

Research Application Summary

Impact of using mobile phones in disseminating agricultural information among medium scale farmers in Kenya

Ongachi, W. & Nyanganga, H.

Department of Agricultural Economics, Faculty of Agriculture, University of Nairobi,
P. O. Box 29053, Nairobi, Kenya

Corresponding author: wycliffeongachi@gmail.com

Abstract

Integration of mobile phones offers incredible opportunities to share agricultural information. Being one of the ICT tools currently used in extension science, evaluating its impact on agricultural production remains crucial. This study particularly focused on the medium scale farmers who are employed by the formal sector and mostly stay in urban areas. As a result, these lack direct contact with rural extension officers. The study was conducted in Uasin-Gishu, Nyeri and Embu Counties, where mobile phone application initiatives have been piloted. A sample of 220 farmers was selected through systematic random sampling. Afterwards, a survey was conducted to evaluate access to extension, ownership of mobile phones, communication pathways preferred and implementation of disseminated information among the participants. Primary data were collected using semi-structured questions. Descriptive statistics were used to analyze data. Results showed that all farmers owned mobile phones. Out of these, 97% of the farmers from Uasin-Gishu, 100% from Nyeri and 84% from Embu were able to use their phones to access information. Short Message Services (SMS) was the most preferred means of sharing information. Further, 43% of the respondents implemented information on how to diversify farming, 26.2% of the farmers implemented information on post-harvesting techniques, 42% and 30% of the farmers implemented information on sales timing and consumer trends respectively. Hence, to reach a large audience of farmers, phone based applications such as esoko should be built on free social networks like Facebook and information shared in SMS format.

Key words: Agricultural extension, dissemination, information, Kenya, medium scale farmers, mobile phones

Résumé

L'intégration de la téléphonie mobile offre des opportunités de partager des informations dans le domaine de l'agriculture. Étant l'un des outils TIC actuellement utilisés dans la vulgarisation scientifique, l'évaluation de son impact sur la production agricole demeure cruciale. Cette étude s'est particulièrement focalisée sur les agriculteurs moyens employés par le secteur formel dans les zones urbaines. En conséquence, ils manquent de contact direct avec les agents de vulgarisation rurale. L'étude a été menée dans les comtés d'Uasin-Gishu, Nyeri et Embu, où des initiatives d'application de téléphonie mobile ont été testées. Une taille de 220 agriculteurs a été sélectionnée par échantillonnage aléatoire systématique. Par la suite, une enquête a été menée pour évaluer l'accès à la vulgarisation, la

possession des téléphones portables, les voies de communication préférées et la mise en application des informations diffusées aux participants. Les données primaires ont été collectées à l'aide de questions semi-structurées. Des statistiques descriptives ont été utilisées pour analyser les données. Les résultats ont montré que tous les agriculteurs possédaient des téléphones portables. 97% des agriculteurs d'Uasin-Gishu, 100% de Nyeri et 84% d'Embu ont pu utiliser leur téléphone pour accéder aux informations. Les services de messages courts (SMS) étaient le moyen le plus privilégié pour partager des informations. En outre, 43% des répondants ont mis en application les informations sur la manière de diversifier l'agriculture, 26,2% des agriculteurs ont mis en application des informations sur les techniques post-récolte, 42% et 30% des agriculteurs ont mis en application des informations sur le calendrier des ventes et les tendances de consommation respectivement. Par conséquent, pour atteindre plus les agriculteurs, les applications de téléphone mobile telles que esoko doivent être construites sur des réseaux sociaux gratuits comme Facebook et des informations partagées en format SMS.

Mots clés: vulgarisation agricole, diffusion, information, Kenya, agriculteurs moyens, téléphones portables

Introduction

Farming is becoming a more time-critical and information-intense business. As income generating sector, agriculture remains a major source of export earnings, creates employment and wealth (GoK, 2008). Although medium and large scale farms account for about 20% of the population involved in agriculture, they cover substantial area (54%) farmed (Kamau, 2013). Specifically, medium scale farmers alone constitute 14% of total number farmers in Kenya (EFG, 2014). Although this is a sizeable number of farmers, little agricultural efforts have been directed to them despite controlling more land than large-scale foreign investors (Jayne *et al.*, 2014). As a result, they have manifested poor farming methods, low yields and poor marketing. To avert the above situation, access to information on agricultural development efforts by this group is very important. In Kenya like in other developing countries, there are not enough extension officers to visit all farmers who need their services (Bentley *et al.*, 2015). This situation significantly affects medium scale farmers who stay away from their rural farms; as their primary jobs are in the non-farm sector (Jayne *et al.*, 2014). As argued by Giridharadas (2009), being in a network is like living in a village where people are greatly compelled to share information. To date, the development and use of mobile phones remains a promising technology for such networking. In the agricultural field, a number of mobile phone application initiatives have been piloted and integrated in a bid to facilitate sharing of information. Past studies by Overa *et al.* (2006) have revealed that mobile phones can speed up and enable farmers to focus and extract useful and up-to-date information from social and business networks. In addition, they can allow farmers to strike better price deals within their existing trading relationships, and to make better choices about where to sell their produce (Katengeza *et al.*, 2011). Furthermore, phones are considered as precious devices which are beneficial to farmers especially in remote areas (Muto and Yamano, 2009) and remain a realistic option of communication due its wide availability, affordability, simplicity and flexibility (Venessa, 2006).

With current developments in the mobile phone sub-sector, mobile phone initiatives such as Airtel Kilimo, M-Farm, iCow and applications such as WhatsApp present a viable way to enhance networking amongst farmers and relevant stakeholders. However, lack of adequate and reliable electricity, and poor communication infrastructure may create barriers for effective use of such phones especially in rural settings. Based on the above background, the current study sought to understand existing mobile phone based communication pathways and level of uptake of various agricultural interventions disseminated through mobile phones among medium scale farmers in Kenya.

Materials and methods

Site description. The study was carried out in Uasin-Gishu, Nyeri, and Embu Counties of Kenya where various mobile phone applications such as Arifu, Esoko have been piloted in order to potentially speak to medium scale farmers. Uasin-Gishu County is located in the Rift Valley Province and extends between longitudes 34° 50' and 34° 57' East and latitude of 0° 3' South to 0° 1' North. This county enjoys two rainy seasons with an annual rainfall ranging between 900 to 1200mm. Nyeri County is located in the Central Province of Kenya. It receives an average rainfall between 500mm and 1500mm during the short and long rains periods; and enjoys range temperature between 12°C in the cold months (June and July) and 27°C in the hot months making it conducive for its diverse agricultural activity. Lastly, Embu County is located at the foothill of Mount Kenya and receives substantial rainfall with average annual precipitation of 1206 mm with a temperature range of 9°C - 28°C. The main occupation of the people in these areas is farming. Farmers hold different land sizes with some being medium sized. Soils found in these areas are mainly good for maize, wheat, horticultural crops and livestock. This study focused on medium scale farmers who work closely with Equity Group Foundation.

Sample selection and data collection. Specific locations were identified based on the baseline surveys conducted by Equity Group Foundation (EGF). The locations were chosen with the hope of finding larger number of mobile phone users in order to achieve the project objective. Primary data were purposively gathered among the selected farmers in three Counties. To realize the study objectives, a multistage sampling procedure was employed to divide the Counties into smaller administrative units and locations. Further, systematic random sampling procedure was employed to select the respondents from the existing lists of farmers as kept in the project records at Equity Group Foundation. From the lists, a total of 220 farmers were randomly drawn using a simplified formula of Yamane (1967). The number of farmers selected for the study are shown in Table 1.

Afterwards, a household survey was carried out to assess the impact of mobile phone on the project participants. Data were collected using semi-structured questionnaires administered through face to face interviews to enable clarification and probing of the respondent for accurate answers. Locals with the necessary education and farming experience were trained to administer the questionnaires. The questionnaire captured questions on ownership of mobile phones, mobile phone initiatives piloted, training on use of mobile phone to access information, preferred mode of communication, uptake of information disseminated, among others. However, 23 respondents from Uasin-Gishu County did not complete interviews, thus their responses were not considered for analysis. Data from complete questionnaires were then subjected to descriptive statistics.

Table 1. Sample size determination

County	Total number of farmers as collated by EGF	Number of sampled farmers
Uasin-Gishu	239	120
Nyeri	115	55
Embu	85	45

EGF = Equity Group Foundation

Results and discussion

Ownership of mobile phones and access of information by the respondents. Ownership of mobile phones is an important indicator of availability, accessibility and affordability of the phones among the respondents. The study revealed that all respondents (100%) owned a mobile phone (Table 2). Out of this, 64.7%, 68.2% and 56.7% of the farmers from Nyeri, Uasin Gishu and Embu respectively had ‘ordinary’ phones while the rest had smart phones. Possession of a mobile phone is an important and first step towards exposure to agricultural messages. Past studies by Wawire (2013) also revealed that physical availability of the medium exposes agricultural programmes to farmers. Smart phones features additional applications that may be important in accessing messages coded in different formats.

Table 2. Level of phone ownership and access to extension services (n=220)

Variables		Counties		
		Uasin Gishu (%)	Nyeri (%)	Embu (%)
Ownership of phone	Yes	100	100	100
Type of phone	Ordinary	87.9	78.2	65.3
	Smart phone	12.1	21.8	34.7
Access to extension	If Yes	97	100	84
Frequency of access to extension services	Weekly	22.1	2	10.2
	Monthly	31.2	94.1	33.4
	Quarterly	37.9	3.9	42.3
	Twice a year	3.5	0	2.6
	Yearly	5.3	0	11.5

Further, the study revealed that majority of the respondents had a relatively high level of access to extension services at 97%, 100% and 84% from Uasin Gishu, Nyeri and Embu Counties, respectively (Table 2). This was attributed to continuous interaction between Equity Group Foundation and other extension service providers with the farmers. Nevertheless, it implies that when mobile phones are appropriately used, large farmer audiences could be reached. This scenario has been reported by Asenso and Mekonnen (2012) and Ongachi *et al.* (2017), that ICT tools improve and enhance faster diffusion of information on agricultural technologies.

However, the level of interaction was low as most of the farmers accessed such services on a monthly basis. This implies that majority of the farmers were not able to receive timely information. Access to timely information and possession of knowledge is the first step toward promoting adoption process. In addition, about 29.3% and 7.7% of the farmers from Uasin Gishu and Embu Counties, respectively, received trainings on the use of mobile phones to access agricultural messages (Fig. 1). On the contrary, all the farmers from Nyeri County had received trainings on mobile phone application. However, they reported only being trained on *Arifu* and *Esoko* platforms. Equity Group Foundation and Bayer’s company were key leading training partners.

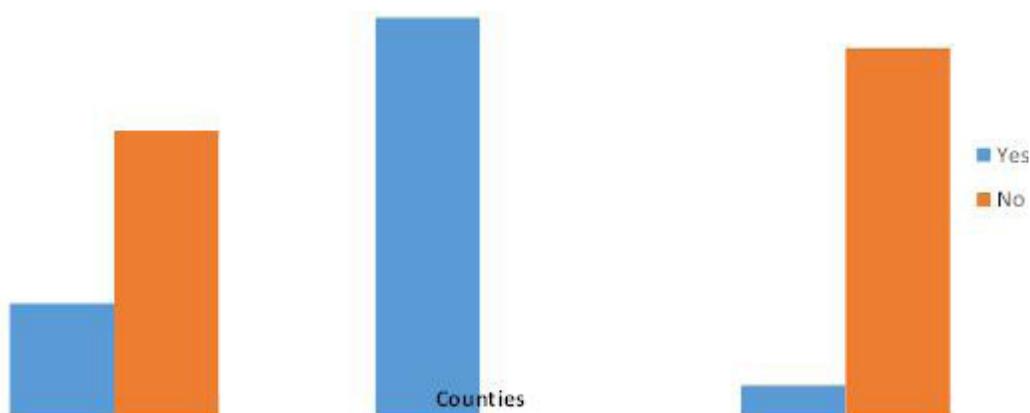


Figure 1. Percentage of farmers who received training via mobile phones.

On sources of information, majority of the farmers got agricultural information from *Arifu* and *Esoko* platforms (Table 3). This could be due to the fact that most of the respondents were mainly trained on such platforms. It may also imply that majority of the farmers preferred *Arifu* and *Esoko* as platforms for sharing information.

In addition, the study found information needs for medium scale farmers to be varied ranging from land preparation to marketing. This could be due to diversification of farming activities. Many of them grew a number of crops, both cereal and horticultural, in addition to rearing livestock. However, this contradicts their small scale counterparts who seemed to demand for similar agricultural information (Spurk *et al.*, 2013; Bernard *et al.*, 2014). Nevertheless, it implies that for improved productivity, access to appropriate information at the right stage of farming is paramount. Previous studies by Nyaga (2012) also asserted that farmers receive varied information from diverse sources depending on their farm activities.

Table 3. Extension services acquired by farmers via mobile phones (n=220)

Type of infor	Source of information/Platform								
	Uasin Gishu County (%)			Nyeri County (%)			Embu County (%)		
	Arifu	Esoko	Plant wise	Arifu	Esoko	Plant wise	Arifu	Esoko	Plant wise
Mrk inf.	84.3	12.6	0	98	0	0	0	23.1	0
Product Pln	10.6	22.1	1.1	90.2	3.9	0	0	23.1	0
Agronomic	10.5	15.5	1.1	7.8	80.4	0	0	12.8	0
Weather inf	7.6	26.3	1.1	98	0	0	0	5.1	0
Sales timing	5.3	15.8	3.3	92.2	0	0	0	23.1	2.6
Credit fac.	6.3	16.8	2.1	56.9	0	0	0	5.1	0
Crop Ins	6.3	11.6	1.1	57	0	0	0	23.1	2.6
Harvesting tec	6.3	2.1	1.1	-	-	-	-	-	-

The preferred communication based pathway in disseminating agricultural messages via mobile phones. Short Message Services (SMS) was the most preferred and used means of exchanging agricultural messages via mobile phones (Table 4). This was attributed to the fact that SMS could be easily retrieved and information stored for future reference. In addition, most of the farmers were

engaged in either off-farm or farm duties during the day and could only use their leisure time in the evening hours to read such messages. Similarly, Ango *et al.* (2013) reported that farmers always pay attention and grasp more information when delivered at their convenient time. The time at which agricultural messages are presented is therefore a key determinant in technology uptake for increased agricultural productivity.

Further, the study found that close to half of the respondents strongly agreed that SMS were affordable, user friendly and could be referred to from time to time (Table 5). This may be due to the fact that SMS is a store-and-forward service; meaning receiver's mobile phone does not have to be active or within the range for messages to be sent. The message can be stored for several days until the receiver's mobile phone is turned on, a point at which the message is delivered thus access to information is guaranteed. Further, the high use of SMS could be a consequence of high literacy rates among respondents. Although this research did not look at education levels of the farmers, past studies by Jayne *et al.* (2014) revealed that medium scale farmers exhibit specific characteristics, as they are educated and act as role models within their society. The result therefore suggests the need to embrace and intensify SMS based communication in bid to reach large number of farmers.

Table 4. Means of spreading information using Mobile phones (n=220)

Means	Uasin Gishu (%)		Nyeri (%)		Embu (%)	
	Used	Preferred	Used	Preferred	Used	Preferred
Internet e.g. email	2.1	5.8	0	2.0	0.0	10.3
Text message(SMS)	60.1	57.5	100	92.9	23.1	55.3
Voice call	22.3	36.7	0	5.9	19.6	38.6

Utilization of information from mobile phones and impacts on the respondents farm.

Table 6 presents the different types of agricultural information that farmers had used. At least 25% of the farmers had utilized information from a mobile phone. This implies that innovations disseminated through mobile phones have high chances of adoption. According to Nyaga (2012), using ICT tools such as mobile phone to link farmers to other stakeholders usually facilitate faster dissemination of information thus higher chances of adoption.

Table 5. Reasons given by the farmers who preferred using Short Messages Services (SMS)

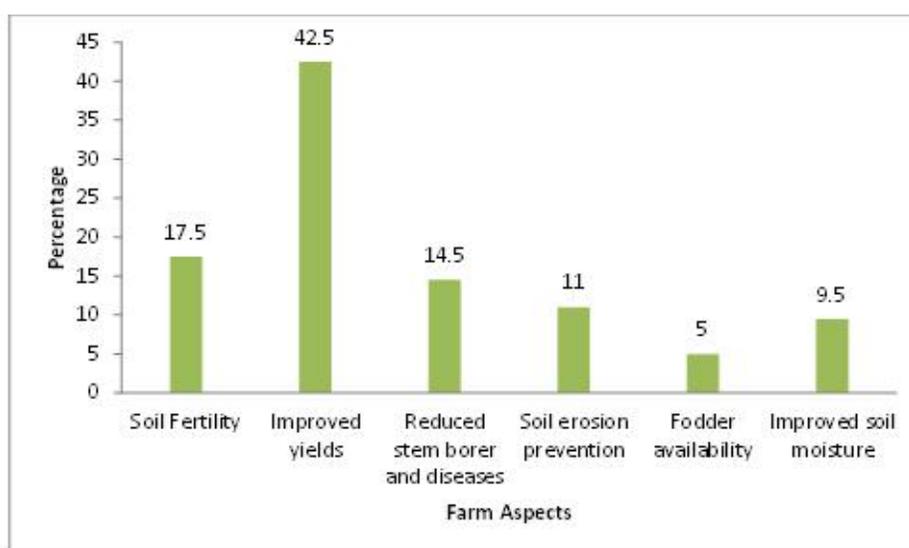
	Uasin Gishu County (%)	Nyeri County (%)	Embu County (%)
Time saving	94.3	83.6	85.4
Affordable	80	68.7	75.2
User friendly	87.4	56.9	76.9
Easily available	79.6	69.1	81.8

Overall, majority of the farmers who implemented such agricultural information realized greater improvements within their farms (Fig. 2). This shows that information on agricultural innovations is key in unlocking production and commercialization. It further signifies the importance of mobile phones in enhancing information delivery and empowering farmers. Information that relate to agronomic practices such as intercropping, crop rotation, and mixed cropping help in improving soil fertility. Crop rotation also reduces the build-up of pests and diseases

Table 6. Various agricultural information put into use by the farmers interviewed (n=220)

Information put into use	Percentage of farmers
Diversification of farming	43
Post-harvest handling techniques	26.2
Sources of credit facilities	37
Sales timing	42
Crop insurance	25
Good agronomic practices	58
Product planning	46
Marketing trends	31.5
Current consumer trends	30

Source: Field data (2017)

**Figure 2. Aspects of the farm that improved.**

Conclusions and recommendations

The use of mobile phones remains an important means of reaching the ‘missing’-medium scale farmers with relevant agricultural information. Results of this study point to a great need to strengthen its application to ensure provision of timely information. Further, the study has shown the importance of farmer training on various mobile phone platforms deployed to spread information. Training creates awareness which is a key determinant of adoption. To effectively reach a large number of farmers, there is need by developers to build these platforms on free social networks like Facebook.

The study also revealed that a greater proportion of the farmers preferred and used SMS as a means to share and exchange information via mobile phones. In this regard, there is need to engage farmers as the first and key stakeholders in the design of messages in order to instil and enhance their confidence. The study concludes that providing medium scale farmers with appropriate information, at the right time

using the right format and the right channel on new agricultural intervention is crucial for development of farming communities.

Acknowledgement

This paper is a contribution to the Sixth Africa Higher Education Week and RUFORUM 2018 Biennial Conference.

References

- Ango, A.K., Illo, A.I., Abdullahi, A.N., Maikasuwa, M.A. and Amina, A. 2013. Role of farm-radio agricultural programmes in disseminating agricultural technology to rural farmers for agricultural development in Zaria, Kaduna State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology* 2 (1): 54-68.
- Asenso-Okyere, K. and Mekonnen, D. 2012. The importance of ICTs in the provision of information for improving agricultural productivity and rural incomes in Africa. *African Human Development Report. UNDP Sponsored research Series*.
- Benard, R., Dulle, F. and Ngalapa, H. 2014. Assessment of information needs of rice farmers in Tanzania: A case study of Kilombero District, Morogoro. *Library philosophy and practice* (ejournal) Paper1071. http://digitalcommons.unl.edu/lib_philprac/1071.
- Bentley, J., Van Mele, P., Harun-ar-Rashid, M. and Krupnik, T.J. 2015. Distributing and showing farmer learning videos in Bangladesh. *The Journal of Agricultural Education and Extension* DOI: 10.1080/1389224X.2015.1026365.
- Communication Commission of Kenya. 2017. Quarterly ICT Statistics. Nairobi: Communication Commission of Kenya.
- Food and Agriculture Organization (FAO). 2005. *Enhancing coordination among AKIS/RD actors: An analytical and comparative*. FAO, Rome, Italy.
- Giridharadas, A. 2009. Behind Facebook's success: It takes a village. URL: http://www.nytimes.com/2009/03/27/world/asia/27ihtletter.html?_r=2&partner=rssnyt&emc=rss, retrieved July 29, 2009.
- Government of Kenya (GoK). 2008. *Strategy for revitalizing agriculture*. Government Printers, Nairobi, Kenya.
- Jayne, T.S., Chapoto, A., Sitko, N., Muyanga, M., Nkonde, C. and Chamberlin, J. 2014. Africa's changing farm structure and employment challenge: Feed the future innovation lab for food security policy leader with associates cooperative agreement between the U.S. Agency for International Development, Bureau for Food Security, Office of Agricultural Research and Policy, and the Department of Agricultural, Food, and Resource Economics, Michigan State University, USA.
- Kamau, F.K. 2013. A Kenyan experience on R&D efforts linking crop and livestock improvement, natural resource management and human health. Research paper submitted to Ministry of Agriculture, Nairobi, Kenya
- Karembu, M. and Nguthi, F. 2011. Communicating agricultural biotechnology in Africa: What role for radio? ISAAA Africenter New Media and Biotechnology Research Brief, Issue 1, Volume 1: Nairobi, Kenya.
- Katengeza, S.P., Okello, J.J. and Jambo, N. 2011. Use of mobile phone technology in agricultural marketing: The case of small holder farmers in Malawi. *International Journal of ICT Research and Development in Africa* 2 (2): 14-25.
- Muto, M. and Yamano, T. 2009. The impact of mobile phone coverage expansion on market

- participation: Panel data evidence from Uganda. *World Development* 37 (12): 1887– 1896.
- Nyaga, E.K. 2012. Is ICT in agricultural extension feasible in enhancing marketing of agricultural produce in Kenya? A case of Kiambu District. *Quarterly Journal of International Agriculture* 51 (3): 245-256.
- Ogambi, A. 2005. The small farmer on the way to the global market – The case of Kenya. Kenya National Chamber of Commerce and Industry. URL: http://archiv.rural.development.de/fileadmin/ruraldevelopment/volltexte/2005/02/ELR_dt_18-20.pdf.
- Olaniyi, O.A., Adebayo, O.O. and Akintola, O. 2011. Rural youths' perception and utilization of agricultural information in Oyo State, Nigeria. *J. Agric. Soc. Sci.*, ISSN Print: 1813– 2235; ISSN Online: 1814–960X 09–015/AWB/2011/7–4–117–123 [http:// www.fspublishers.org](http://www.fspublishers.org).
- Ongachi, W., Onwonga, R., Nyanganga, R. and Okry, F. 2017. Comparative analysis of video mediated learning and farmer *field* school approach on adoption of striga control technologies in Western Kenya. *International Journal of Agricultural Extension* 5 (1): 1-10.
- Overa, R. 2006. Networks distance and trust: Telecommunications development and changing trading practices in Ghana. *World Development* 34 (7):1301 - 1315.
- Rivera, W.M., Qamar, M.K. and Mwandemere, H.K. (Eds.). *Review of country studies on agricultural knowledge and information systems for rural development (AKIS/RD)*. CABI International.
- Spurk, C., Schanne, M., Mak'Ochieng, P. M. and Ugangu, D. W. 2013. Results of a joint research project “Shortcomings of communication in agricultural knowledge transfer in Kenya- and ways to improve it”. Final report, Multimedia University.
- Venessa, G. 2006. The un-wired continent: Africa's success story (2005) ITU. Available at: www.itu.int/ITU-D/ict/statistics/at_glance/Africa_EE2006_e.pdf
- Wanjala Wawire, A. 2013. Awareness and use of Kenya agricultural commodity exchange Services (kace) information services by smallholder farmers of Bungoma County- Kenya. [University of Nairobi, Department of Agricultural Economics](#).
- Yamane, T. 1967. *Statistics: An Introductory Analysis*. 2nd Edition, New-York: Harper and Row.