Towards a Sustainable Horticultural Value Chain among Smallholder farmers in Kenya: Unlocking the Potential of Mobile Telephony

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Abstract

Sustainable agriculture is fast emerging as a paradigm that seeks to ensure that farming is done in a manner that meets today's society's food needs while taking cognizance of future generation's needs. The Big Four Agenda clearly underscores the need for food security for all Kenyans. This paper explores the potential contributions that mobile phone services can make towards sustenance of the horticultural value chain among smallholder horticultural farmers. The paper outlines findings from an external online desk review of studies that have attempted to analyze the role of ICT functionality in agriculture and particularly from a smallholder farmer perspective. Studies were sourced on-line under the criteria that they focused on the agricultural value chain, and were carried out from the year 2010 to date. From the reviews, the paper concludes that mobile telephone usage is fast penetrating the agricultural industry, and provides potential for improving the horticultural value chain. Among the potential benefits that could accrue from mobile usage includes; creation and capture of value across the chain, access to agricultural information, improved efficiency in the value chain, and enhanced access to markets. However, relying on the secondary data approach alone makes the findings to be questionable in terms of authenticity and representatives. Future studies should strive to be causal in nature and should rely on primary data sources.

Keywords: Mobile telephony, sustainable horticultural value chain, smallholder farmer, horticultural produce

INTRODUCTION

Food security is one of the components of the "Big-Four Agenda" that was mooted by His Excellency the president of the Republic of Kenya Hon. Uhuru Muigai Kenyatta, in response to the desire for dignity, enough food and lower cost of living among Kenyans (Budget watch, 2018/19). Realization of food security is no doubt indebted to the agricultural sector which has been and remains critical to Kenya's economy (Ongeri, 2014). The horticultural sub-sector has emerged as a major component of the agricultural sector contributing up to 36 percent to the agricultural GDP (Research Solutions Africa, 2015). According to Research Solutions Africa, the horticultural sub-sector is not only a leading foreign exchange earner, but also contributes significantly to household income and food security among farmers who practice some form of horticultural production.

In Kenya, horticultural products are mainly in the form of flowers, vegetables, fruits, root crops, spices and herbs. Smallholder farmers are responsible for the bulk of horticultural produce, and account for between 50 and 60% of total production (Ongeri, 2014). Production of vegetables is particularly seen to be central to the improvement of livelihood and attainment of food security among smallholder farmers. Among the major vegetables produced are; kales, cabbages, spinach,

tomatoes, carrots, snow peas, broccoli and Asian vegetables. Most if not all of these vegetables are perishable in the sense that they have a short life span and, require processing or consuming within a short time of production. This presents a major challenge to small holder farmers who have to offload them in haste.

Indeed, smallholder farming has been noted to pose logistical challenges owing to the fragmentation of production into small individual units (Kinyua, 2012). Moreover, the rural locality of smallholder farms means that they are typically far from the main rural road network. This coupled with the perishable nature of the produce and the fragile rural transport infrastructure that needs frequent maintenance due to heavy rainfall, brings into question sustainability of the horticultural value chain among this category of farmers. The value chain that characterizes smallholder horticultural farmers is typically broken into four major segments.

The first segment of the smallholder horticultural value chain as delineated by KENDAT (2015), relates to 'farm to primary collection point. This segment links the farm to a point from where the produce is picked. It links independent smallholder farmers with rural assemblers and purchasing agents. It is characterized by unclassified network of tracks which link the farms to the rural road networks motorized transport is notably scarce and operates with a lot of difficulty particularly in the rainy season.

The second segment relates to the linkage between rural assemblers and purchasing agents with rural-urban wholesalers and brokers. It is an intermediate transport stage which is characterized by movement of the produce from collection points to storage depots or to secondary markets. According to KENDAT, transport in this stage is mainly achieved on classified rural / district roads. The third stage links rural brokers to rural retailers on one side, and rural assembling and purchasing agents with rural retailers on the other. The fourth segment links rural retailers with rural, urban and international consumers in some cases. It involves transportation of the produce to terminal destinations which consist of national and international markets. Transport logistics in this stage is more advanced and is conducted along national roads, air and water and uses high capacity vehicles and vessels.

Objective of the Study

The key objective of this study is to explore the potential possessed by mobile telephony in the sustenance of the horticultural value chain among smallholder farmers in Kenya. Currently there are three main mobile service providers in Kenya, Safaricom, Airtel and Orange. In their competition for customers, these providers have customized services such as mobile financial services and information platforms, which can be exploited to address the various logistics problems that stallholder farmers in the horticulture sub-sector experience.

More precisely, the study explores potential benefits that may accrue to smallholder horticultural farmers when they exploit the financial and information services offered by the mobile phone providers. Moreover, the study examines the potential of mobile telephone to open up markets and give cues of pricing for horticultural produce.

METHODOLOGY

An external online desk review was conducted on previous studies that have explored digital solutions to farming challenges such as connecting farmers to markets. Under this approach, relevant data was sourced from the incredible amount of data available online. The criteria for inclusion of studies were that; the study examines viable solutions to the value chains involving small holder farmers and the challenges they experience; that potential studies to be included in the desk review were identified through the Google search engine, and had to have been conducted from the year 2010 to date. Recurrent themes were extracted by critical examination of the study abstracts with particular emphasis on major findings and recommendations.

RESULTS

A number of potential solutions that smallholder farmers in the horticultural value chain can reap from the use of mobile phones in their farming were unearthed from the desk review. While such solutions were inexhaustible, the following were the major ones that were identified.

Creation and Capture of Value across Farmers and Value Chain Partners

The first potential benefit that could accrue from use of mobile phone technology to the horticultural value chain was identified as the end–to–end solution of horticultural farmers to access inputs like seeds, fertilizer and crop protection through m-payment services. Studies also identified SMS messages as an avenue through which farmers across the value chain can exchange agronomic advice on crop cycle and types of inputs to purchase. A desk review of studies highlighting the central role of digital solutions in creation of value was carried out and the following studies were discerned.

Moceviciute and Babcock (2016) on behalf of Technoserve assessed the impact of a commercial mobile agriculture (mAgri) solution. Observing that in the year 2012, the connected Farmer Alliance (CFA) initiated a commercial mobile agriculture (mAgri) solution in Kenya, Mozambique and Tanzania, the study by Moceviciute and Babcock (2016) sought to evaluate the impact of mAgri and to document lessons learnt at the end of the project. Key among the findings were that mAgri had a positive impact on productivity of smallholder farmers in its supply chain and that functionalities of connecting smallholder farmers through mobile technology led to efficient outcomes and in essence greater value for value chain partners. The implication of these findings is that by leveraging mobile technology smallholder horticultural farmers have the capability of partnering and adopt a holistic approach to challenges experiences in their value chain.

Surabhi and Mamta (2012) examined the contribution of mobile phones to growth of small farmers from an Indian perspective. Buoyed by the rapid growth of mobile telephony, surabhi and Mamta were keen to show how the utility of mobile phones could be tapped for smallholder farming. They established that the penetration of mobile telephone had enhanced partner collaboration across the agricultural value chain in form of knowledge and real time information sharing through SMS. The implication is that the penetration of mobile telephony in Kenya has given smallholder horticultural farmers an opportunity to share information with regards to the produce in order to forestall loses associated to their perishable products.

Musungwini (2018) conducted a baseline study on the use of mobile phones among Zimbabwean smallholder farmers. Among the findings made by Musungwini were that; asymmetry of information was a major challenge among smallholder farmers; market information was also highlighted among the challenges. Yet, the study further established that there was low usage of mobile phone in support of agricultural activities. The implication of the findings by Musungwini to the smallholder horticultural farmer is that uptake of mobile telephone in their farming could be the panacea to information asymmetry and the required market information. The mobile telephony has the potential to diversify information sources across the horticultural value chain.

Osadebamwen and Ideba (2015) analyzed smallholder farming and the use of mobile phone technology in Sub-Sahara agriculture. They were buoyed by the fact that the mobile phone has the potential to improve efficiency in the agricultural supply chain. Using quantitative data collected using multi-stage sampling; they established that use of mobile phone was increasing among young farmers who use it to form networks for information sharing. On the basis of these findings, it is apparent that smallholder horticultural farmers in rural Kenya can also form networks through mobile services such as whatapp and enhance value of information across the horticultural value chain.

Okello et al., (2010) examined the use of ICT for integration of smallholder farmers into agricultural value chain under the DrumNet Project in Kenya. Noting that DrumNet was an ICT based intervention that had achieved success in integrating smallholder farmers into a higher value chain, Okello and colleagues sought to assess the design of the project. They established that the project was designed in a way that it resolves smallholder farmer's challenges involving credit, information market failures, and insurance which in so doing enables them to address organizational failure. It is imperative to note that mobile telephony also offers an intervention that smallholder horticultural farmers can exploit to propel the horticultural value chain into the higher value agricultural chain. Just as in the case of the DrumNet project, mobile telephone could resolve challenges to credit, insurance and market information through services such as m-payment; person to person (P2P); person to Business (P2B) and loaning facilities.

Enhanced Access to Agricultural Information

Access to agricultural information among smallholder farmers was the second attribute associated with mobile telephony in reviewed studies. A number of previous studies maintained the narrative of mobile information platforms that were responsible for exchange of agricultural information pertaining to prices for inputs and produce sales; as well as on coping with climate variability.

Halewood and Surya (2012) focused on how to mobilize the agricultural value chain. They were specifically interested in examining how mobile phone services were impacting the agricultural value chain in terms of decision making for inputs, marketing and processing among others. They established that through mobile telephony, the agricultural value chain is seeing more access to agricultural information. For instance, farmers are able to access real-time information on prevailing market price, aggregate demand and value and, fluctuations that occur over time. Moreover, Halewood and Surya found out that mobile telephony has enabled real-time access to information on disease and weather variation. Consequently, they have served as systems for establishment of mitigations to potential disease and weather risks and in essence increased value of income.

The findings by Halewood and Surya (2012) with regards to access to agricultural information provide strong implications for smallholder horticultural farmers in Kenya. Access to pricing information no doubt adds value to the horticultural value chain since it blocks exploitation by middlemen, and enables smallholder partnerships to set up their preferred prices. Moreover, given that horticultural products are sensitive to diseases and climate change, information accessed in relation to potential diseases and weather changes can definitely be used to reduce farmers loses and improve income.

Olayini (2018) examined digital agriculture by analyzing the impact of mobile phones and internet on the development of agriculture in Africa. Olayini (2018) established that whereas the internet had significant negative effects on agricultural value addition, mobile phones had impacted positively on agricultural development by way of access to vital information. The implication of Olayini's findings to the horticultural value chain in Kenya is that mobile telephony is surely the way to go for smallholders if they have to inject value in the chain. However, the negative impacts of the internet should not be underestimated. Farmers stand to lose their earnings to criminals through cyber crime.

Surabhi and Mamta (2012) in their study on contribution of mobile phones to growth of small farmers in India also established that mobile telephony enabled dissemination of information which small holder farmers could leverage upon to improve their produce and earnings. They however, cautioned on quality of information, trustworthiness and timeliness. The implication drawn from these findings by Surabhi and Mamta (2012) is that, while it could be of benefit to the horticultural farmer in Kenya to leverage information dissemination accorded by mobile phones, some of the information could lead to losses. Consequently, partnerships in the horticultural value chain should look to maximize trust and buyer supplier relationships.

Rugema, Sseguya and Kibwika (2017) examined the importance of quality sharing and use of information in the value chains in the context of the rice value chain. Their study was motivated by the understanding that information connects all components, activities and operations in a value chain. They established that the quality, type and content of information shared were functions of trust and that trust required regular interactions among value chain partners. The significance of these findings in the context of the horticultural value chain among smallholder farmers in rural Kenya is that, farmers could form networks founded on regular interactions in order to nurture trust. The sensitive nature of the horticultural produce is such that the value chain must thrive on trusted partnerships and relationships.

Improved Value-Chain Efficiency through Data Visibility

The third attribute associated with use of mobile telephony in the agricultural value chain that emerged from the reviewed studies is improved data visibility in terms of improved logistics and traceability of product movement. Halewood and Surya (2012) in their study on mobilization of agricultural value chain further established that besides being a platform for improved information services, mobile phones create value by linking producers, distributors and retailers in the value chain. They found out that mobile phones have for instance, been used in Zambia and Morocco to improve transport logistics. Through P2P and SMS, farmers are able to coordinate with truckers within their localities to oversee improved transport of products and identification of markets to deliver produce. Another function of the

mobile phone that Halewood and Surya (2012) identified is the ability to trace the movement of products. Farmers are able to communicate with buyers, suppliers and transporters to know the exact situation of the products.

The findings by Halewood and Surya (2012) showing the significance of mobile phones in improving logistics and traceability of goods is indeed enough motivation for smallholder horticultural farmers in rural Kenya to turn to mobile phone use in farming. Challenges experienced in transport logistics among horticultural farmers requires that avenues are found through which transportation and safety of the rather fragile products are assured. Mobile phones are therefore critical in contacting truckers within local areas and for continuous monitoring of product movement.

In line with the logistics component, Abbas (2016) examined effects of mobile phone technology on logistics performance among clearing and forwarding firms. Abbas determined that mobile technology impacted positively on logistics performance. Despite Abbas's study not focusing on the agricultural value chain, it however has implications for the horticultural value chain. The bottom line is that use of mobile technology raises chances of streamlining transport logistic issues experienced in the chain.

Dannenberg and Lakes (2013) analyzed use of mobile phones among small scale farmers who export fruits and vegetables. Buoyed by the increasing popularity of mobile phones in society and businesses in Kenya, they established that mobile phones had potential to improve small scale farmers chance of production, marketing, payment and more importantly, competitive and seamless integration in internalized value chain. The significance of the findings by Dannenberg and Lakes (2013) is that, through mobile phones smallholder horticultural farmers have the opportunity to venture into the international markets through improved logistics.

Enhancing Access to Markets

Opening up significant additional routes to potential markets emerged as a critical contribution of mobile phones to various agricultural value chains. Minten, Reardon and Chen (as cited in Halewood & Surya 2012) for instance, found out that over 80% of farmers in Bangladesh, India, China and Vietnam owned a mobile phone which they used to connect with traders and agents to estimate market demand. In another study, Muto and Yamano (2010) found out that access to mobile network had boosted the sale of bananas by upto 19 percent in remote communities in Uganda. Moreover, Sen and Chaundhary (2011) established that a riskier (perishable) product required an understanding of real-time market dynamics made possible via mobile telephony. The implications from the findings by Muntein et al., Muto and Yamano, and Sen and Chandhary is that the use of mobile phones by smallholder horticultural farmers in Kenya has the potential to widen their access to markets, and with it improved earnings.

Chete and Fasoyiro (2014) examined the impact of mobile phone on market access among women farmers in Nigeria. Buoyed by the understanding that ICT was a novel and critical element of agricultural service delivery in Nigeria, and the fact that a symmetric information constrained women smallholder farmers' access to markets, Chete and Fasoyiro established that women farmers have adopted mobile phones for agricultural activities at a high rate, and this had increased their access to markets. The essence is that the horticultural value chain stands to engage more players and markets through mobile telephone use.

Owusu, Yankson and Frimpong (2017) assessed knowledge among male and female small holder farmers on use of mobile telephony, and its implications to the development of the agricultural market. Among the findings highlighted were that mobile phones among farmers were mainly used to access commodity prices in the market; contacting input dealers; financial institutions, and transporters; and to seek information on potential for market penetration.

DISCUSSIONS

The review highlights four critical functions that use of mobile telephones among smallholder horticultural farmers in Kenya can achieve. It emerges that there is increasing adoption of mobile telephony in the horticultural value chain. This not withstanding however, there are challenges particularly in the form of transport logistics that smallholders' horticultural farmers continue to experience. Reviewed studies show that such challenges are surmountable if mobile phones are adopted. The study establishes that mobile phones have the capability of creating value across the horticultural value chain in form of enhanced partnerships in the value chain which ultimately leads to increased outputs. These findings are consistent with those of others (e.g. Moceviciute & Bulkock, 2016; Musungwin, 2018; Surabhi & Manita, 2012).

The review further revealed that mobile phones have the capability to enhance access to agricultural information. This finding is significant to smallholder horticultural farmers considering that access to information could enable farmers to exercise their voice in the value chain, and to effectively monitor their produce. Moreover, accurate and up to date information on pricing and market dynamics is crucial for the success of the horticultural value chain in the sense that such information forms the basis for strategy formulation. Indeed, information sharing has been associated with effective strategy formulation (Elrehail et al., 2016; Nicoleta & Sonja, 2017; Rajasekar, 2014).

The study finding showing that use of mobile phone has the potential to enhance data visibility across the chain is critical in the horticultural produce transport logistics. Use of the mobile phone to trace product movement is critical in improving the value chain. Evidence shows that tracking and tracing of produce is a key element of customer service, and that, traceability leads not only to the reduction of total logistics costs, but also increases efficiency in offering new value addition services to clients (Blaszkowska, Pieriegud & Wolanski, 2007). Moreover, the finding that mobile telephony can open up new avenues for markets provides hope for smallholder horticultural farmers to diversify and venture into new markets and produce which, in the process they get opportunities to maximize income. Studies have shown that access to markets impacts positively on among other positives, access to food and opportunities for selling farm produce and which in essence increases dietary diversity (. Koppmair, Kassie, & Qaim, 2017).

CONCLUSION

There is no doubt that use of mobile phones has the potential to lead to enhanced horticultural value chain, a pedestal upon which smallholder horticultural farmers depend upon to handle their perishable products. On the aegis of the Big Four Agenda, the horticultural value chain must overcome several emerging challenges. The value chain must re-look at the potential possessed by the mobile telephony to

address a myriad of logistical problems. The mobile phones capability to create and capture value across the chain; enhance access to agricultural information; improve value-chain efficiency; and enhanced access to markets should be exploited for purposes of improving the value chain. It is imperative to note however, that the approach of external online desk review used relies on secondary data and could be limited by lack of authenticity in the reviewed studies, as well as, in the representativeness of the reviewed studies. Future studies should approach that are causal in nature and which uses the actual farmers.

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