Mobile Phones Usage in Improving Access to Cotton Seeds: A Case of Sengerema District, Mwanza Region

Chacha A. Matoka[1] and Dismas Nziku[2]

[1]The Open university of Tanzania, Email: chacha.matoka@out.ac.tz
[2]College of Business Education, Email: d.nziku@cbe.ac.tz

Abstract: *Technological change and adoptability is a fundamental phenomenon from one stage to another. Usually the change to be a change should be demarcated and differentiated from the previous situation as compared to the present situation. The study has identified the value of prompt dissemination of cotton farming practices information in recent years with the aid of mobile phones as a tool for sophisticating farming processes. The major focus was on the application of mobile phones in communication and payment modalities of information between cotton farming stakeholders to speed up the process. The conclusion of the study was based on the data gathered through questionnaires from four hundred (400) cotton farmers in Sengerema District. It was observed that, despite of many people having mobile phones of different nature, they mostly use them to share common information and contributes very minimal on farming practices. Therefore, this study has identified such weaknesses and suggested best practices of using mobile phones among cotton stakeholders in both information dissemination and payment systems. In short, the use of mobile phones in cotton farming practices helped vigorously in spreading information and payments related to agriculture, eventually resulted into good quality and quantity of cotton output.*

Key Words: Mobile phones, Technology, Cotton farming, Information

Introduction

Number of studies describe that the application of mobile phones technology is vital to farmers and supports to the maximum on the crop production (De Silva & Ratnadiwakara, 2010; Duncombe, 2016; Shimamoto et al., 2015; Arinloye et al., 2015; Misaki, Apiola, Gaiani, and Tedre 2018).

The application of mobile phone technology in the crop farming value chain (from the earliest to the final stage of cotton growing) enables both small - scale farmers (SSFs) and large-scale farmers (LSFs) to access farming information that supports optimal decision - making and increases crop productivity. The optimal decision may be on acquiring land/farm, farm preparation, the preferred cotton seeds to be planted, size of the farm, and so many related issues regard to crop production. The farming information includes access to artificial manure, market, loaning financial institutions,

transport facilities and weather information. The positive outcome on the application of mobile phones at transmitting information rapidly to both SSFs and LSFs lead to increased production which improve food security and maximum reduction of poverty in African countries which mostly depend on agriculture as a major economic activity.

Mungera and Karfakis (2013) describe SSFs as people who own between 0.1 and 10 hectares of land while LSFs possess more than 10 hectares per individual and mostly they have an average of more than 15 hectares per each large scale farmer and Small - scale farmers commonly have access to less than 2 hectares of land (NEPAD, 2013; Vanlauwe et al., 2014).

Krone et al., (2016), Mbatia et al. (2013) & McNamara(2009) described that, despite of having very large land for cotton cultivate for both SSFs and LSFs information related to the activities it is very important to be circulated to them so that can stand informed for what they intend to do as far as agriculture is concerned. The easiest way to spread all these information is through mobile phone, and is well accommodated to most of the aspects of cotton production including cultivation seasons and market information.

In Tanzania and Zambia, 75% of the total population derives their livelihoods from agriculture (Kalinda, Filson, & Shute, 2010; Misaki, Apiola, & Gaiani, 2016). Hence, an innovation that increases agricultural productivity cannot be ignored as it improves the livelihood of most farmers. Studies that address challenges facing SSFs and LSFs may be pivotal in reversing a decline in food production and deserve attention (Kalinda et al., 2010). One of the many difficulties SSFs and LSFs face are getting reliable farming information, thus leading to poor and weak decision – making during farming phases (Misaki, Apiola, &Gaiani, 2015). This is one of the reasons that have prompted technology innovators to design mobile phone technology solutions to improve the quality and quantity of information flow. The application of mobile phone technology has, in some studies, been shown to be beneficial to SSFs and LSFs (Aleke, Ojiako, & Wainwright, 2010; Chisita, 2010; Sanga, Mussa, Tumbo, Muhiche, &Haug, 2014).

TCRA 2018; asserts that, mobile phones lead for information transfer, and statistics shows about 99.2%   of Subscription Market Share (Zantel – 2% Halotel – 12%, Tigo – 30%, TTCL – 1%, Vodacom – 31%, Airtel 23% and Smart – 0.2%) of Tanzania have mobile phones reflecting that, most of the information can reach to the end user as quick as possible. Not only information, but also money transfer through such networks is also growing with very high speed and reached 96% Mobile Money Subscriptions Market Share (Halotel Money 4%, M-pesa 35%, Airtel Money 26%, Tigo Pesa 30%

and Easy pesa 1%). Since mobile phones play vital role in spread of information and money, then the study on hand has conducted a Systematic Literature Review to explore the application of mobile phones in linking cotton seeds dealers and cotton farmers in Sengerema District – Mwanza Region.

Despite of being informed by researchers like Mahant, Shukla, Dixit, & Patel (2012); Nsimbila, Larsen, &; Kimeme (2014) Saidu, Clarkson, Adamu; Mohammed, & Jibo, (2017) & Saidu et al. (2017) that mobile phones help to spread information but do not address the link between the cotton seeds dealers or agents and cotton farmers in both SSFs and LSFs categories.

Since access to information and an effective and efficient use of the data obtained can improve SSFs' and LSFs' chances to gain competitive advantage in the farming business, the study will conduct **a Systematic Literature Review (SLR) on mobile phone technology** usage in cotton farming projects in Mwanza region specifically Sengerema District which is giant in cotton production of all districts of the region so as to identify obstacles and recommend appropriate future solutions.

Literature Review
The revolutions in crop production, especially cotton started with the mechanical revolution that began with the plow, planter, reaper, and the shift from horsepower to tractor power. The mechanical revolution started after the turn of the 20th century with the replacement of the horse with modern tractors. Meanwhile, due to the advancement of technology, the mechanical approach has been revolutionized by the new availability of computers, software, and satellites which together form, Information Communication Technology (ICT) (Mahant, Shukla, Dixit, & Patel, 2012). This technology enables what is frequently referred to as Precision Agriculture (PA). The precision agriculture technology enables advances from a data-poor to a data-rich environment. Formerly, in mechanical era yields were measured by fields; while with the advance in ICT it is possible to measure yield continuously. With the avail of the Internet services, the farmers' business practices are affected in a similar fashion as it does other types of business (Saidu, Clarkson, Adamu, Mohammed, & Jibo, 2017).

In many successful countries in the world that produces the cotton in great quantity and quality like India, China and USA migrated from mechanical revolution to Precision Agriculture, which possesses the huge potential of ICT to produce, process, store, retrieve and disseminate information like yielding production, market facilitation and financial intermediation services to different stakeholders in the agriculture industry (Mahant,

Shukla, Dixit, & Patel, 2012). Figure 1 (below) depicts the five (05) leading cotton producing countries in the world as per year 2017/2018.
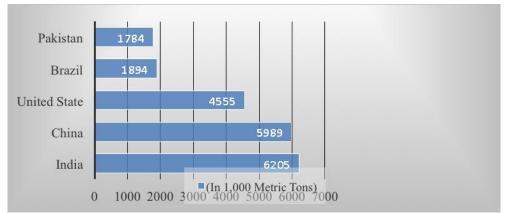

Figure 1: Leading Cotton Producing Countries Worldwide 2017/2018 Year (The Statistics Portal, 2018)

Southern and Eastern Africa is the largest organic cotton production region in Africa. The following Southern and Eastern African countries produce organic cotton: South Africa, Tanzania, Uganda and Zambia. In the past Uganda has regularly been the largest producer of organic cotton fiber in Africa. This position is now occupied by Tanzania due to the many political issues (including the anti-malarial policy) that is currently affecting the organic sector in Uganda. Organic cotton production is currently being trialed in Kenya and efforts are underway to regenerate interest in organic cotton in Zimbabwe (Textile Exchange, 2010).

Tanzania is an East Africa Country which yields cotton as a cash crop for export and internal activities to generate household and national income. The production process of cotton is the major source of household income which relatively employs about 500,000 rural households. More than 90% of cotton is produced in Tanzania are from the southern part of Lake Victoria; Mwanza, Shinyanga, Mara, Tabora, Kigoma, Simiyu, Bukoba and Singida regions (Baffes, 2012). The cotton is produced primarily by smallholders on farms of 0.5 to 10 hectares with an average of 1.5 hectares with a yield of about 750kg of seed cotton per hectare (Nsimbila, Larsen, &; Kimeme, 2014).Traditionally, the type of agriculture conducted in Lake Zone regions are predominantly rain-fed, with the majority of smallholder farmers using hand hoes and animal tracking for tillage, has low-yielding production, lacks access to critical information, market facilitation, and financial intermediation services (Mwangulumba & Kalidushi, 2012).

The moderate quantity of cotton produced in Tanzania particularly in Lake Zone is not associated with rapid delivery of information as a link between cotton seeds dealers and cotton farmers. Information regarding cotton farming practice is not easily accessed by the cotton growers, which is the reason of not producing the right quality and quantity at a proper time. Thus, the study has suggested the way forward in solving this problem to cotton growers, cotton dealers/agents and the market by making them freely interacting and disseminating information instantly through mobile phones as they are requested.

Other Related Works

Saidu et al. (2017) explained that,'e-Kapas' an initiative of utilization of information and communication technologies (ICTs) for delivering appropriate cotton technologies to farmers aiming to improve the efficiency of current manual system by saving time, money and making technologies available anywhere & anytime to users using mobile phones and to connect cotton growers for profitable and sustainable cotton farming in India. Meaning that, all information regarding to cotton faming demands can easily be accessed by using mobile phones at the earliest stage. Therefore, in relation to that, the study on hand will focus at looking on only one aspect which is how the mobile phones contribute on the transmission of information relating to cotton seeds.

Omri, Trish, Liezl, & Kamal (2012) clarified the 'Drum Net', a project of Pride Africa; offers support services to smallholder farmers in Kenya by providing access to information, financial services, and markets. Drum Networks to address the need for access to markets using information technology, efficient business processes, and economies of scale. It combines information, commodity transaction services, and financial linkages into a single business service model that provides access to markets, market information, and credit for the rural poor to support sustainable agriculture and rural development.

Mahant et al. (2012) clarified the role of mobile technology in the Groupe Spéciale Mobile Association GSMA's 'mAgriProgramme', which aims to identify and fund opportunities for mobile communications in the agricultural value chain as an initiative to alleviate food security related problems.

Statement of the problem

Misaki, Apiola, Gaiani, and Tedre (2018), Mbatia et al. (2013) & Mwangulumba & Kalidushi, (2012) emphasized that, mobile phones have great impact at spreading information from one point to another, either by using short messages (SMS) or through the use of social media such as

WhatsApp, Facebook, Instagram, IMO, the few to mention where the information may be bad or good. The studies have tried to point some areas that mobile phones are useful at spreading agricultural information such as access to artificial manure, market, weather (temperature and rainfall), and financial institutions.

However, on crops' information transmission particularly on seeds awareness to farmers by agents/dealers is common to maize, pineapples, and tomatoes simply by dialing *150*43# which is the most common Unstructured Supplementary Service Data (USSD) for the registered members to the mobile network providers. Therefore, studies have not covered on how cotton seeds information can be accessed by cotton famers through mobile phones. The Systematic Literature Review (SLR) explored about the knowledge of cotton farmers towards accessing information thorough mobile phones and provided critical recommendation for succession. The study filled the gap of knowledge of information transmission and on time delivery of cotton seeds to the cotton farmers which required close interaction between cotton seeds agents or dealers and cotton farmers so as to speed up the farming process which is the solution to both cotton farmers and cotton seeds agents/dealers within a lake zone.

The Research Rationale

The rationale of this study is seen in the outcome by supporting the knowledge on how cotton farmers can easily access information related to cotton seeds which can help to facilitating best cotton farming practice as the solution to both cotton farmers and cotton seeds dealers.

The study has emphasized on creation of a strong link of information to all stakeholders of cotton production, market facilitation, and accessibility of the financial intermediation services within the agricultural industry.

In additional to that, the study has transformed Tanzania cotton smallholder farmers to adopt the precision agriculture technology that enriches cotton stakeholders with precise information and cost effective approach about best farming practices by improving the income which relatively employing about 500,000 rural households (Nsimbila, , Larsen, &; Kimeme, 2014).

Furthermore, it is perceived that this study has enhanced the cotton statistical data by; providing accurate data/information, data acquisition and processing, storage, filtering and dissemination for the respective user/stakeholder as per needs.

The General Objective
The general objective of the study is to investigate how mobile phones can improve access to cotton seeds by cotton farmers in Sengerema, Mwanza.

The Specific Objectives
(i)   To identify the crucial cotton farming information for both cotton farmers and seeds agents/dealers.
(ii) To assess how the cotton farmers and seeds middlemen interacts each other through mobile phones when transacting cotton seeds.
(iii) To measure the potentials of mobile phones in strengthening information flow and mobile money transaction between cotton farmers and cotton seeds agents/dealers in Sengerema

Constraints encountered during the study process
The possible constraints of the study were as follows:
(i)   *Accessibility of the areas;* the production of cotton in Mwanza is mostly experienced in the remote areas and difficult to reach during the rainy seasons. The organization of the study managed to access these areas before and during the rainy seasons by using vehicles which are friendly to the said environment.
(ii) *Language barrier;* the cotton farmers with their greatest percentage were from rural sides where Swahili and English are not their mother languages. The study prepared to recruit research assistants with the great familiar about the mother tongue (language(s)) as per Mwanza region. In addition to that, the data collection tools were presented according to the language which is most spoken in a particular region/area.
(iii) *Poor response from the respondents;* ninety percent (90%) of cotton farmers are from the rural areas; the majority of them, they possess negative attitudes when asking for what they always believe is their rights (ownership). The study explained and provided the general knowledge by offering the aim, objective of the study and how is significant to them.

Methodology
Study design
Due to the nature of the research, the study has employed exploratory research design as it is in the interest to clearly explore the link on how mobile phones can enhance easy access of information regarding to cotton seeds so as to speed the cotton farming practices. The systematic literature review research design has helped to establish priorities in developing operational definitions so as to improve the final research output and eventually to establish the link between dealers of cotton seeds and cotton farmers.

With regards to the approach, the study employed both qualitative and quantitative research approach. Qualitative research involves collecting, analyzing and interpreting data by observing what people do and say. Hence this is crucial in obtaining field views from the farmers and dealers of cotton high bread seeds and creating a better way that these important two parameters of cotton farming can interact and create strong relationship for speeding up the process.

Moreover, a case study or in-depth study involved to acquire specific issues regarding the difficulties that farmers face at acquiring the relevant seeds for cotton cultivation. Quantitative data on the other hand were used for analysis, providing descriptive, comparative and statistical results for the study generalization.

Study place

The research has covered Sengerema District in Mwanza region as a case study. However, in Tanzania there are mainly two cotton regions; Western Cotton Growing Area (WCGA) and the Eastern Cotton Growing Area (ECGA). The WCGA consists of regions of Shinyanga, Simiyu, Mwanza, Mara, Geita, Tabora, Kigoma and Singida and accounts for 97-99% of the total cotton production in the country. The ECGA includes Manyara, Morogoro, Coast, Kilimanjaro, Tanga and Iringa regions and accounts for the remaining 1-3% of cotton production (Mwangulumba & Kalidushi, 2012).

Hence based on the grounds of their contribution, it has been observed that, Mwanza region is a giant for cotton production form the year 2008/09, 2009/10, and 2010/11, 2011/12 of all regions but dropped suddenly at a significant quantity for the year 2012/13 which influenced the authors to select Sengerema District in Mwanza region as the study area focusing on the contribution of mobile phones in speeding up cotton farming practices. The reason of opting for Sengerema District is due to the study done by Cotton & Africa (2014) asserting that, among the districts of Mwanza Region, Sengerema is outshining others for an average of 9% to 11% every year.

Socio-Economic and Demographic Characteristics of Cotton Production Regional wise

The area's main source of income is agriculture, including farming and livestock. Most of the country's cotton is grown in the lake zone, and other crops include sorghum, cassava, tobacco and peanuts. Apart from agriculture, gold and diamond mines are another major source of income. In Mwanza, located along the shore of Lake Victoria, many people work in the fishing industry.

Table 1: Seed Cotton Production from 2008/09, 2009/10, 2010/11, 2011/12, and 2012/2013 in Western Eastern Cotton Growing Areas

Zone	Region	*2008/09*	*2009/10*	*2010/11*	*2011/12*	*2012/2013*
Western	Simiyu					147,564
	Geita					35,730
	Shinyanga	75,744	59,637	33,669	50,206	45,100
	Mwanza	220,808	174,162	105,143	138,383	64,800
	Mara	53,283	10,986	10,705	15,940	20,925
	Kagera	2,559	4,700	1,827	3,734	1,029
	Tabora	13,451	15,650	10,737	14,842	32,700
	Kigoma		1,336	47	386	429
	Singida	1,300	294	753	883	2,000
Total Western		**367,145**	**266,765**	**162,881**	**224,374**	**350,277**
Eastern	Manyara	898	172	490	768	1,496
	Morogoro	307	33	73	564	204
	Kilimanjaro	84	6	33	25	28
	Pwani	84	19	28	120	41
	Tanga	157	5	11	77	35
	Iringa	23	4	1	10	80
Total Eastern		**1,552**	**230**	**636**	**1,564**	**1,884**
Grand Total		**368,697**	**267,004**	**163,517**	**225,938**	**352,161**

Source: Tanzania Cotton Board Annual Report 2013

Sengerema District (Mwanza region) has been selected to be the area of the study since has good population of cotton growers. Most of the dealers of cotton seeds are situated in Mwanza as headquarters in Lake Zone however; they have small offices in other regions of Lake Zone. Therefore, the study has focused in Mwanza region specifically Sengerema district since we expect to receive more information for generalization. However, to cover the entire region is very difficult, because consumes time, more resources and cost, therefore the study dealt with only one district of Mwanza region namely Sengerema District. Coulson, (2016) & Cotton, & Africa, (2014) identified Sengerema District as the giant in cotton production within Mwanza region which provided a base for authors to assume that, the District have vital information for generalization.

Study Population and Unit of Analysis
The study used individuals as the unit of analysis, whereby, the target population of the study covered both large and small-scale cotton farmers. Moreover, cotton board, agricultural consultants and extension officers, export and import processors were consulted so as to acquire the necessary information regarding delivery of necessary information on how cotton seeds can easily reach cotton growers. The rationale behind choosing this study population is related to the homogenous nature of problem which is the delay of information about cotton seeds to the cotton growers.

Sample Size

Sample Size Selection
In conducting a study, it is not possible, practical and sometimes expensive to collect data by taking into account the whole population. Thus, a sample was chosen to represent the relevant attributes of the whole of the units (Resnik, 2011).
According to Nsimbila, Nylandsted, & Kimeme, (2014) presented that the entire Western Cotton Growing Area in 2012 covered more than 50 competing ginneries and had 350,000 registered smallholders. Therefore, target population was 350,000 which used in the determination of true sample.

Saunders (2011) proposed a use of infinite formula in order to select sample for the study. Thus, this study adopted the following formula to calculate the sample size.

$$n = \frac{N}{1+N(e)^2}$$

Where
n = Sample size
N= Targeted Population (350,000)
e = The precision level (error of estimations) (5%) i.e. 95% Confidence interval

Thus

$$n = \frac{350,000}{1+350,000(0.05)^2}$$

n = 400

Based on this formula the sample size that used for this study were 400 cotton farmers based in Mwanza region covering only Sengerema.

Study Procedures
Based on this nature of the study, the data were collected from both small scale and large-scale farmers. Due to the nature of the study only simple random sampling technique were used to collect information, meaning that every individual had equal chance to provide information so as to fulfill the demand of the study. The purpose of employing this method in gathering information is to ensure the sample selected have true representative to the true population that they are cotton farmers and the same time they had convenient time to participate in answering the questions for the study as proposed by (Saunders (2011).

The kind of information gathered should reflect on how mobile phone is useful at receiving and transmitting information relating to cotton seed in both availability of cotton seeds and payments through mobile phones.
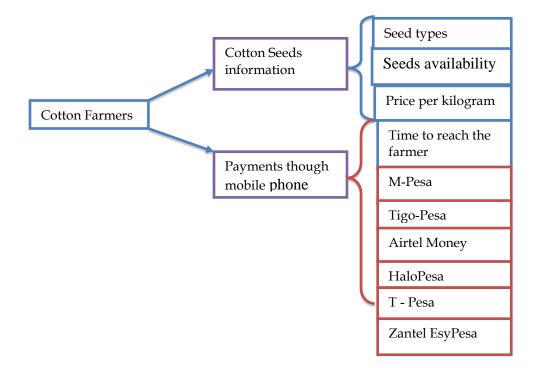

Figure 2: The diagram above depicts the information relations as demanded by farmers so as to fasten farming process

Methods of data collection and study tools
This research used both primary and secondary data because the interest of the study is to determine the contribution of mobile phones at speeding up the rate of information delivery about cotton seeds to the cotton farmers. For example, manures can easily be accessed through mobile phones *150*53# for YARA TANZANIA, where the study has suggested to be the same even for cotton seeds. Primary data will involve the collection of data from respondents by the use of a questionnaire, focus group discussion, interview guide and the information from respective cotton bodies. The use of the questionnaire was justified because it is an effective way of collecting information from a large literate sample in a short period of time and at a reduced cost than other methods.

Additionally, questionnaires facilitate easier coding and analysis of data collected (Resnik, 2011). The questionnaires were important tool in assessing

whether the model is effective in facilitating best farming cotton practices. Focus group discussion and interviews were engaged to collect information which were not readily available from the prepared data collection tools. The communication process through mobile phones in farming process has enabled cotton farmers to ask and receive cotton farming information easily which resulted to the increased cotton productivity and the welfare of all cotton farmers. The process become softer due to vital information gathered from cotton farmers in solving the problem of information delay as demanded by cotton growers.

Data Analysis Methods
The researcher applied both qualitative and quantitative methods of data analysis in order to provide the reliable results or findings to the research study. Data collected through questionnaire especially closed ended questions were analyzed using Statistical Package for Social Sciences (SPSS). Descriptive analysis in the form of percentages and univariate measures such as mean were used to analyze the data and were presented in form of tables. The data collected through personal interview and documentary review were analyzed using content analysis.

Ethical Considerations
Ethical considerations form a major element in research. Ethical research principals: honesty, objectivity, integrity, carefulness, openness, respect for intellectual property, confidentiality, competence and legality are important to follow (Resnik, 2011). Thus, the study carried out considering a range of ethical principles such as Obligations to Subjects in terms of avoiding undue intrusion, obtaining and adjusting informed consent, protecting the interests of subjects, enabling participation, maintaining confidentiality of records, preventing disclosure of identities. Obligations to Colleagues in terms of maintaining confidence in research, exposing and reviewing their methods and findings, ensuring safety and minimizing risk of harm to field researchers and referencing texts that belong to other authors in APA style.

Results and Discussion
The findings were based on the commonalities between the needful information by both cotton farmers and dealers or agents of cotton seeds. The important issue in this aspect is to measure the speed of information delivery and associated payments with the aid of mobile phone. Moreover, is to assess on the interaction between cotton seeds agents and the cotton farmers. Finally, is to measure the potentiality of mobile phone in strengthening cotton farming process.

Results

The systematic literature review has tried to explore the cotton productivity in the lake zone regions, from the year 2008/2009 to 2012/2013 indicating the production trend in tones from each mentioned region and zone as indicate in Figure 1. However, the Cotton Board report does not state anything on how mobile phones had been potential at transferring information related to cotton farming.

Hereunder is the needful information by the cotton farmers and dealers/agents percentage-wise as rated by the respondents;

Table 2: Cotton seeds information

S/N	Needful information	Frequency of information in %
1	Information about availability of cotton seeds	52
2	Information about types of seeds	43
3	Information about price per kilogram	71
4	Information about time frame to reach the farmers	16
5	Information about cultivation seasons	32

Table 3: Mode of payments

S/N	Needful information	Frequency of payments (%)
1	Payment through bank account	19
2	Payment through debit or credit cards (Visa & MasterCard)	2
3	Payment through M-pesa	81
4	Payment through Tigo pesa	78
5	Payment through Airtel Money	59
6	Payment through HaloPesa	9
	Payment through T - Pesa	0
	Payment through Zantel EsyPesa	0

Discussion of findings as per study objectives

Both systematic literature review and random sampling reflected that the application of mobile phones in cotton farming is being practiced; however, is not so active for early delivery of some farming vital information. Information provided in Table 2 and 3 rated in percentages tries to provide an overview about the application of mobile phones in speeding up the cotton farming process. The information is categorized into two important aspects, which are general cotton seeds and mode of payment information which are the most important in strengthening quality, quantity, accessibility of cotton farming information and products at an affordable cost to all stakeholders

The crucial cotton farming information for both cotton farmers and seeds agents/dealers.

Cotton farming information is power to cotton stakeholders in Tanzania, because help to create awareness on situations regarding cotton

productivity, market availability, availability of cotton seeds, cotton market price, harvesting time, and the cultivation seasons (Nsimbila, Larsen, & Kimeme, 2014). The researchers have made thorough analysis of the information gathered from the respondents as they rated the identified crucial information as indicated below:

(i) Information about availability of cotton seeds
The cultivation of quality cotton seeds in a well-controlled environment, usually results into good yields during harvesting period. This information reaches customers (cotton farmers) for an average of 52%, which is very low speed depending on the potentiality of the information. Therefore, there is a need to stimulate the spread of such information up to about 90% - 99% so as to increase sales on cotton seeds agents and increase of production of quality cotton and its products at appropriate time.

(ii) Information about types of seeds
Type of seeds is very important because farmers sometimes they cultivate basing on the nature of the environment (climatic condition) therefore could be in need of specific species. Despite of these information to be readily available, but mobile phone usage at spreading such information is not sufficient and constitute about 43% which should be increased to manageable level so as to sophisticate the process.

(iii) Information about price per kilogram
Price per kilogram is very important to be aware by the cotton farmers at appropriate time and can help farmers to budget appropriately. A reasonable average of 71% of reach ability of information through mobile phones to the customers about the pricing models of cottons seeds helped to make decision at right time.

(iv) Information about time frame to reach the farmers
Distance from the agents of cotton seeds and to the farmers matters a lot to determine the time frame at which when demanded can arrive to the farmers at right time. Respondents (cotton farmers) responded that, the information regarding cotton farming practices are disseminated to all stakeholders, however at a lower speed as rated by 16%. Thus, the study has suggested using mobile phones in disseminating information at high priority to simplify the ordering and delivery process of cotton seeds, manure and to the market as demanded by users.

(v) Information about cultivation seasons
32% of the respondents agreed that, mobile phones rarely help to share some information rapidly about the cultivation seasons; however, some of

them are less concerned with it, because they are aware with cotton cultivation seasons and amount of rainfall supporting the farming practices. Respondents further clarified that, amount of rainfall is not stable since fluctuates seasons to season or year to year which sometimes making them to depend on the information from weather forecasting agents for cultivation implementation.

Shimamoto, Yamada, & Gummert, (2015) and Saidu, et al., (2017). Emphasize that, mobile phones are vital at speeding up information of any nature (text messages, calls or social networks) and that if used properly in agriculture, brings greater impacts which can be quantified into outputs. Thus, the study has created awareness to cotton growers to adopt new means of disseminating information through mobile phones.

The cotton farmers and seeds middlemen interact each other through mobile phones when transacting cotton seeds
Shimamoto, Yamada, & Gummert, (2015) and Saidu, et al., (2017) asserts that, before realization of mobile phones as vital tool for disseminating agricultural information, cotton farmers used internet to communicate through emails, however was not popular because few classes of farmers had Information Technology (IT) skills. Nsimbila, Larsen, & Kimeme, (2014) points out that, the adaptability of cotton growers to dissemination of information through mobile phones is growing gradually and possibly to be high in recent years after emphasis by many researched publications. The respondents argued that, mobile phones despite of not being adopted by many farmers with reasons like unable to use, illiteracy, and difficulties to accept such technology, but it is health to persuade them because is useful in speedy dissemination of information as well as escaping the possible intermediary costs.

The potentials of mobile phones in strengthening information flow and mobile money transaction between cotton farmers and cotton seeds agents/dealers in Sengerema
Mobile phones play vital role of completing payments instantly at any time so long there is network Mahant et al. (2012). Payments through mobile phones is easy and accessible more than banks with the reason that, banks have limited operation time, while mobiles phones have no limited time and money can be retrieved from bank account to mobile phone, then payments can be made as per requirements. Respondents have valued the payment modalities as per their views as listed below:

(i)   Payment through bank account

Banks are very scattered, commonly are located in towns and some famous areas basically a place with specific economic activities like mining, large industry like that of Dangote in Mtwara – Mikindani. There banks are not sufficient tool for completing payments because farmers basically are situated in rural areas. Therefore, this kind of payment modality does not favor majority as rated very low for about 19% of total respondents. However, a number of Bank agents have started opening-up much closer to people in both rural and urban areas so there could be some improvement in this payment mode in near future.

(ii)   Payment through debit or credit cards
Debit or Credit cards are not popular payment method for Tanzanians. Debit or Credit cards are commonly used for foreigners especially who come to visit Tanzania National Parks where they do not accept cash payments rather through these cards. Only 2% of total respondents are able to use debit or credit cards, that is to say this payment modality for cotton farmers is not common and is totally disparaged instead they need to use payment system which is user friend and readily available to most of farmers.

(iii)   Payment through M-pesa
M-Pesa is one of the most commonly payment modality which is rated by good number of respondents for 81%, that is to say is the most preferred by the good number of cotton growers and dealers around the lake zone. The underlying assumption on this aspect is that Vodacom has more customers around Lake Zone as compared to other networks.

(iv)   Payment through Tigo - pesa
78% of the respondents have been paying and still suggesting the payments to be made through Tigo – pesa.

(v)   Payment through Airtel Money
59% of the respondents have been paying and still suggesting the payments to be made through *Airtel Money*

(vi)   Payment through HaloPesa
9% of the respondents have been paying and still suggesting the payments to be made through Hallo – pesa. However, this is not popular because the mobile network is very new in the market since it was introduced in Tanzania late 2016. Therefore, has very few customers and yet not adopted to use Hallo – pesa in cotton seeds payments to cotton dealers.

(vii) Payment through T-Pesa and Zantel Easy-pesa

In Sengerema District of which the study was conducted, no any cotton stakeholder among the sampled respondents used in making payments through mobile phones by TTCL (T- pesa) or Zantel (EsyPesa). Mobile phone payments is increasing gradually and counting an average of 56.7% which is above the average of other payment modalities by 43.3%. Misaki, Apiola, Gaiani, and Tedre (2018), Mbatia et al. (2013) & Mwangulumba & Kalidushi, (2012). Encorages cotton growers to devote on mobile phones payments and dissemination of cotton farming information to speed up farming practices with the possible minimum costs.

Recommendations
Mobile phones are common and superior in transferring information from one point to another in recent years as compared to the previous years where we had only internet and e-mails. Through introduction of mobile phones particularly smartphones have termed as universal due to the fact that have covered all the areas of communication like, internet (emails), social networks and ordinary messages. Moreover, mobile phones have facilitated rapid flow of information in different forms like audio, video, text/files, pictures, and others at right time. Mobile phone has helped much on strengthening the link between cotton seeds' agents and farmers on timely delivery of related information such as general seeds information and payment modalities.

Each payment modality is sufficient depending to the user of the mobile network, however debit or credit cards are not popular to both sides (cotton seeds agents, farmers and other stakeholders), and therefore through observation is suggested to be ignored and adopt to bank and mobile payments because they are secured, easy to transact, easy to realize payments, and services are abundant especially when considering that rural electrification has covered much more villages and more banking services are increasingly brought closer to people in urban and rural areas through their agents.

Since the interaction between cotton farmers and cotton seeds' agents is not significant yet, therefore it is recommended to be increased so as to make all the necessary information readily available to all respective categories.
It is also recommended to government as policy maker to include and formalize payments through mobile phones and to enforce all the cotton stakeholders to adopt for their own future benefits.

Conclusion
In recent years, most of Tanzanians are good users of mobile phones. However, they are mostly using for normal communication and rarely for agricultural information transmission and associated payments.

The study found that, cotton farmers sometimes disseminate information related to cotton farming and in any other business categories through mobile phones.

The study's focus was on contribution of mobile phones in communication of information between cotton farmers and seeds' agents/middlemen which has been in average; therefore, this study has suggested to activate the flow of information so as significantly can increase productivity and cost-effectiveness for coming out with quality and quantity of cotton outputs. The study has observed that, there is insufficient utilization of mobile phones particularly for farming; therefore, it suggested to be utilized vigorously so as to make cotton farming practices much better and raising productivity to the reasonable level.

References

Arinloye, Djalalou-Dine AA, Anita R. Linnemann, Geoffrey Hagelaar, Ousmane Coulibaly, and Onno SWF Omta. (2015)"Taking profit from the growing use of mobile phone in Benin: a contingent valuation approach for market and quality information access." Information Technology for Development, 21(1), 44-66. https://doi.org/10.1080/02681102.2013.859117.

Baffes, J. (2012). Tanzania's Cotton Sector: Constraints and Challenges, (42).

Cotton, M. O., & Africa, I. E. (2014). Procotton Evaluation Tanzania Part-Biosustain.

Coulson, A. (2016). Cotton and textiles industries in Tanzania: the failures of liberalisation. Review of African Political Economy, 43(sup1), 41-59.

De Silva, Harsha, Dimuthu Ratnadiwakara, & Ayesha Zainudeen. (2010). Social influence in mobile phone adoption: Evidence from the bottom of pyramid in emerging Asia. https://doi.org/10.2139/ssrn.1564091.

Krone, M., Dannenberg, P., & Nduru, G. (2016). The use of modern information and communication technologies in smallholder agriculture: Examples from Kenya and Tanzania. Information Development, 32(5), 1503-1512. https://doi.org/10.1177/0266666915611195.

Mahant, M., Shukla, A., Dixit, S., & Patel, D. (2012). Uses of ICT in Agriculture, (1), 1–4.

McNamara, K. (2009). Improving agricultural productivity and markets: The role of information and communication technologies.

Mbatia, O. L. E., Okello, R. M., Ofwona-Adera, E., & Okello, J. J. (2013). Using ICT to Integrate Smallholder Farmers into Agricultural Value Chain: The Case of DrumNet Project in Kenya.

Meera, S. N., Jhamtani, A., & Rao, D. U. M. (2014). Information and Communication Technology in Agricultural Development: A Comparative Analysis of Three Projects from India.

Misaki E, Apiola M, Gaiani S, Tedre M. Challenges facing sub - Saharan small - scale farmers in accessing farming information through mobile phones: A systematic literature review. E J Info Sys Dev Countries. 2018; e12034. https://doi.org/10.1002/isd2.12034

Mwangulumba, E. I., & Kalidushi, B. M. (2012). Tanzania Cotton Production and Productivity.

Mungera, H., & Karfakis, P. (2013). Land distribution and economic development: Small-scale agriculture in developing countries. Journal of Management Studies, 3(5–6), 138–153.

NEPAD. (2013). Agriculture in Africa, transformation and outlook (NEPAD Research Report). http://www.un.org/en/africa/osaa/pdf/pubs/2013africanagricultures.pdf Retrieved 2/12/2016

Nsimbila, P., Larsen, M. N., & Kimeme, J. (2014). The rise and fall of cotton contract farming in Tanzania: What went wrong?

Omari, V. Z., Trish, A., Liezl, D. G., & Kamal, M. (2012). ICTs for for Agriculture in Africa.

Resnik, D. B. (2011). Scientific research and the public trust Science. Trust. Science and Engineering Ethics, 17(3).

Saidu, A., Clarkson, A. M., Adamu, S. H., Mohammed, M., & Jibo, I. (2017). Application of information and communication technology in agriculture: opportunities and challenges in developing countries. International Journal of Computer Science and Mathematical Theory, 3(1), 11.

Saunders, M. N. (2011). Research methods for business students (5th ed.). Pearson Education India.

Shimamoto, D., Yamada, H., & Gummert, M. (2015). Mobile phones and market information: Evidence from rural Cambodia. Food Policy, 57, 135-141. https://doi.org/10.1016/j.foodpol.2015.10.005

Textile Exchange. (2010). The Biosustain Story: Generating Wealth in the Region.

The Statistics Portal. (2018). Leading cotton producing countries worldwide in 2017/2018 (in 1,000 metric tons).

Vanlauwe, B., Wendt, J., Giller, K., Corbeels, M., Gerald, B., & Nolte, C. (2014). A fourth principle is required to define conservation agriculture in sub- Saharan Africa. The appropriate use of fertilizer to enhance crop productivity. Field Crops Research, 155, 10–13.