Information and Communication Technologies (ICTs) Attract Youth into Profitable Agriculture in Kenya

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ABSTRACT
Youth cherish technology, efficiency and innovations and accommodate entrepreneurial risks. The objectives of this study were to show the beneficial use of Information and Communication Technologies (ICTs) in agriculture among the youth in Kenya, assessed ICT application and commonly used tools, experienced challenges, impacts and suggested future ICT use. Beneficial ICT applications were exemplified by ‘Mkulima Young Champions’ who led digital initiatives, drew youth into farming, helped them learn among themselves, and traded and overcome agricultural challenges. Using radio, short message services (SMS) and social media, they discussed agricultural topics and shared successes. Mkulima Young’s Facebook was vibrant. The youth posted photographs and videos, asked questions, discussed issues and interacted. Most of the youth obtained information from the internet, hence the internet was the best platform to market and promote agriculture to the youth. They used internet and social media to obtain production technologies, market information and for information sharing. Most commonly used tools were MS Office and spreadsheets for record keeping. Voice messages and SMS assisted timely accessing of market prices, reaching clients, sharing production information and money transactions. The ICT content should be relevant to targeted youth, valuable, localized and dependable. The ICT-savvy youth operated intensive, efficient and profitable farms, producing diverse and branded products for niche markets. The youth transformed the community use and access to ICTs and influenced community economic status. Smart phone technology will revolutionize access to and use of ICTs. YouTube, Twitter and WhatsApp should be expanded and widely popularized among the youth.

KEYWORDS
Information and communication technologies (ICTs); Kenya; Mkulima Young Champions

Introduction
There is a pressing need to rebrand agriculture to address the long-held belief that agriculture and rural areas are for those who cannot make a livelihood anywhere else. Agriculture needs to be branded as the new unexploited frontier for growth in business opportunities (Njenga et al., 2012). The youth find agriculture unattractive mainly due to the time and input investment as the traditional staples are slow to mature, risky and often yield low
returns. Agricultural incomes are seasonally related to rainfall and harvest cycles, suggesting that for long periods of time, the youth would have no income. Insufficient innovations have led to reliance on traditional and arduous labour based production techniques and concentration on a narrow range of agricultural commodities – mainly staple crops.

The flow of information on agricultural production and marketing to youth has been hampered by under-utilization of information and communication technologies (ICTs) (Njenga et al., 2012; International Institute for Communication and Development, 2013). However, it is essential to digitize agricultural production and marketing information into web-based resources. This would enable wider outreach and use since the few available extension officers do not effectively reach the majority of the farmers at different locations. The youth could greatly contribute to the agricultural sector through actively participating in generating, posting, management and utilization of this information.

The formal Kenyan economy has been unable to create enough employment opportunities to absorb the constant supply of labour-seeking youth. Whatever the solution to this problem, a great deal of coordination and skilful thinking will be required to attract gadget-loving and efficiency-prone young people into the agricultural sector. However, youth participation in the agriculture sector in many developing countries is low, largely because the sector is highly unattractive due to risks, costs, inefficiency and its labour intensive nature. As such, motivating the youth to view agriculture as a career opportunity will require a multi-level intervention. Continuous initiatives to support youth in agricultural enterprises and widen the opportunities to showcase their successes in order to attract more young people are paramount. One of these should be the incorporation of information and communication technologies (ICTs) such as the internet, mobile phones, computers and Global Positioning Systems (GPS) associated or not with traditional communication technologies such as radio, television, written press and video.

The emerging trend in Kenya has shown that well educated and skilful youth are turning to agriculture to earn a living. The youth are not interested in growing traditional crops or rearing the usual domestic animals. They target niche markets to start ventures where produce moves quickly. Farming has become attractive, and despite their academic qualifications, they are not averse to soiling their hands to earn a decent living where their less creative contemporaries see no money. The majority of youthful farmers own modern phones and spend considerable time on the internet, reading about the animals they keep or the crops they grow, following market and farming trends. Most have active Facebook accounts and websites and spend most mornings responding to queries from customers or fellow digital farmers. These digital youth advertise their products through Facebook by posting product photographs, indicating their offer price and giving the location. Product demand calls immediately start coming in.

Education certainly offers these youthful farmers alternative ways of earning a living. When they do not get jobs, they turn to farming and, thereby, create jobs for less educated youth and get extension services through the internet and radio. In addition, when the market is limited, they post their products on the internet for a wider reach. A change of attitude and a little seed money could be the next big thing for jobless graduates. With this in mind, empowerment programmes must demonstrate clear understanding
of the youth’s affinity for technology, efficiency and a strong voice in the decision-making processes. Youth desire innovations and have a high propensity for taking higher entrepreneurial risks.

Kenyans are famous ICT platform innovators. Some of the innovations include M-PESA (“Pesa” Swahili word for money), which allows users to deposit money into a credit account and withdraw money from their accounts, eventually sending money to others. A revolution in banking is in the offing through Safaricom M-Shwari. M-Shwari, the new banking product for M-PESA customers allows clients to save and borrow money through their phones while earning them interest. KilimoSalama, a micro-insurance programme, allows farmers to insure their crops using their phones.

The objectives of the study were to document current examples of beneficial use of ICTs in agriculture among the youth in Kenya; assess the use of ICTs in agriculture, accessing technical and marketing information; document the currently commonly used ICT tools; demonstrate the challenges, benefits and impacts to youth of ICT use and make recommendations for future ICT use in agriculture in Kenya.

**Materials and methods**

Data were collected through a review of studies, focus group discussions, personal interviews and key informant interviews. A review of studies mainly concentrated on research into youth participation in agriculture in Kenya. Focus group discussions involved youth group members comprising 19 representatives from Baringo, Kiambu, Nairobi and Nakuru Counties. Key informant interviews included two Senior officers from Kenya Agricultural Research Institute (KARI), two professors from the University of Nairobi (UoN), two lecturers from Egerton University (EU), eleven senior officers from Ministry of Agriculture, Livestock and Fisheries Development (MOALFD) Headquarters, three senior officers at Equity Bank Headquarters, Nairobi and the Managing Director, Nutrimix Ltd, Nairobi. An interview guide was used during these discussions to pick out key youth participation.

**Results and discussion**

**Youth profiting from ICTs**

Until recently, many young Kenyans saw farming as an unskilled and unrewarding profession, suitable only for the retired or the uneducated. Now, however, a group of determined young farmers are challenging traditional prejudices and trying to explain the attractions of farming as a profession. They include the ‘Mkulima Young Champions’ and have become figureheads for a digital initiative to change the way farmers are viewed by young people. Using a range of technologies, they are proving that farming in Kenya really is a profitable 21st century career path. ‘Mkulima Young Champions’ aim to draw more young people into farming, help them learn from each other, trade and overcome the challenges of agriculture together.

Since Mkulima Young started featuring champion farmers, an appreciable change in young people’s attitudes towards agriculture has been noticed. By having Mkulima Young Champions who are educated and young, the attitude of the youth towards
agriculture has changed: from viewing it as an activity for the old, to a profession where they can accrue millions of shillings. Notably, it is not only the jobless who are turning to farming, and the initiative is about far more than publicity. Using radio, SMS and social media, young Kenyans are engaged to discuss agricultural topics and listeners to radio programmes can give feedback online, helping to shape the content and making it more relevant. Meanwhile, *Mkulima* Young’s Facebook page, which was opened in January 2013 and already has over 19,000 followers, has become a vibrant place where young people post links, photographs and videos, ask questions, discuss issues and interact with other young people who are passionate about agriculture.

The following examples are detailed in a survey by the *Daily Nation* (Muiruri, 2013). The survey showed that new graduates were not interested in growing traditional crops or rearing domestic animals. They targeted niche markets to start ventures whose produce moves quickly. A day for any of these youthful farmers is a busy one as the majority of them spend considerable time on the internet, reading about the animals they keep or the crops they grow. Most have active Facebook accounts and websites and spend a lot of time responding to queries from customers or fellow ‘digital’ farmers. They use gadgets such as iPads and tablets routinely to reach markets beyond Kenya and these are considered most convenient marketing tools.

Kenya’s money is called Kenya Shillings (KES) with USD ≈ KES 90. *Mkulima* Young website and Facebook accounts had posts that were simple and to the point: “Cucumber available (20–100 kg); red capsicum at KES220 a kg; pork at KES300/kg, 650 kilos available; tomatoes available at KES50 per kilo (120 kilos available, Eldoret); 1,000 all-male tilapia fingerlings available at KES10 each (Maseno). Want nutritious feed for your livestock? Get a hydroponic system at KES95,000 (Zambezi). Other sites showed numerous posts, such as enquiries on selling geese around Nairobi, red onions and about silk worms. Such were the interactive queries and information from youthful graduates in Kenya, hungry for information on agricultural produce or equipment.

One of the *Mkulima* Young Champions is a typical example of the new breed of Kenyan entrepreneurs who are starting to see the opportunities farming offers. The farmer was earning approximately KES300,000 (≈ USD3300) per month using aquaponics technology to rear fish and grow strawberries. The technology is resourceful because ammonia produced by the fish is filtered out of the ponds through stone-filled towers, providing free nutrients and water for the strawberry plants. This farmer is one of those proving to the young generation of Kenyans that technologically-enabled farming is skilful, lucrative and not necessarily labour intensive.

A 23-year old farmer in Kajiado, Kenya earns an average monthly income of KES80,000. Initially, the farmer earned an average of KES18,000 per month and was contracted to grow seedlings for other farmers. The farmer was initially capable of growing 100,000 seedlings per time. The farmer claimed that production doubled as a result of using technologies acquired through an iPad.

Mary Gitau-Makori, 29, holder of a Master’s degree in Psychology, owned 52 pigs, 50 rabbits, 200 runner beans and two greenhouses. Her farm – ‘Doben Resource Farm’ – is located on the outskirts of Nairobi city and measures 150 × 100 square feet. The sale of 40 pigs earned KES200,000 profit, while KES90, 000 was realized from the sale of tomatoes within three months. In addition, KES130,000 was accrued from the sale of capsicum and strawberries. Her rabbits weigh between 6 and 9 kg; a mature one sells for
KES2,500. The blend of tomato and strawberry juice earned a profit of at least KES21,000 per month.

There are many other farmers with testimonies of beneficial ICT application in their farming enterprises. For instance, at 30 years of age, a civil engineer Wycliffe Fundi, from Embu County, has an estimated monthly income of Sh250,000. He started with initial capital of KES3,600. Apart from possessing 1,600 chickens, the farmer has a hatchery that can produce 2,000 chicks per time. “I began with 30 chicks and today I have 1,600 chickens worth Sh960,000,” he said. His two brooders hold 500 chicks at a time and, in addition, he has crossbred a variety of chicken, producing what he calls taste ‘yangu’ (my taste) due to its special flavour. Fundi recently opened an outlet at Mwea town in Kirinyaga County, where he slaughters at least 40 chickens daily. A Facebook enthusiast, he sells most of his chicken via this media. His wife, Anne Wawira, manages the farm when he occasionally lands consultancy jobs with local road construction firms. ‘I would be earning merely Sh70,000 month at most if employed. See where I am?’ he challenges graduates who are still job-hunting.

An 18-year old student from Nyeri County earns an average monthly income of KES40,000. The farmer was already earning more than a government-employed teacher before completion of his studies. From his dairy animals, which were producing 40–45 litres per day, fresh milk was being sold at about KES35 per litre and a margin of KES50 per litre was realized from yoghurt. With the surge in milk production, the farmer has been planning to set up a cheese manufacturing and ice cream unit.

Use of ICTs in agriculture

There is under-utilization of ICTs for agricultural production and marketing. It is essential to digitize agricultural production, processing and marketing information into web-based resources to increase outreach and use. The Extension Services emphasized the importance of continuously involving the youth. The technology requires training, investment in ICT tools, tailoring to match niche markets and clients’ needs. Simpler software is needed to be developed, tested and users trained before final commissioning.

The use of ICTs provided the required information to enable the youth to make objective choices on profitable enterprises, their niche markets, modern technology and model success stories. There was a need to set up ICT hubs near markets and agricultural commodity bulking centres. These hubs will enable easy access to farmers, the community, support organizations, trainers and information sources. Youth entrepreneurs were to be encouraged to invest in setting up such ICT hubs as commercial enterprises. The possibility of forming private-public partnerships to provide ICT facilities was encouraged. There was a need to integrate training and introduction of ICTs and its use in agriculture. Wide acceptance and application of ICTs in rural areas will increase the retention of youth in agriculture and enhance access to new technology; widening access to modern production techniques enables timely access to market information and agricultural financing opportunities.

The youth groups were enthusiastic about the use of ICT in agriculture. They were particularly happy about the prospect of the use of computer software in ration formulation, its application to feed formulation and the opportunity to provide feed formulae at a commission. It was felt that the demand was huge, from individual households where the
youth lived, the existing groups, cooperatives and the community. Nutrimix Ltd, Nairobi routinely provided backup on formulae to the feed industry in Kenya using several softwares. Various softwares were available and in use among the researchers in the institutions visited, including Excel spreadsheet, PC Dairy and Feed Formulator MOF-Dairy Edition (Mutua et al., 2012). However, there was no unified approach and software was chosen to meet the unique need for which it was developed. The majority of the software was complex in operation and information needed to function, hence not friendly at farm level use. Simpler software needed to be developed, tested and users trained before final commissioning for farm level application.

Equity Bank ran loan packages to the youth and had accumulated a wealth of experience in financing the agricultural industry. The bank ran training programmes to build the capacity of the borrower right from the outset, including eight weeks training on financial management, leadership, record keeping and group dynamics. They ran a wide branch network at which preferably two officers had agriculture training and dedicated their time to handling agricultural credit and farmer capacity building. Equity Bank ran a credit portfolio for individuals and groups.

**Commonly used ICT tools**

The ICT-savvy youth served as trainers and community consultants and transformed the community’s use and access to ICTs. Some of the youth widely used ICTs on their farms. For example, in Western Kenya, 90% of the youth embraced ICTs in their farming (IICD, 2013). The most commonly used tools were MS Office for word processing and spreadsheets for farming and trading record keeping. Frontline mobile phone SMS and voice messages were commonly used for accessing timely market prices, reaching clients, sharing accurate production information and money transactions. Examples included M-Farm, which provides up-to-date market information, and links farmers to buyers through their marketplace and current agri-trends (Macharia, 2013). M-Farm Ltd is a software solution and agribusiness company. Their main product M-Farm, is a transparency tool for Kenyan farmers where they simply SMS the number 20255 (Safaricom Users) to get information about the retail price of their products, buy their farm inputs directly from manufacturers at favourable prices and find buyers for their produce. They collect wholesale prices of the commodities from the five major markets in Kenya and post them on their price page.

iCow, the winning application in the Apps for Africa Competition 2010 allows small-scale dairy farmers to manage and trade livestock (Oafrica.com, 2012). The platform has allowed users to increase milk production by over 50% and income by 42%. iCow, in one of its products, helps beef farmers track their cows’ gestation periods to increase livestock numbers. Farmers use an SMS code to register their cows and their insemination date. The service then sends SMS prompts to the registered farmer on the expected date of calving or the best days for new insemination. This service also sends weekly SMS messages to subscribers with tips on breeding, nutrition, milk production efficiency and other best dairy practices. iCow also posts the location of the nearest veterinarian or artificial insemination specialist on its website, or sends farmers an SMS with the information. Through its iCow-Soko (market in Swahili), farmers can trade livestock and livestock by-products on their mobile phones.
FrontlineSMS was created in 2005 to enable effective communications channels for communities in the developing world. FrontlineSMS leverages the ubiquity of mobile phones and familiarity of text messaging to turn an offline laptop into a communication hub. The simple innovation empowers villagers, aid agencies and news services to exchange information among groups easily. Frontline SMS was designed as a free SMS communications system for development projects and has been used effectively in very specific contexts such as pastoralists in northern Kenya to access local crop and livestock prices (www.nafigs.go.ke/NAFIS). Developed by the Ministry of Livestock Development, it is a comprehensive information service, intended to serve the needs of farmers throughout Kenya including the rural areas where internet access is limited. The Kenya Plant Health Inspectorate Service (KEPHIS) operates the Maize Variety SMS Service. To receive an SMS for the recommended maize varieties in your division: (1) Go to ‘write message’ on your handset; (2) type MAIZE#DIVISION e.g. Maize#Lanet; (3) Send message to 20354; (4) You will receive details of seed varieties. The youth also viewed agricultural videos, listened to radio programmes, viewed TV programmes and surfed the internet using Google Search to obtain accurate production technologies.

With the widespread use of mobile phones, voice and SMS solutions should find more use. The voice solution is by far the most promising platform for the farmer as it can be customized for language, is readily accessible and very natural, as it involves using a mobile phone through direct responses to specific questions. Internet tools commonly used by the youth included M-Farm which is owned by M-Farm Ltd, a software solution and agribusiness company. Another site is kiwanja.net that helps social innovators, entrepreneurs, farm practitioners and non-profit organizations make better use of information and communication technologies in their work. kiwanja.net specializes in the application of mobile technology, with a particular emphasis on its role as a driver of innovation, entrepreneurship and social change around the world. Another web and mobile-based technology programme is KilimoSalama, which means ‘safe farming’ in Swahili. Run by the Syngenta Foundation for Sustainable Agriculture (SFSA), part of a Swiss agribusiness operating in partnership with UAP Insurance of Kenya and Safaricom, it offers seeds and crop insurance against drought or excessive rains. Smallholders purchase cover through local agrodealers while buying their seeds, fertilizer and insecticides. Using solar powered weather stations, KilimoSalama collects information about extreme weather that may reduce yields and sends farmers these reports via SMS. If the company’s climate station registers extreme weather, it sends insured farmers a mobile money payment that covers the costs of their seeds, fertilizer and other inputs such as insecticide that have been insured. Even if the entire crop is lost, the insurer provides the farmer with the funds to buy next season’s seeds.

Social media commonly used by the youth was Facebook site ‘Mkulima Young Champions’ who have become figureheads for a digital initiative to change the way farmers are viewed by young people. Using a range of technologies, they are proving that farming in Kenya really is a profitable twenty first century career path. Mkulima, meaning “farmer” in Kiswahili, was founded to draw more young people into farming, help them learn from each other, trade and overcome the challenges of agriculture together. ‘Mkulima Young Champions’ targets youth to inspire them to participate in agricultural activities through awareness creation and knowledge change by harnessing the power of multimedia, including radio and other ICT tools. ‘Mkulima Young Champions’ identifies
outstanding agricultural entrepreneurial activities and disseminates them through radio, Facebook, Twitter, YouTube and SMS. They obtain feedback from their regular radio clientele through an SMS and address them during subsequent radio programmes.

Most of the youth got their information from the internet so the reality of the matter is that the internet would be one of the best platforms to market and promote agriculture if you want to reach the youth. Internet and social media were used to obtain farm production technologies, market information and for information sharing. The internet was used to access production brochures, magazines and newspapers. Seeking information from these and other platforms was an onerous task for the farmers as it entailed ploughing through many publications or surfing a large number of web pages. Furthermore, for the illiterate farmer this becomes impossible right from the onset. Web-based solutions also bring challenges because the internet infrastructure in Kenya is still very sparse. Nevertheless, these are very useful resources and all that is needed is to provide an easy way for the farmers to navigate them.

YouTube is one of the most visited websites after Google and Facebook (Wambugu, 2014). YouTube is a user-generated content website that allows every person, company and social entity to share their videos and voice. The poultry unit at KARI Naivasha uses YouTube to interact with farmers rearing indigenous chicken. Farmers receive training and provide feedback on areas such as housing, disease control, feeding and management. They have had over 50,000 views from April 2013. Twitter is a networking and microblogging service utilizing instant messaging, SMS or a web interface that enables users to send and read ‘tweets’, which are text messages limited to 140 characters. Registered users can read and post tweets, but unregistered users can only read them (https://twitter.com/). YouTube and Twitter were not commonly used by the sampled youth, except those who accessed ‘Mkulima Young Champions’.

**Benefits and impacts to youth of ICT use**

ICT use was a gateway to better jobs and employment in farming or outside farming. The youth were more proficient at using ICT skills for farm planning, production and marketing. This improved the productivity and profitability of farming activities through high yield prices and farm income. The use of ICTs provided reliable markets and modern production information on existing livestock and crops and provided better access to profitable markets. Youth status was transformed generally from idlers to more serious players in the agricultural industry who can be engaged by both public and private sector in farming activities and information use and transmission. These youth were more entrepreneurial and eager to adopt innovations and modern agricultural technologies. The youth increased their recognition from parents, peers, farming organizations and other community members. They were more respected and were approached as technical resource persons by other farmers for the latest farming information and technologies and latest prices of agricultural commodities.

The public and private sectors valued them as the main entry point for introducing modern extension and agricultural technologies and for expanding extension coverage. In fact, the youth were able to effectively and profitably capitalize their linkages with private sector actors. Their effectiveness for obtaining current market information and modern farming technologies enhanced youth negotiation strength and market position,
surpassing local traders, agribusinesses and other agricultural value chain players. The role of youth in agriculture stood out more strongly internally towards their parents and externally to extension agents, the private sector, chain stakeholders and community elders. The youth trained in ICTs were appointed to more responsible roles in producer groups and commodity bulking centres and also served as trainers to fellow youth. Their farms were more intensive, efficient and profitable, producing for niche markets and created employment for other youth. The youth transformed community use and access to ICTs and influenced community economic status and political power relationships.

In general, the use of ICTs improves efficiency in agriculture. ICTs can provide weather forecasts, ease farm input purchases and pricing information, expand reach of extension services through phones, radio, video and their combined application. ICTs can provide mobile banking and timely payments, for example using M-Pesa and M-Shwari, and enable buyers to manage transactions with thousands of smallholders.

**Challenges for ICT use**

The use of ICTs required that the youth are well trained and conversant with these tools. It requires access to the computer and the internet, which may not be readily available. ICT tools should be readily available and in close proximity to the users. The websites hosted by service providers should provide information that is well packaged, reputable and in the appropriate languages (vernacular, Kiswahili or English).

**The future of ICT use in agriculture**

Smart phone technology will revolutionize access to and the use of ICTs, particularly for Facebook, YouTube, Twitter and WhatsApp among the youth in Kenya. This will enhance the introduction of modern extension and agricultural technologies and will increase extension coverage. The outcome will be improved productivity and profitability of farming activities through higher yields, higher prices and increased farm income, climaxing in more youth engaging in agriculture. The wide reticulation and commissioning of fibre optic cable in Kenya has increased the bandwidth and coverage among the majority of its citizens, which will stimulate ICT use among the youth. New innovations are likely to occur that will cause growth of the information and communication technologies sector in Kenya.

**Conclusions and recommendations**

The use of ICTs in agriculture increased opportunities, and motivated and increased the capacity of the youth to engage in profitable agriculture targeting niche markets. Their use created an occupation worthy of investing time, effort and financial resources. The availability of ICT tools should be expanded and organizations contributing to agricultural development require their technologies to be packaged simply and to be posted on their websites for easy access. ICT tools need to be simple and affordable. Content should be relevant to targeted youth, valuable, treasured, localized and dependable. The use of
YouTube, Twitter and WhatsApp in agricultural knowledge access by institutions and among the youth should be expanded and widely popularized.

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