

AFRICA'S MOBILE AGRICULTURAL REVOLUTION: FARMING APPS IN SUB-SAHARAN AFRICA

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ABSTRACT: *Mobile phones have gone from luxury items to daily essentials in the lives of billions of people around the world. The start-up boom encouraged the creation of numerous apps targeting specific market niches and in the last decade, they have become more sophisticated offering thousands of streamlined services. With the touch of a button they are able to grant end-users access to various resources in different sectors, including agriculture. This paper evaluates the stance of mobile agricultural apps in sub-Saharan Africa. It gives a brief history on their development and points out why they have been a successful farm improvement tool in subsistence agriculture. It also identifies possible challenges that may stifle their applicability and growth potential in the region. It then goes ahead to highlight possible ways to mitigate these challenges*

KEYWORDS: apps, agriculture, sub-saharan africa

INTRODUCTION

Agriculture is undergoing a revolution all over the world. A move propelled by governments, individuals and investors who want to be at the forefront of this long-awaited leap. The focus on climate change not only puts pressure on the sector to reduce its carbon emissions, but also come up with avenues to absorb some of the greenhouse gasses already expelled into the atmosphere. In recent years, smart farming and the concept of responsible innovation have become necessary tools for sustainable intensification (Rose & Chilvers, 2018). And as we approach the cusp of the fourth agricultural revolution, countries the world over are strategically placing themselves in a position to ride this wave in order to achieve maximum returns (Lejon & Frankelius, 2015). The revolution in Africa is moving on a rather different path. Unlike their counterparts in developed nations, changes in Africa are moving at a slower pace, but are having a more profound effect on society than would be expected.

The survival of millions in Africa is dependent on agriculture, as the continent contains about 60% of the world's uncultivated arable land – in addition to abundant natural resources. The sector informally employs over 175 million people who produce staple crops, cash crops, meat, hide, timber and other raw materials, a large portion of which are consumed locally. One would therefore expect a highly advanced and diversified industry with investors begging farmers and agro-allied industries to take their money for a share of

the profits, but this is not the case. Despite the seeming abundance, Africa is actually the most food-insecure region in the world, with a large percentage of cultivated land in the sub-Saharan region owned by subsistence farmers who grow staple crops, and a few who grow cash crops and herd animals on fragmented plots that have become too small to be economically viable (Austin, Ulunma, & Sulaiman, 2012). Crude farming implements, archaic production practices, non-existent distribution networks and high production losses have also worked hand-in-hand to keep farmers in a perpetual cycle of uncertainty and poverty. The growing middle class and rapid urbanisation have led to the migration of youths from rural farming areas to cities in search of corporate jobs. The consequence is a disinterest in agriculture that is reinforced by difficulties surrounding land acquisition, decaying infrastructure and the increasing costs of farm inputs, all of which have become huge deterrents for entry into the sector.

The average farmer in sub-Saharan Africa is aged 60 years or above (Oxford Business Group, 2019) although about 60% of the continent's population is below the age of 30. There is a shortage of youths willing to take over farms as veterans drop out. The youths are weary and want nothing to do with agriculture. They are the silent observers who grew up watching countless government and NGO projects unable to deliver on promises to turn small farms into super producers. They have watched the land become depleted over time and produce on a constant decline, which has left many farmers in debt. They have seen countless think tanks struggle to come up with 'innovative approaches' that have had very little, if any, impact on the lives of their benefactors. Young people are therefore deciding to take their future into their own hands by migrating to cities to try out their luck or (illegally) into Europe, where their choices are even more limited (Boateng, 2017).

LITERATURE REVIEW

Post-independence, most African nations were self-sufficient, with booming agricultural sectors that made up a huge part of their exports. For example, in 1965, Nigeria was a young food-secure nation with cash crops contributing about 62.2% of her foreign exchange; the discovery of crude oil in the mid-1960s put a damper on the sector. Agriculture took a back seat as petroleum was favoured for its quick returns and soaring prices on the international market (Eigege & Cooke, 2006). Other countries have similar stories of declining farm exports resulting from wars, the discovery of precious gems and metals, unrealistic development policies, corruption or difficulties understanding international politics after independence.

Decades after independence, farming has declined to become one of the most disdained professions on the continent. The rich and middle class consider agriculture to be the ultimate sign of poverty and forbid their children to consider careers within the sector (Nir, 2019). Farming has become relegated to poor villages whose only reason for existence is

to supplement food imports in towns and cities. An unspoken understanding has developed between the classes, and most would prefer to maintain the status quo. These attitudes go beyond stereotypes; they have subconsciously flowed into national policies, including funding to the agricultural industry and agriculture departments in universities, which have affected the development of the sector on the continent.

Why Africa must feed herself

By 2035, Africa's population is expected to explode to 1.8 billion, accounting for half of the world's population. Governments will be presented with new sets of challenges in healthcare, education, infrastructure and agriculture as 50% of this demographic is expected to be below 24 years (Bello-Schünemann, Cilliers, Donnenfeld, Aucoin, & Porter, 2018). Low agricultural productivity and heavy reliance on imports creates a security and social risk not just for African countries but also for other nations as well. One bad harvest could expel millions of 'hunger migrants' fleeing starvation to nations across the world, thereby increasing pressure on NGOs and host countries already quivering from existing numbers of refugees.

Climate change is also affecting the field outputs of large exporting countries like the US, leading to an erratic supply of the imported staples like rice, wheat, soybean and maize on which sub-Saharan nations have come to depend. Any decrease in supply drives up food prices, which pushes these food items out of the reach of the poor. Simply put, overdependence on food imports is risky because food prices on the global market fluctuate. As determined FAO (2009), poor households already spend a large proportion of their income on food and high food prices resulting from the volatility of on International Commodity Markets can push them further into poverty, as was evident in the 2007–2008 world food crisis. This overdependence has contributed, in part, to the underdevelopment of local production industries.

Looking for change

There is evidently a need to modernise the agricultural sector to raise the output and income levels of farmers to attract young talent. The plan is to use the interface between agriculture and technology to attract the younger generation who have an unending fascination with innovation. Moves like this have been met with some level of scepticism, as many believe the myth that mechanisation will lead to increased unemployment because less labour will be needed for manual work. On the contrary, mechanisation will lead to an increase in agriculture-related jobs such as transportation, processing, packaging and research, which will absorb the floating manpower from subsistence farming.

So far, individuals and governments have looked to funding from developed nations whenever technology or development is mentioned. Africa has become dependent on development aid from other continents to prop up its industries and supplement national

budgets. As it is becoming increasingly evident that dependence on foreign aid does not help developing countries – especially those in Africa – better their industries, some nations are starting to come up with other solutions. At the eighth CGECI meeting in 2019, President Paul Kagame of Rwanda encouraged African countries to finance their own transformation by partnering with neighbouring nations and private entities. He also deprecated overdependence on foreign aid and encouraged dissemination of knowledge among partners (Mwai, 2019).

Billions of dollars in foreign aid that have flowed into Africa and have been relatively ineffective in producing any tangible change over the decades – notably within the agricultural sector. Even so, some academics and NGO reports attribute what little improvements that can be observed as a direct result of their instituted programmes. In line with Pedroza (2012) findings, these claims are inconclusive, as humanitarian agencies lack the systemic means to evaluate the effectiveness of their programmes properly. One can equally argue these changes are a result of the fall in extreme global poverty rates (Roser, 2019) caused by improved international trade and lower production costs, which have created wealth and made the world richer. Mass production and improving technology have made previously exclusive items and services trickle down to the poor.

The groundwork

The advent of mobile phones has been met with wide acceptance and rapid adoption. Mobile phones have created an avenue for low-income individuals to partake in the global technological revolution. The falling cost of mobile devices, thanks to low production costs in countries like China, is making these devices affordable to almost everyone. The infrastructural challenges in Africa have led many start-ups to develop their business ideas around the most readily accessible technology – mobile phones. They have become the platform for numerous digital services beyond social media or traditional call services and offer a way for low-income individuals, including farmers, to keep up with technological progress.

This revolution started with mobile money transfer services, which laid the foundation for other extra-mobile services. M-Pesa, launched by Vodafone in Kenya in 2007, was the forerunner, but its business model has now spread to other African countries. The growth of telecommunication infrastructure has provided an avenue for small businesses and individuals to avoid the high costs associated with money transfers by using pay-as-you-go mobile services that exclude traditional bank charges or account maintenance fees. Such services also exceed the speed and security of the traditional system of having to wait until someone from the city was going to the village to send money back to one's family. As noted by Pasti (2018), sub-Saharan Africa accounted for 45.6% of global mobile transactions, with an estimated value of US\$26.8 billion (over 28% of the global total) in 2018.

The growth of telecommunications in Africa is helping to push the continent's agricultural revolution forward. In 1999, with the exception of South Africa, most sub-Saharan countries had low mobile coverage or barely functioning landline networks, but by 2008 over 60% had access to mobile services (Aker & Mbiti, 2010). Unlike the gradual move from landlines to mobile services experienced in developed nations, Africa's transition was quite sudden, and it is still changing. For example, there has been a move from SIM cards and phone ownership being couple-owned or group-owned to being individually owned. In addition, the dropping costs of these services has increased accessibility to SMS and the Internet (James, 2018). It is estimated that about 75% of African own a phone (Hetland, 2016) and have access to the Internet, so they are able to look up information of interest to them or at the very least receive pictures and SMS from family members. The spread of mobile phone ownership has also helped connect city dwellers with families in villages and hard-to-reach places. In less than 10 years, mobile phones have gone from luxury devices to almost basic necessities in many countries.

Breaking the mould

As developed economies slow down and struggle to maintain neutral GDPs, global investors look towards emerging economies for new opportunities. Individuals from emerging economies are also becoming aware of investment opportunities in their home countries and are turning their attention inwards. A growing number of young technopreneurs throughout Africa are beginning to see investment opportunities in the agri-tech sector. Many of them are graduates, some from well respected US and Europe institutions, who have quit their jobs to move back to Africa or were discontent with work conditions in their respective countries and decided to become self-employed. Most have come in from non-agricultural backgrounds to pursue what many believe to be one of the most undervalued investment opportunities on the continent. Additionally, besides a steady income stream, this sector not only addresses the need for food, but also has a lasting positive social impact.

This renewed interest seems to be the push the industry has been waiting for. Local farmers are surprised but happy to see educated youths coming back into villages to document their experiences and improve on them. Current farmers see themselves as custodians of the land and are beginning to accept the fact that they must be more open to change if they are to become competitive – either that, or be pushed off the scene. So far, both generations have been able to work together to develop much-needed apps and informative material based on methods and data provided by the older generation. The older generation, impressed by the usability of such apps, are becoming more willing to incorporate the offered services into their daily farm tasks, because they were created specifically to address issues within their localities.

A few popular examples of such apps include Farmcrowdy and EZ Farming. These are Nigerian digital crowdfunding platforms working to connect investors across the world to thousands of local farmers across Nigeria, Ghana and Sierra Leone. With as little as US\$200, investors can become patrons to farmers in return for a share of the profits at the end of a farming cycle. Farmers sign up to these platforms to access finances, inputs, labour and information needed to ensure a bountiful harvest. Their progress is monitored and the funds released in stages throughout the growing season. These companies have also established relationships with export partners in developed nations, who buy farm produce at fair prices. The end game is to help farmers earn enough profit to become independent, improve their lives and reinvest some of their own profits to grow their farms. Kitovu is another Nigerian start-up making soil analysis available to farmers at affordable rates on their mobile phones. It also helps farmers access agro-chemicals and seeds (Jackson, 2019).

Zenvus (a Nigerian start-up) and the Kenyan companies Apollo Agriculture and Tulaa are providing inputs, advisory services and market connections to small- and medium-scale farmers. Their goal is to maximise output by incorporating satellite data and machine learning. Their customised services range from finance to produce marketing, and all these services can be accessed on a mobile phone (Balachandran, 2018). UjuziKilimo is another Kenyan interactive advice-sharing, machine-learning platform where farmers can get advice on weather, soil or farming activities.

National governments are also actively participating in this technological revolution. The Ethiopian Agricultural Transformation Agency (2019), for example, has developed a digital soil map accessible to everyone by phone. This takes the guesswork out of determining farm soil types or plant needs. The Nigerian government works with over 15 million small-scale farmers through an e-Wallet programme, providing mobile services tailored to individual farm needs. Similarly, Wefarm is a peer-to-peer mobile information service operating in Kenya, Tanzania and Uganda. Farmers give and receive information by SMS, cutting out the need for the Internet. Cowtribe, in Ghana, provides veterinary services ranging from outbreak reports to vaccination reminders.

FINDINGS

Familiarity with already existing mobile financial services has made farmers more willing to try other innovations rolled out on the same platform. Mobile phones have become the gadget of choice for most people. One can have one's bank, TV, communication device, torch, alarm clock and radio all on a single device. When one adds portability and price to the list of attributes, mobile phones become an almost indispensable item that many in rural communities simply refuse to live without.

One has to bear in mind that, in the case of rural farms, access to the internet does not necessarily mean access to much-needed information, as most online data on innovative approaches to farming are geared towards intensive industrial farms in developed nations. They have little or no applicability to small-scale farmers looking to gain a little information on how to increase output, either because of their high cost or complicated nature. Low literacy rates in Africa also mean that farmers will prefer apps that are straightforward and easy to use or those on which they can see pictures, figures and illustrations (Gyamfi, 2005).

Why farming applications work

Despite the myriad of information available on the Internet, such information is yet to be of any tangible benefit to the life of the average farmers in Africa. The millions spent on online databases and information centres are ineffective because they are not accessed by the target audience. Instead, they are being used by large farms, multinational agricultural conglomerate and academics. Most mobile farm apps, meanwhile, are user-friendly so they do not require organised lessons or extensive training sessions.

NGOs are a dime a dozen in Africa and have come to be seen as part of everyday life. Farmers have come to expect such organisations to invite them for trainings or information sessions. These organisations are perceived as public-private partnerships that exist as a matter of course, rather than out of a determination to effect changes. This is why although farmers volunteer for trials, they sometime opt out midway, and those that stay until the end are just too polite to leave so they finish the programme cycle and continue with their previous farming practices. Although NGOs report high success rates, it should be noted that those results tend to focus more on the rate of adoption of new techniques, but hardly give any information on how long adoptees continued with the methodology in question. It is also important to note that the transmission of information and acknowledgement of receipt does not necessarily mean a desire to implement or a clear understanding of the science behind the results.

Furthermore, because farmers decide to use these apps without being cajoled into doing so, they put in time learning all they can about how these apps work. Another distinct advantage is that these tools help to reduce 'noise' in communications. They eliminate the unnecessary information that usually accompanies other transmission channels such as group trainings or demonstration plots by focusing in on the desired information.

Challenges opposing the move

It is not news that the Green Revolution and other self-sufficiency strategies have failed in Africa due to improper policy formulation, implementation structures and differences in socio-cultural aspects of each region. They failed to consider the differences in soil types and that irrigation technology was not as widespread on the continent as in Asia.

Additionally, the success of such moves do not depend on the government alone, but on the people and the private sector (Voortman, 2013).

Additionally, it has been difficult to maintain the success of implemented programmes in sub-Saharan Africa. New projects receive much media attention, and the surrounding enthusiasm makes participants try their best, but the desire to continue dwindles during the project lifespan, almost vanishing towards the end. There is a need to maintain momentum if the desired end results are to be achieved. Also, most governments, individuals, the private sector and NGOs do not build on the groundwork laid by their predecessors. They prefer to start afresh or rebrand existing projects, which takes away from the direction and impact already achieved. It is sometimes necessary to build projects from the ground up, but in most cases this has not been the best use of resources. A chain of continuity has to be established to enforce the impact of achieved results. The best course of action is not to abolish or roll out new programmes that conflict with already existing plans on the ground.

It is possible that farmers might become dependent on some of these apps, such as Farmcrowdy and Tulaa, without desiring to become self-reliant – in much the same way African countries have become dependent on foreign aid. Because these services are becoming more available, the desire to outgrow the dependence on these software may gradually fade, giving farmers no reason to want to improve beyond their assistance. One may suggest that a limit be placed on the number of times each farmer can access such applications or give them permission to use these platforms for only a certain number of years, after which they are expected to be self-reliant. This is not feasible, because farmers can just move to other platforms and keep receiving the same type of support elsewhere. As there is also competition between technopreneurs – with each trying to amass as many users as possible – it is not likely that they will turn down prospective users for the sake of enforcing a login limit. It is also possible that some farmers may be slower than others and will not become self-sufficient before any determined deadline, so rules like this will push them back into poverty. Climate change is already affecting weather pattern across Africa and causing unpredictable rainfall and floods. According to Cooper and colleagues (2008), these conditions are expected to worsen over time, so access to information and quick response times are essential if farmers to be able to feed their families. The challenge is bridging the gap between technology and agriculture in a way that builds on its existing success while gradually pushing farmers towards self-sufficiency.

Good governance is key to the development of industries in any nation. Most app creators are first-time entrepreneurs, who launch into the scene unprepared for what they encounter. Like most start-ups, the failure rates are very high, so having conducive local conditions in place that support businesses are beneficial to agri-tech platforms, especially if they plan to be pan-African or globally competitive. So far, successful projects have not only required partnership with investors and innovators that understand the African terrain, but have also taken the initiative to customise their products to the culture and needs of each

country. Investors and international NGOs are key players in agricultural development but many have lagged behind start-ups because they still hold onto unrealistic or outdated work plans that are more in line with academic theories than reality. To partner with these platforms adequately, they need to re-evaluate their approach if the intent is to tackle the root cause of drawbacks in agriculture and put funds to better use.

CONCLUSION

One thing we can be sure of is that the agricultural revolution in Africa will not follow the same evolutionary stages as on other continents. In today's modern world, it may be impossible to have that same gradual shift from subsistence to mechanised farming. Rather, it will follow a different path, a hybrid approach that blends modern technology with everyday field operations at a pace convenient for local farmers. A push for a quicker move to enable the continent can 'catch up' would only produce similar failures to those seen in previous agricultural movements. It would be best to let this trend develop organically and not stifle it by trying to ensure the revolution follows the same paths as in Asia or Western nations. It will be interesting to follow its advancement and watch the growth of a new facet of agricultural development.

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