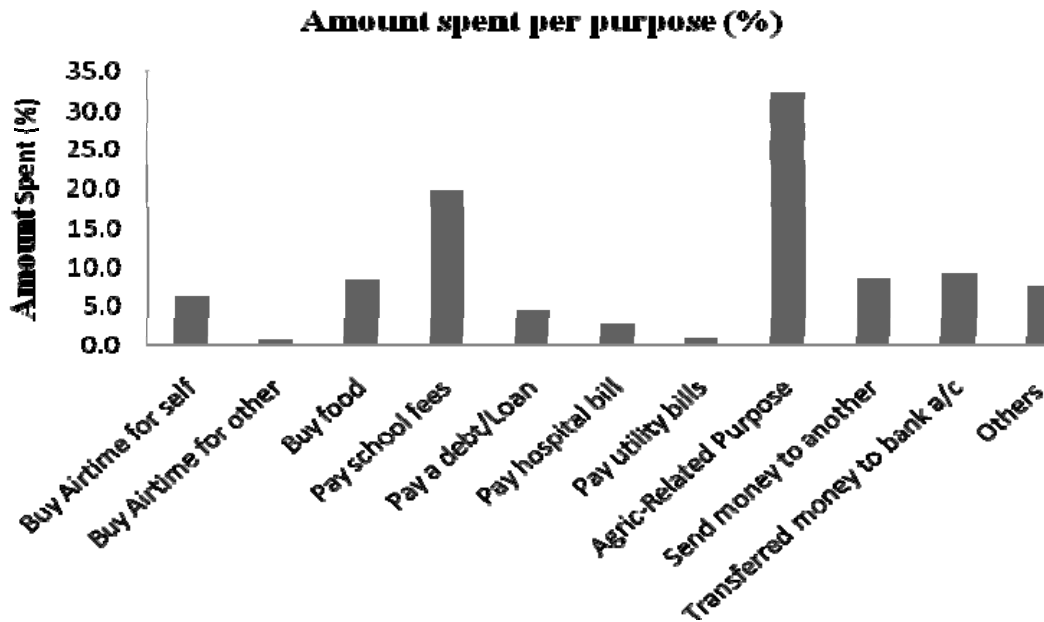
Figure 4: Use of mobile phone-based money transfer services by district



The farmers interviewed in this study use the money they received through mobile phone transfer for various purposes. Figure 5 presents the various uses to which monies received via mobile phone are used. Interestingly, agricultural related purposes (purchase of seed, fertilizer, farm

equipment/implements, leasing of land for farming, paying of farmworkers) accounts for the largest proportion (32%) of use of the monies received via mobile phone transfer. School fees payment accounted for 20% while purchase of food 10%.

Figure 5: Uses of money received via mobile phone transfer



We investigated the various purposes for which farmers send money using m-banking services as shown in Table 3. Overall, 25% and 23% of the money sent was for paying school fees and regular support to recipients, respectively. Approximately 14% of the farmers sent money for the purchase of inputs and for paying farmworkers. The results also show that 7% of the monies transferred via mobile phones went into purchase of inputs. Indeed, some farmers now transfer the money to the input dealers who in turn send back inputs without the former going to the markets.

Table 3: Purposes of sending money via m-banking

Purpose of sending money	Percentage of sent money
Regular non-food household needs	22.9
Purchase of farm inputs	7.0
Pay utility bills	1.8
Paying farmworkers	6.2
Repayment of debt	12.3
Pay non-farm labour	0.4
Pay school fees	24.7
Buy food	8.8
Health care	7.1
Other	7.9

4.3 Determinants of Use of M-banking among smallholder farmers

The results of the logistic regression are shown in Table 4. The likelihood ratio shows that the model fits the data well (pvalue = 0.0001).

Table 4: Drivers of use m-banking services by smallholder farmers: Logit regression

Use of m-banking	Coef.	Std. Err.	p-value
Gender	0.54	0.26	0.041
Age	0.03	0.02	0.118
Education (years)	0.19	0.04	0.000
Distance to nearest m-banking agent	-0.31	0.01	0.001
Group membership	0.71	0.26	0.007
Distance to nearest bank	0.51	0.02	0.009
Household size	-0.09	0.06	0.159
Years of experience in farming	-0.03	0.01	0.064
Agric extension	-0.01	0.02	0.642
Ln assets	0.11	0.05	0.028
Ln income	0.24	0.08	0.005
Constant	-5.1373	1.1543	0.0000
No. Of Observations: 378			
Pseudo R ² : 0.1985			
P-Value: 0.0001			
Log Likelihood: -207.2917			

As hypothesised, distance to the m-banking agent plays a critical role in usage of m-banking. The further away the farmers from m-banking agent the less likely the use of the service. These findings indicate that m-banking therefore has great potential to reduce the exclusion of farmers from banking services caused by lack of access resulting from distance to the service. Indeed, results of the descriptive analysis indicated the m-banking services are located within average

distance of 2 km from the farmers interviewed. Indeed, distance to the nearest bank is positively and significantly related to the likelihood of use m-banking services. That is, the further away the farmer from the nearest commercial bank, the more likely that farmer will use m-banking services. An increase in distance from a bank by 10 percent increases the likelihood of usage of m-banking services by 5 percent.

Results also shown, that among the household characteristics, gender and education affect the likelihood of using m-banking services. An increased in level of education by 1 year increases the likelihood of using m-banking by 0.02 percent. The finding relating to education supports the earlier argument that literacy affects the awareness and use of m-banking services. Results further show that social capital proxied by membership in farmer organizations also affects the likelihood of using m-banking services. This finding is in-line with those of previous studies that indicate that collective action affects adoption of new techniques of farming.

The other capital endowment variables that affect the likelihood of using m-banking services include possession of physical assets and income. Results show that an increase in the value of assets owned by a respondent by 10% increases the likelihood adoption of m-banking services by 11%. This finding indicates that the likelihood of usage of m-banking services is higher among the more asset endowed farmers than their counterparts. Results further show that the more financially endowed farmers are more likely to use m-banking services than their counterparts. An increase average income by 10% increases the likelihood of use of m-banking services by 24%.

5. Summary, conclusions and policy implications

This study assessed the level of awareness and usage of mobile phone-based money transfer among smallholder farmers in Kenya. It finds that the level awareness of mobile phone is quite high. More than 96 percent of the farmers are aware of mobile phone-based money transfer services. However, the level of awareness has not translated into usage. Only 52 percent of the farmers were found to be users. The study also finds that aware of m-banking services does not vary much among the study regions. However, the usage of mobile phone is significantly higher in regions with greater level of agricultural commercialization. The study also finds that the

largest proportion of money received via m-banking (32%) is used on agricultural related purposes (purchase of seed, fertilizer for planting and topdressing, farm equipment/implements, leasing of land for farming, paying for labour).

The study find the factors explaining use of use of m-banking include education, distance to a commercial bank, membership to a farmer organization (a proxy collective action), distance to the m-banking agent, and endowment with physical and financial assets. It study specifically finds that distance to the m-banking agent (which affects transport cost to the m-banking agent and opportunity cost of time spent) has an inverse relationship with the decision to use m-banking service. The further the m-banking agent is from the farmers, the lower the likelihood of usage.

The implication of these findings is that there is need to expand the coverage of m-banking services in rural areas since it resolves one idiosyncratic market failures farmers face namely access to financial services. In addition, attention should be given to infrastructural constraints facing rural areas namely the lack of electricity (needed to charge mobile phones). It also implies that m-banking service providers should consider expanding the availability of sufficient “float” of funds to expedite transfers into and from farming communities. Indeed, lack of adequate float was also cited as one of the major constraints to the use of m-banking in remote areas where majority of clients use the service to receive cash remittances from friends and family. These findings therefore indicate priorities for policymakers and the private sector to invest in linking farmers to financial services. They also highlight the importance of improving rural literacy level of the farming communities.

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