

# Delivery of Agricultural Extension Service can be Improved through Mobile Phones

## *Key messages, findings and recommendations*

- ❖ As a response to address constraints facing agriculture extension service, the Web-based and Mobile-based Farmers Advisory Information System (W-FAIS & M-FAIS) were developed to minimize various constraints hindering agricultural production such as lack of timely agricultural information; poor delivery of extension services because of few extension officers, lack of incentives as well as under-utilization of ICTs.
- ❖ The W-FAIS and M-FAIS were released for public use in January 2015 that followed an awareness campaign which was conducted in Kilosa District. The project improved working efficiency of the extension officers, provision of equal access to information and agriculture innovation system to the farming community linking all major actors of agricultural sector such as farmers, transporters, traders, input suppliers, extension officers, researchers and policy makers, which makes easier for the establishment of community initiative for solving complex problems in agriculture.
- ❖ Issues of quality control were monitored through the use of agriculture innovation system. The agriculture innovation system consists of networking with members of Kilosa community radio, local telecentre, researchers from Sokoine University of Agriculture and representative actors from farmers, processors and traders.
- ❖ The study proposes a policy for establishing a national framework for validation of agriculture knowledge information systems. For this policy to work the following aspects should be operational: establishment of an e-Agric-Extension Policy; improving collaboration and capacity building; and strengthening ICT infrastructure

## Introduction

Lack of timely agricultural information is one of the constraints on small-scale agricultural production and natural resource exploitation a sector that provides livelihood for 70–80 percent of the Tanzanian population. The main reasons being low budget allocated for extension services, inadequate number of extension officers, and poor working environment. Yet others include lack of reliable means of transport to reach the farmers, limited financial support for carrying out demonstrations and field experiments on new technologies. Many efforts have been done by the Government of Tanzania to address this problem such as involving the private sector in the provision of extension services, restructuring of district and local Governments. This has been done to

coordinate extension services at district and village level.

**Table 1: Farmer-agent ratio in selected countries**

	Ethiopia	Kenya	Tanzania	Nigeria	China	India
Total number of extension agents (000)	60	6	7	5	800	60
Farmers per extension agent	480	950	2500	3300	620	5000
Agent ratio per 1000 farmers	2.08	1.05	0.40	0.30	1.61	0.20

[ Source: Bakasa et al., 2015]

In Tanzania various ministries, universities, private sector, non-governmental organizations, community based organizations, faith based organizations and development institution partners already

provide extension service to farmers. They all offer their extension service to farmers and other actors but often they work in isolation. A national framework for e-extension is needed for translating it into a national strategy. Its aim is to bring all actors together to work towards common goals, which would increase efficiency and effectiveness of the agricultural education and extension services offered to farmers and other actors to realize synergies. This would avoid duplication of interventions and increase cost effectiveness of the extension services.

Moreover, the potential of ICTs has not been fully exploited for supporting a holistic national e-agriculture strategy especially in supporting communication, knowledge sharing and transfer of new and proven technologies in agriculture. Quality of information given to the farmers using AAS supported by ICT is questionable. The reason being that most AAS provide pre-defined questions and answers which don't match with different contextualized problems facing farmers in various agro-ecological zones of Tanzania. Also, the cost for advisory services using AAS is higher. Thus, there is a need to address the aforementioned problems through use of electronic extension (e-extension) and conventional agriculture extension service delivery systems. With the help of ICTs, an agricultural extension officer is expected to be more diversified, knowledge-resourceful to meet farmers' information needs in various subjects (agriculture, social, health, cross cutting issues etc) (Plate 1). As a response to this quest, the web-based and mobile-based Farmers Advisory Information Systems (W-FAIS & M-FAIS) were developed.



**Plate 1: Farmers from Kilolo district visited Kilosa district to learn how Ushauri Kilimo works (17-06-2015)**

W-FAIS and M-FAIS is designed to provide timely and accurate agriculture information to many farmers at low cost compared with the conventional agricultural extension services. W-FAIS and M-FAIS is a web-and mobile-based application which enables farmers to submit questions and inquiries to the system by sending messages via their mobile phones or web. The question from the farmer is immediately sent using either SMS or web form to a competent subject matter specialist. A SMS can immediately reply to the question and the answer is sent back to the farmer through FAIS. The system also keeps record of all questions asked and their answers. FAIS allows the farmer to get a timely answer on agricultural and marketing information at any time of the day from extension officers. FAIS also supports automatic secure storage of the exchanged information between farmers and extension officers.

### Research Methodology

The research study area was in Kilosa District located in Morogoro Region in Tanzania. The participatory action research approach was used in which problems on poor delivery of extension services were thoroughly studied to see how best the ICTs can be utilized to solve them. Also a baseline survey was conducted to understand the attitudes of the community in relation to the use of ICTs in agriculture.

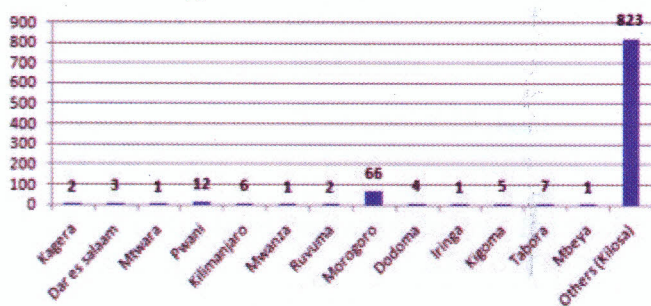
### Findings

Analysis of questions answered shows that farmers submitted questions in the following areas :-

- i. Crop husbandry (annual & food crops)
- ii. Livestock
- iii. Climate change issues
- iv. Tree farming
- v. Aquacultures and
- vi. Markets and market information

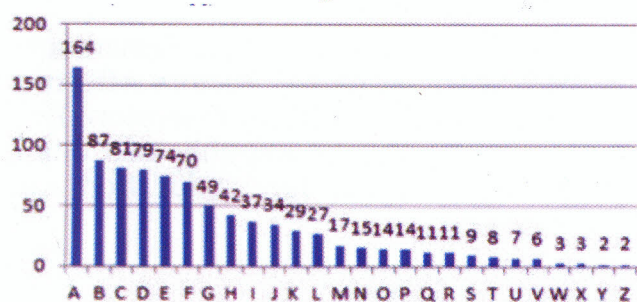
Further, it was found that the pattern of farmers who specified their locations in their SMS shows that they called from different parts of Tanzania (Table 2):

**Table 2: Number of SMS sent to Ushaurikilimo Vs Region**

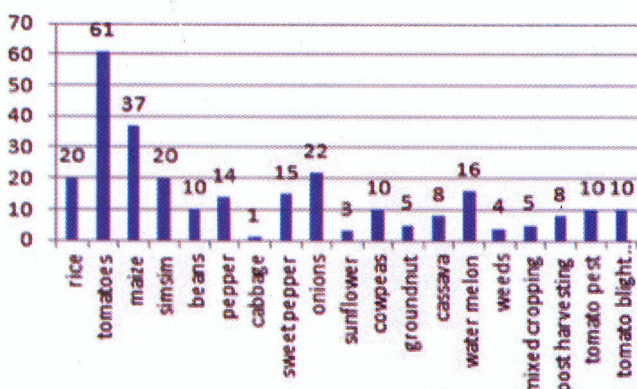


The average number of questions per farmer was 2.26 questions where 1289 questions were asked by 571 farmers. Out of these, only 895 had been answered by the extension officers, and the average number of questions answered per extension officer was 33.15 (Table 3).

**Table 3: Number of questions answered Vs**

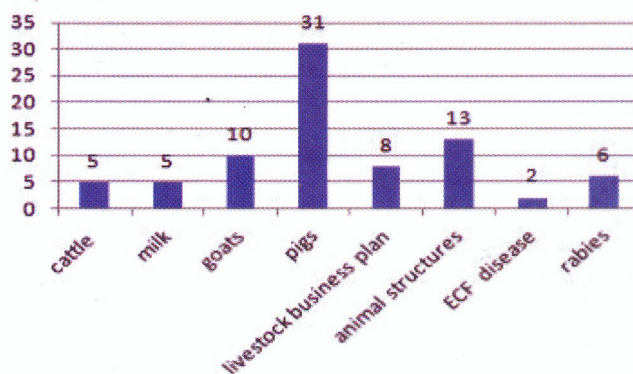


Analysis of questions answered shows that 279 questions asked were in crop husbandry (annual and food crops). The number of SMS sent to Ushauri Kilimo for different types of crops is as shown in Table 4 below, of which 61% were in tomatoes.



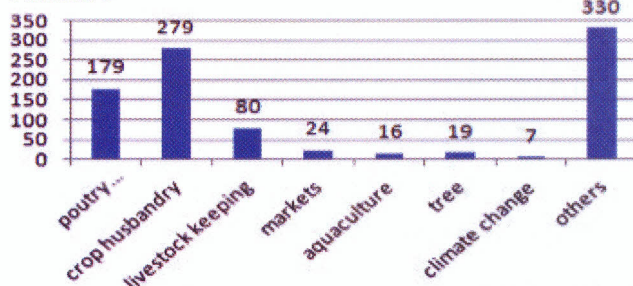
Also, there were 80 SMS submitted by farmers asking questions on issues about livestock husbandry (Table 5).

**Table 5: Number of SMS vs Types of livestock**



In summary, the types of questions asked for 934 SMS are depicted in Table 6. However, most SMS contained multiple issues making it difficult to categorize them.

**Table 6: Number of SMS vs Issues in agriculture**



## Conclusion

The study findings show that access to appropriate information and techniques on time is more critical for the smallholder farmers. Piloted W-FAIS and M-FAIS proved that mobile phones use has direct impact for enhancing agricultural productivity and farmers' livelihoods. Also, the project has improved work efficiency of the extension officers through provision of information to farming communities on time. The best extension officer answered 87 questions apart from his/her daily face-to-face visits to farmers in a village. The average response time after the question had been assigned to an expert to answer was 32.49 hours. The system has been re-engineered to improve the average response time and hence in April 2016 it was reduced to 17.8 hours. Furthermore, W-FAIS and M-FAIS has linked major actors in the agricultural sector such as farmers, transporters, traders, input suppliers, extension officers, researchers and policy makers.

## Policy Recommendations

The findings from this research necessitate the establishment of national framework for validation of agriculture knowledge information system. The proposed framework or innovative platform would enable the extension system to be linked and function as one rather than as a stand-alone isolated platform without clear guidelines and coordination. To achieve this, the following are recommended.

### i. Include e-Agric-Extension in the National Policy

The National ICT Policy of 2003 does not explicitly cover ICTs in agriculture. Hence, there is for MAFCs to have an e-Agriculture issues in the policy, with emphasis on agricultural extension service delivery supported by ICTs.

### ii. Capacity building in ICTs for agriculture

MAFC through the Agriculture Sector Development Strategies (ASDS) Programme should allocate funds to local government authorities for ICTs training, and scaling up.

### iii. Strengthening ICTs for agriculture

The LGAs should invest in ICTs: by providing computers with Internet connection, community radio stations, mobile phones to ensure that information, knowledge, innovations and practices are appropriately sent to smallholder farmers.

### iv. Use of Communication Methods & ICTs

For effective agricultural extension service delivery, LGAs should see that agricultural extension officers use ICTs and traditional extension communication methods (farm visits, print media, Internet, social media, radio, TV) to reach many farmers with minimum efforts.

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**Annex 1: List of publications products from EPINAV Mobile Phone Project**

Type of Publication/ Communication product	Title and Authors; publisher (Full citation	Target audience
<p>Book chapter</p> <p>Journal papers</p>	<p>MOBILE PHONE PROJECT</p> <ol style="list-style-type: none"> <li>1. Sanga, C. A., Tumbo, S. D., &amp; Mlozi, M. R. (2014). System Design and ICT Adoption in Agricultural Extension Services Delivery in Tanzania. In K. Bwalya (Ed.), Technology Development and Platform Enhancements for Successful Global E-Government Design (pp. 282-306). Hershey, PA: Information Science Reference. doi:10.4018/978-1-4666-4900-2.ch015, ISBN13: 9781466649002, ISBN10: 1466649003, EISBN13: 9781466649019 <a href="http://www.igi-global.com/chapter/system-design-and-ict-adoption-in-agricultural-extension-services-delivery-in-tanzania/96701">http://www.igi-global.com/chapter/system-design-and-ict-adoption-in-agricultural-extension-services-delivery-in-tanzania/96701</a></li> <li>2. Sanga, C. , Mlozi, M.R.S., Tumbo, S.D., Mussa, M., Shetto, M.C.R., Mwamkinga, G.H. and Haug, R. (2013). On Search for Strategies to Increase the Coverage of Agricultural Extension Service: Web based Farmers' Advisory Information System. International Journal of Computing and ICT Research, Vol. 7 Issue 1, pp 42-55. <a href="http://www.ijcir.org/volume7-issue1/article5.pdf">http://www.ijcir.org/volume7-issue1/article5.pdf</a></li> <li>3. Sanga, C., Tumbo, S., Mlozi, M., &amp; Kilima, F. (2013). Stakeholders' Analysis using Value Chain Analysis: AHP in action. North American Institute of Science &amp; Information, Volume 1, Issue 2, pp. 85- 104. <a href="http://www.researchgate.net/publication/259573945_Stakeholders_Analysis_using_Value_Chain_Analysis_AHP_in_action/file/60b7d52ca995e81d96.pdf?origin=publication_detail">http://www.researchgate.net/publication/259573945 Stakeholders Analysis using Value Chain Analysis AHP in action/file/60b7d52ca995e81d96.pdf?origin=publication_detail</a></li> <li>4. Sanga, C., and Buzingo, J. (2013). Factors Influencing the Adoption and Use of ICT by Small and Medium Sized Enterprises in Tanzania: A Case Study of Kilosa District, ICT for Development Working Paper Series, Volume 3, Issue 2, ISSN 2307-0099, pp.77-93. URL:<a href="http://www.ulab.edu.bd/journals/ict/WPS_V3.N2_December_2013.pdf">http://www.ulab.edu.bd/journals/ict/WPS_V3.N2_December_2013.pdf</a></li> <li>5. Sanga, C. , Mlozi, M.R.S., Tumbo, S., Mussa, M., Muhiche, L., Haug, R. (2014). On the Development of the Mobile based Agricultural Extension System in Tanzania: A technological perspective, International Journal of Computing and ICT Research (IJCIR), 8 (1), pp. 49-67. <a href="http://www.researchgate.net/publication/263859723_On_the_Development_of_the_Mobile-based_Agricultural_Extension_System_in_Tanzania_A_Technological_Perspective">http://www.researchgate.net/publication/263859723 On the Development of the Mobile-based Agricultural Extension System in Tanzania A Technological Perspective</a></li> </ol>	<p>Researchers, policy makers</p>

RESEARCH OUTPUTS DEVELOPED WITH PROJECTS OF SIMILAR (SYNERGY) RESEARCH OBJECTIVES

6. Sanga, C., Kadege, F., Nicodemus, N., and Kilima, F.T.M. (2013). Web-based System for Monitoring and Evaluation of Agricultural Projects'. Interdisciplinary Studies on Information Technology and Business (ISITB). Volume 1, Issue 1, North American Institute of Science & Information, pp. 17- 43. <http://www.naisit.org/journal/paper/id/47>
7. Sanga, C., Kalungwizi, V., and Msuya, C. (2014). Bridging Gender Gaps in Provision of Agricultural Extension Service using ICT: Experiences from SUA FVR project in Tanzania, International Journal of ICT Research and Development in Africa (IJICTRDA), 4 (1), 1- 19. URL: <http://dl.acm.org/citation.cfm?id=2670414>
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OTHER RELATED OUTPUTS ON INNOVATIVE COMMUNICATION PATHWAYS DONE BY STUDENTS & STAFF ATTACHED TO OUR RESEARCH GROUP

9. Sanga, C., and Buzingo, J. (2013). Factors Influencing the Adoption and Use of ICT by Small and Medium Sized Enterprises in Tanzania: A Case Study of Kilosa District, ICT for Development Working Paper Series, Volume 3, Issue 2, ISSN 2307- 0099, pp.77-93. URL: [http://www.researchgate.net/publication/260700543\\_Factors\\_Influencing\\_the\\_Adoption\\_and\\_Use\\_of\\_ICT\\_by\\_Small\\_and\\_Medium\\_Sized\\_Enterprises\\_in\\_Tanzania\\_A\\_Case\\_Study\\_of\\_Kilosa\\_District](http://www.researchgate.net/publication/260700543_Factors_Influencing_the_Adoption_and_Use_of_ICT_by_Small_and_Medium_Sized_Enterprises_in_Tanzania_A_Case_Study_of_Kilosa_District)
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11. Kipanyula, M. J., Geoffrey, A. M., Fue, K. G., Mlozi, M. R., Tumbo, S. D., Haug, R., & Sanga, C. A. (2016). Web and Mobile Phone Based Rabies Surveillance System for Humans and Animals in Kilosa District, Tanzania. *International Journal of Information Communication Technologies and Human Development (IJICTHD)*, 8(2), 47-59. doi:10.4018/IJICTHD.2016040104

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Morogoro

16. Fue, K. G., Tumbo, S.D., & Sanga, C.A. (2015). Experts' Assignment Algorithm for Cloud-based Agro-advisory Service Information System (CASIS) using Weighted Sum Model: Piloting CASIS. *Beyond Connectivity: The Road to NREN Maturity, UbuntuNet-Connect 2015, 19-20 November 2015, (1-8)*, Maputo, Mozambique, URL: <https://www.ubuntunet.net/sites/default/files/Fue.pdf>

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15. Mlozi, M.R.S., Sanga, C., Tumbo, S., Shetto, M.C. and Mwamkinga, G.H. (2012). The Role of Mobile Phones Towards Improving Coverage of Agricultural Extension Services: Preliminary Findings from Kilosa District, Tanzania, 1st EPINAV Annual Scientific Conference, 17 - 18 December 2012 Hilux

Factsheet	On the role of mobile phones towards improving coverage of agricultural extension: Maize value chain in Kilosa District Status of ICT and utilization for agriculture. URL: <a href="http://www.umb.no/statisk/noragric/EPINAV/mloziepinavmlozifactsheetdec2012revaug13sangajbh.pdf">http://www.umb.no/statisk/noragric/EPINAV/mloziepinavmlozifactsheetdec2012revaug13sangajbh.pdf</a>	policy makers
10 Radio promos (jingles)	The maize contents uploaded on W-FAIS and M-FAIS has been aired in Kilosa community radio from November 2013 up to December 2014. The aim was to validate the type of SMS which farmers can send to the system. URL: <a href="http://ushaurikilimo.org/faq2.php">http://ushaurikilimo.org/faq2.php</a>	all maize value chain actors in Kilosa, Tanzania
Facebook page	177 subscribed to our project facebook page to get updates of activities of mobile phone project- URL: <a href="https://www.facebook.com/Ict4AgriculturalExtensionServices/">https://www.facebook.com/Ict4AgriculturalExtensionServices/</a> Project story - <a href="http://www.suanet.ac.tz/epinav/docs/mobilephone.pdf">http://www.suanet.ac.tz/epinav/docs/mobilephone.pdf</a> Project in newspaper - <a href="http://www.thecitizen.co.tz/News/Extension-services-set-to-go-mobile/-/1840340/2229632/-/6ps83h/-/index.html">http://www.thecitizen.co.tz/News/Extension-services-set-to-go-mobile/-/1840340/2229632/-/6ps83h/-/index.html</a>	General public
Copyright policy for more than 900 agro- advisory information and knowledge present on SUA Ushaurikilimo	<a href="http://ushaurikilimo.org/Copyright Policy 2013 2016.pdf">http://ushaurikilimo.org/Copyright Policy 2013 2016.pdf</a>	General public

#### Acknowledgement

The authors acknowledge the financial support of The Royal Norwegian Embassy in Dar es Salaam through the EPINAV Collaboration Programme, between Sokoine University of Agriculture and The Norwegian University of Life Sciences.

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#### Disclaimer:

The views expressed in this brief are those of the authors and do not necessarily represent those of SUA or sponsors of the EPINAV Programme

For more information on Mobile Phone project:

A web-based Farmers' Advisory Information System (W-FAIS): visit, <http://ushaurikilimo.org/farmerlogi-nok.php?fname=1>

A mobile-based Farmers' Advisory Information System (M-FAIS): visit, <http://ushaurikilimo.org/maswali-majibu.php>

