Innovative "Swahili based Agricultural Apps" Underutilized new Way of Reaching Farmers and Disseminating Information in Tanzania

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Abstract

Agricultural professionals are constantly in the search of innovative ways to engage farmers and timely dissemination of information. Smartphone application is one of the popular avenues used in some countries, to engage farmers and disseminate information. This study was conducted to assess the use of Swahili based agricultural apps in Tanzania. Virtual product snowball sampling was used to identify Swahili based agricultural apps in android Google Play Store for sixty days i.e. November to December 2020. The findings show that at least 23 Swahili based agricultural apps were available in android Google Play. The oldest of identified apps was released on 2017, which suggest that the use of customised apps to reach farmers is a new phenomenon in Tanzania. Content of the identified apps show that three apps (13%) provide exclusively information on poultry farming; others have general information on crops and livestock. The content on fisheries and aquaculture is notably meagre in the existing livestock apps. Most (83.2%) of the apps had less than 10,000 downloads and only one app has reached 100,000. The users' opinions are skewed to positive. Taking into account the number of farmers and adoption rate of internet based smart phones in Tanzania, downloads figures suggest that existing apps are under-utilised. The study concludes that the use of Swahili based agricultural apps is a new practice at the early stage of adoption, which should be harnessed for timely and fruitful engagement with farmers and transformation of extension services in Tanzania.

Keywords: Apps, Smartphone apps, Agriculture, Agricultural technologies

Introduction

Agricultural professionals are constantly in the search of innovative ways to engage farmers and timely disseminate information on weather forecasting, crop production, disease and pest management, postharvest storage and marketing (Barh and Balakrishnan, 2018a). Advancement of Information and Communication Technologies (ICTs) has transformed farmers engagement system and how extension and advisory services are delivered (Khan *et al.,* 2019). Smartphone is one of ICT tools promoted to tackle the drawbacks of traditional agricultural extension and advisory services (Emeana, Trenchard and Dehnen-schmutz, 2020). The use of smartphone applications in agriculture is becoming popular among farmers in the developing countries as in developed ones (Sharma and Kiranmayi, 2019). Smartphone applications, usually referred as apps have made it possible for farmers to access various agricultural information and advisory services in some countries (Mahapatra, 2020; Naika *et al.,* 2021). Smartphone apps are moving agriculture to the next level by facilitating the availability and accessibility of vital information in a real time (Saiz-Rubio and Rovira-Más, 2020). According to Kusyama *et al.,* (2020) apps are cost-effective and provide real time information to farmers. The apps are reported to be the best means of engaging and disseminating agricultural information to farmers' because of its interactive nature, easiness to user and acceptance among lay

public (Kandagor, Githeko and Opiyo, 2018).

Studies on the use of apps to disseminate agricultural information show countries with high adoption rate to be United States of America (USA), Brazil, and India (Barbosa *et al.,* 2020). Apps are customized to disseminate specific and/or general agricultural information (Barh and Balakrishnan, 2018b). The diversity and availability of apps helped Bangladesh farmers to access all kind of information on their fingertips (Sadekur-Rahman *et al.,* 2020). Mandi and Patnaik (2019) found out that Indian farmers use smart phone apps to get most up-to-date agricultural information. The use of apps is promoted in Africa to stabilise irregularities of delivering agricultural information to the farmers in need (Samuel, 2018).

In Tanzania farmers call for friendly communication systems to help them access agricultural information in real time (Misaki *et al.,* 2019). Nyamba (2017) publicized early use of mobile phones apps among farmers in Tanzania. The accounts which was affirmed by (Karimuribo *et al.,* 2017). Previously, Karimuribo *et al.* (2016) documented the use of smartphone apps and encourged application of digital technologies to improve animals health service deliverly through inclusive disease survellance. Tumbo *et al.* (2018) unveil the use apps among Tanzania farmers seeking agricultural information related to climate change adaptation. Studies on Tanzania have not identified suitable and easily reached apps for Tanzania farmers. Therefore, the study on which the paper is based was conducted to establish the existing and use of "Swahili based agricultural apps" in Tanzania.

Methods

Useful Keywords Research and Analysis Approaches as described by Joshi and Motwani (2006) were adopted in this study to search for Swahili based agricultural apps in Android Google Play Store. Virtual Product Snowball Sampling is a non-probabilistic sampling method that was used to increase the sample size in this study. The method permits the search of Apps in Android Google Play Store and websites of respective products (Baltar and Brunet, 2012). It allowed one app to lead to the other. Only apps

that have agricultural content in Swahili were recorded. Initially, the two researchers worked independently to review the identified apps and later worked together to compare notes and validate the list of apps. It was noted that google provide information on approximation basis and not exact number of app downloads.

The study focused on Android operating because of its dominance in Tanzania mobile phone market and among users across the globe (Chmielarz, 2020). The used keywords were Kiswahili terms, the language used by majority of Tanzanian farmers besides their tribal languages. Consequently, the suitable apps are expected to have its content in Kiswahili. The searched short-tail keywords are: *Kilimo* (agriculture), *Ufugaji* (livestock keeping), *Kilimo cha Kisasa* (modern farming), *mkulima* (a farmer), *wakulima* (farmers), *bustani* (garden), mboga mboga (vegetables), *kilimo biashara* (commercial agriculture).

The data was collected for sixty days period, November to December 2020. The study investigated only free version apps (apps which allow free to download and use) because the free version apps have high rate of adaptability and download also, apps users prefer free version app over paid version app (Arora *et al.,* 2017).

Results

The study identified twenty three (23) Swahili based agricultural apps in Play Store for android operating Smartphone. All identified apps were freely available for download and use. Twenty (87%) apps have general information in farming and animal husbandry, 3(13%) are specific for poultry farming. The status of the identified apps in terms of content/information, date of release and number of downloads is detailed beneath each app.

i.   Kilimo na Ufugaji Bora

This app provides information and manuals to guide farmers on crop and animal husbandry. The manuals aims at helping farmers effectively manage pest and diseases and learn modern farming practices. It was released on 05/02/2017 by Technology Tza. This was the most downloaded Swahili based agricultural app with over 100,000 downloads. One of the reviewers

commented that "This app is very important to farmers as it gives detailed information about farming, we are grateful".

ii. Kilimo Biashara

The app provides information in agricultural business. It intends to equip farmers with skills on food processing, animal keeping and horticulture crop farming. It was released on 13/09/2019 by Mshindo Media. Ten thousands (10,000) users have downloaded the app for the period of one year. Based on users' feedbacks, the app is considered to be "excellent" and "easy to access"

iii. Kilimo Taarifa

This app provides platform for farmers, extension staff, researchers, retailers, advisors, aggregators, processors and distributors to interact. The information is categorised as business crops, food crops and wild crops, and oil crops. The app was released on 19/06/2018 by Fahamu Tech. In the period of two years, about 1,000 users have downloaded the app. The app reviewers' commented that *"inanisaidia kuamua jinsi ya kulima"* and "a very useful app for Tanzanian farmers".

iv. Kilimo Smart

The app covers information on pest and diseases management, agrochemicals, farming and animal husbandry, market and agricultural news, with the aim of improving farmers' productivity through good agricultural practices and encourages the adoption of conventional agriculture. Kilimo Smart incorporated company released the app on 23/08/2018. It has attracted over 1,000 downloads in two year time. One of the reviewers commented that "Very special app. I like it. I get to learn much of agriculture" as the other collaborated with a five star rating "this app is helpful to me love it, my five star are fairly given to you"

v. Kilimo Tanzania

This app offers information on farming, animal husbandry, agricultural technologies, and entrepreneurship. It was the first app released on 13/07/2018 by Mshindo Media, it has 5,000+ downloads. The users' feedback signifies the app is of good quality. One user applauded the app saying "Good app ever seen before, thanks so much".

vi. Kangeta Kilimo

The app has information on agricultural technology, inputs, market, pest and weeds management, and provides guidance to the farmers from planting to harvest. Kangeta Kilimo released the app on 27/05/2019. One thousand (1,000+) users have downloads the app in a period of over one year. The reviewers viewed the app very useful and helping farmers to solve their information problems. One of the users endorsed this app as the most useful to farmers *"Wakulima kweli tumepata mkombozi kupitia hii app nimeipenda sana ni utatuzi wa changamoto zetu vitu kama mbolea mbegu bora dawa na utaalam wakilimo mbalimbali pia miche. Nimevutiwa na app hii kuwa inaweza kukumbusha kupiga dawa na kuweka mbolea hongera sana kageta kilimo kwa kazi nzuri. kwel kilimo na utandawazi".*

vii. Kilimo cha Kisasa (Jifunze kilimo Kwa Kiswahili)

Jifunze Kilimo Kwa Kiswahili literally means learn agriculture in Swahili is the main goal of *Kilimo cha Kisasa* app. App users obtain information on conventional agriculture. Farmers can get free guide on proper use of fertilizer, greenhouse technology and horticulture cropping. Mzansi incorporated company released this app on 06/06/2018 and has attracted 5,000+ downloads. Users commend this app.

viii. Kilimo Bora

The app aims at helping farmers to improve their living standard through agriculture. It provides information on agricultural technologies, production, processing and entrepreneurship. This was the latest app Mshindo Media series released on 11/11/2020. One hundred (100+) users have downloaded *Kilimo Bora* app in a month time. Users have not reviewed this app.

ix. Kilimo na Ufugaji

DAC Tech developed this app to provide

agricultural education on breeding, employment opportunities and economic growth. Users have a platform to discuss different issues on agriculture. The app has attracted 1,000+ downloads since its release on 08/02/2019. The feedbacks from app users give credit to the developer. For example, one user commented that "this app can help you to grow in self-employment, it is like home banking, thank you "as the other collaborated that "this good for me".

x.   Kilimo na Mifugo

The app was released on 03/10/2018 by Chegula to providing farmers with information and knowledge on poultry farming, livestock diseases detection and management and general information on crop production. The app has attracted 500+downloads and no review for the period of two years. No user has reviewed the app.

xi.   Kilimo Bora na Ufugaji-Jifunze Kilimo cha Kisasa

The app provides information and guiding manuals on crop and animal farming. The manuals on sun flowers, sugarcane, hot pepper, bee and fish farming are available. This app was released on 26/06/2018 by H.b.r Inc., and has 5,000+ downloads. Users have commended the app for farmers.

xii.   Mkulima Mbunifu

Mshindo Media released this app on 21/08/2020, which had 100+ in December 2020. The app has information packed in text and video clips to train farmers on entrepreneurship, proper use of fertilizer, and processing. No review was recorded for the period of three months.

xiii. Ongeza Mkulima

Ongeza Tanzania released an app for their registered farmers on 10/15/2020. Ten (10+) users had downloaded the app by the end of December 2020. No review was recorded for the period of two months.

xiv. Ufugaji Bora-Mafunzo ya Ufugaji na Matibabu

The app was released on 09/06/2020 by Mshindo Media to provide animal and veterinary advisory services to farmers. The app focuses on animal husbandry and management of pests and diseases. It has 1,000+ downloads, and reviewers consider the app to be useful.

xv.   Ufugaji Bora

The app promotes the farming of indigenous chicken; and provides general information on animal husbandry. It was released on 14/05/2017 by Technology Tza and has 10,000+ downloads. The app users commented that "this app is real important for our country "and "it is good, I like it".

xvi. Ufugaji Bora-Fuga kitaalamu

The app focuses on animal keeping. It provides information on poultry production, breeding and rearing of dairy goat and cattle sheep; pigs and fish farming. The app contains information on production and diseases management. It was released on 11/09/2020 by Chegula and has 1,000+ downloads in December 2020. Users' comments were positive, for example one user commented that "great app for agriculture. I like it" and other said "it is a good app for modern agriculture".

xvii. Ufugaji Bora-Mafunzo ya Ufugaji na Matibabu

The app developed to provide training for farmers on animal production and disease prevention and management. It was released on 10/05/2019 by Afrotech Studios and has 10,000+ downloads. The app is applauded by users, as one wrote that "the app is much educative I like to learn how to keep chicken "and the other said "very nice app".

xviii. Ufugaji

Ufugaji app promotes commercial animal farming. Similar to Ufugaji bora- Fuga kitaamu app, it provides information on poultry production, breeding and rearing of dairy goat and cattle sheep; pigs and fish farming. The app was released on 26/03/2018 by Chegula and has 1,000+ downloads. Users have commended the

app.

xix. Ufugaji na Matibabu and Veterinary Care

Mshindo Media released this app on 23/05/2020 and 10,000+ users downloaded it in a period of seven months. The app is exceptional for providing information on animal production and veterinary services.

xx. Fuga Kibiashara-Mafunzo ya Ufugaji na Matibabu

Mshindo Media released this app on 26/08/2019, 1,000+ users have downloaded it. The app offer training on commercial animal farming.

xxi. Ufugaji wa Kuku Kitaalamu

This app provides information on poultry farming. People interested in poultry farming are guided on how to start and manage the farm, also, it offer market information to farmers. The app was released on 22/07/2020 by Mshindo Media and has 1,000+ downloads. Users have not provided feedback on this app.

xxii. Kuku Kalenda-Aquinus

This app is optionally good as it provides platform for farmers and veterinary officers to directly interact virtually. A farmer can contact a veterinarian with this app and get advice. The app also provides information on different chickens breed, market and packages. NdomskKey Technologies released this app on 13/08/2019 and has 1,000+ downloads. Users have commended this app.

xxiii. Kuku ni Biashara

The app provides information on commercial production of chicken. The user can pose a question through the app and receive veterinarian advice from the app or social media such as Facebook, YouTube, Instagram, and WhatsApp group. Mshindo Media released this app on 27/07/2020 and has 500+ downloads. No review was recorded on this app.

Discussion

The first Swahili based app was released on 05/02/2017, but only 100,000+ people have downloaded it. This hints early initiatives of exploring the use of customized apps to serve Tanzania farmers. The findings from Kusyama *et al.* (2020) reaveled that main sources of agricultural information to Tanzania farmers are radio, television and extention officers, which enlight why small number downloads over five years. Studies elsewhere suggest farmers are not aware of agricultural apps (Sadekur-Rahman *et al.,* 2020), and so low download and usage. Most (87%) Swahili based agriculture apps disseminate crop and animal farming information, which reflects the nature of farming system in Tanzania. The provision of general information could be contributing factors for unpopularity of the apps. However, few (13%) agricultural Swahili based apps disseminate specific information, which was one poultry farming. Elsewhere, Mandi and Patnaik (2019) identified various apps disseminating information about specific crops such as rice, groundnut and pomegranate, the specificity of the app increases its adoptability and attracts more users suggesting future apps developers may need to focus in specific crop or animal (Tamil and Balasubramaniam, 2019). Also, Kumar and Karthikeyan (2019) argues that the farmers need information that is accurate, brief, timely and trustworthy. The app with specific information and advisory services would interest farmers (National Institute of Agricultural Extension Management, 2017). However, the scope of specificity is questionable as other studies suggest that agricultural apps should help farmer get solution to all of information needs in a single platform (Mahapatra, 2020).

The use of smartphone apps to disseminate agricultural information was projected to help farmers improve production in 2017 (Nicholas-Ere, 2017). Tanzania was not left behind; Swahili based agricultural apps were developed from 2017 at increased release rate, as only two apps were developed and released in 2017 compared to five apps in 2020. However, the practice of customising apps in Swahili language is still an immature stage. According to Barh and Balakrishnan (2018b) the mature stage will be attained when the use of apps will boost agricultural sector in term of information availability. Gao *et al.* (2020) collaborated that this innovative agricultural technology

has the significant impact on dissemination of agricultural information to farmers.

Swahili based agriculture apps are still lacking in key sub-sectors. For example, this study did not find an app specific for fish farming. Elsewhere, Sharma identified 124 apps related to fishing sector. Similar to other sub-sector, underutilization of this technology has negative impact because of the potential to address many of the shortcoming in dissemination of information (Bradley *et al.,* 2019; Kusyama *et al.,* 2020).

Conclusion

The paper concludes that the use of Swahili based agricultural apps is a new practice, which should be harnessed for timely and fruitful engagement with farmers and transformation of extension services in Tanzania. Evidence proves that suitable smartphone apps are cost efficient and can provide real time information and advisory services to farmers. Therefore, there is need to develop more specialized Swahili based agricultural apps for the purpose of addressing shortcoming in dissemination of agricultural information and reaching out farmers.

Acknowledgments

References

Arora, S., Hofstede, F. ter and Mahajan, V. (2017). The implications of offering free versions for the performance of paid mobile apps. *Journal of Marketing,* [online] 81(6), pp.62–78. Available at: <https://journals.sagepub.com/doi/abs/10.1509/jm.15.0205> [Accessed 23 Oct. 2021].

Baltar, F. and Brunet, I. (2012). Social research 2.0: virtual snowball sampling method using Facebook. Internet Research. 22(1), pp.57–74.

Barbosa, J.Z., Prior, S.A., Pedreira, G.Q., Motta, A.C.V., Poggere, G.C. and Goularte, G.D. (2020). Global trends in apps for agriculture. *Multi-Science Journal,* 3(1), p.16.

Barh, A. and Balakrishnan (2018a). Smart phone applications: Role in agri-information dissemination. Agricultural Reviews, 39(1), pp.82–83.

Barh, A. and Balakrishnan (2018b). Smart phone applications: Role in agri-information dissemination. Agricultural Reviews, 38(01).

Bradley, D., Merrifield, M., Miller, K.M., Lomonico, S., Wilson, J.R. and Gleason, M.G. (2019). Opportunities to improve fisheries management through innovative technology and advanced data systems. Fish and Fisheries, 20(3), pp.564–583.

Chmielarz, W. (2020). The Usage of Smartphone and Mobile Applications from the Point of View of Customers in Poland. Information.

Emeana, E.M., Trenchard, L. and Dehnen-schmutz, K. (2020). The Revolution of Mobile Phone-Enabled Services for Agricultural Development (m-Agri Services) in Africa: The Challenges for Sustainability. Sustainability, 12(485).

Gao, Y., Zhao, D., Yu, L. and Yang, H. (2020). Influence of a new agricultural technology extension mode on farmers' technology adoption behavior in China. *Journal of Rural Studies,* [online] 76(March), pp.173–183. Available at: <https://doi.org/10.1016/j.jrurstud.2020.04.016>.

Joshi, A. and Motwani, R. (2006). Keyword generation for search engine advertising. Proceedings - IEEE International Conference on Data Mining, ICDM, pp.490–494.

Kandagor, J.C., Githeko, J.M. and Opiyo, A.M. (2018). Usability attributes influencing the adoption and use of mobile apps for dissemination of agricultural information. *International Journal of Agricultural Extension,* 6(1), pp.33–41.

Karimuribo, E.D., Batamuzi, E.K., Massawe, L.B., Silayo, R.S., Mgongo, F.O.K., Kimbita, E. and Wambura, R.M. (2016). Potential use of mobile phones in improving animal health service delivery in underserved rural areas: experience from Kilosa and Gairo districts in Tanzania. BMC Veterinary Research, [online] pp.1–6. Available at: <http://dx.doi.org/10.1186/s12917-016-0860-z>.

Karimuribo, E.D., Mangesho, P.E., Neselle,

M.O., Mlangwa, J.E., Queenan, K., Mboera, L.E.G., Rushton, J., Kock, R., Häsler, B., Kiwara, A. and Rweyemamu, M. (2017). Exploring local knowledge and perceptions on zoonoses among pastoralists in northern and eastern Tanzania. PLoS Neglected Tropical Diseases, 11(2).

Khan, N.A., Qijie, G., Ali, S., Shahbaz, B. and Shah, A.A. (2019). Farmers' use of mobile phone for accessing agricultural information in Pakistan: A case of Punjab province. Ciencia Rural, 49(10), pp.1–12.

Kumar, S.A. and Karthikeyan, C. (2019. Status of Mobile Agricultural Apps in the Global Mobile Ecosystem. *International Journal of Education and Development using Information and Communication Technology,* 15(3), pp.63–74.

Kusyama, S.L., Machuve, D., Kisangiri, M., Mfanga, A.A. (2020). Analysis of effectiveness of channels for information gathering and dissemination: Case of fisheries stakeholders in Mwanza and Mara regions of Tanzania. *African Journal of Science, Technology, Innovation and Development,* pp.1–6.

Mahapatra, S.K. (2020). Smartphone Apps for Agri-information dissemination during Covid19 lockdown. Biotica Research Today, 2(5), pp.116–119.

Mandi, K. and Patnaik, N.M. (2019). Mobile apps in agriculture and allied sector : An extended arm for farmers. Agriculture Update, 14(4), pp.334–342.

Misaki, E. Apiola, M. Gaiani, S. (2019). Developing a Communication Application System for Chamwino Small-Scale Farmers in Tanzania: A Participatory Design Research, 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatij. [online] BioMed Central Ltd. Available at: <http://www.ijbnpa.org/content/8/1/63>.

Naika, M.B., Kudari, M., Devi, M.S., Sadhu, D. S., Sunagar, S. (2021). Digital extension service: quick way to deliver agricultural information to the farmers. In Food Technology Disruptions. Academic Press, pp.285–323.

National Institute of Agricultural Extension Management, (2017). Mobile Apps Empowering Farmers. Extention Digest, 1(2).

Nicholas-Ere, O. (2017). Dissemination of Agricultural Information to Farmers using ICT. *International Journal of Computer Applications,* 179(7), pp.27–31.

Sadekur Rahman, M., Enamul Haque, M. and Safiul Islam Afrad, M. (2020). Utility of Mobile Phone Usage in Agricultural Information Dissemination in Bangladesh. *East African Scholars Journal of Agriculture and Life Sciences,* [online] 3(6). Available at: <http://www.easpublisher. com/easjals/>.

Saiz-Rubio, V. and Rovira-Más, F. (2020). From Smart Farming towards Agriculture 5.0: A Review on Crop Data Management. Agronomy.

Samuel, M. (2018). Mobile Phone Use by Zimbabwean Smallholder Farmers: A Baseline Study. *The African Journal of Information and Communication,* (22), pp.29–52.

Sharma, A. and Kiranmayi, D. (2019). Virtual fisheries through mobile apps : The way forward Virtual fisheries through mobile apps : The way forward. *Journal of Entomology and Zoology Studies,* 7(6), pp.1093–1099.

Tamil, T. and Balasubramaniam, P. (2019). The Usage of Mobile Apps in Agriculture. International Journal of Agricultural Science and Research, [online] 9(4), pp.221–228. Available at: <www.tjprc.org> [Accessed 23 Oct. 2021].

Tumbo, S.D., Mwalukasa, N., Fue, K.G., Mlozi, M.R.S., Haug, R. and Sanga, C.A. (2018). Exploring information seeking behavior of farmers' in information related to climate change adaptation through ICT (CHAI). International Review of Research in Open and Distance Learning, 19(3), pp.299–319.